Agriculture Canada

SOIL SURVEY OF ANTIGONISH COUNTY NOVA SCOTIA

Report No. 6
Nova Scotia Soil Survey

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Report No. 6
Nova Scotia Soil Survey
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PREFACE

Because of the public demand for information on the soils of Antigonish County, N.S., this soil survey report has been reprinted. During the years since the report was published, substantial changes have taken place in survey techniques, in the system of soil classification, and in soil evaluations. The latest edition of *The Canadian System of Soil Classification* is available from authorized bookstore agents, other local bookstores, or by mail for $9.00 ($10.80 outside Canada) from the Publishing Centre, Supply and Services Canada, Hull, Que. K1A 0S9. Your cheque or money order in Canadian funds should be made payable to the Receiver General for Canada.

The map was recompiled on a new topographic base, which has created slight discrepancies along streams and other water features. It is necessary to regard with caution the delineation of adjacent soils, such as stream floodplains.

A generalized soil map of the province was published in 1974 under the title: *Soils of Nova Scotia.* A map depicting the suitability of Nova Scotia soils for septic tanks is also available. Address your requests to: Soils and Crops Branch, Nova Scotia Department of Agriculture and Marketing, Nova Scotia Agricultural College, Truro, N.S.

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The base maps were supplied by the Canada Department of Mines and Technical Surveys, Ottawa and the final drafting of the soil map was done by the Cartographic Section, Field Husbandry Division, Central Experimental Farm, Ottawa.

The Nova Scotia Research Foundation supplied aerial photographs of the county and their assistance is gratefully acknowledged.

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INTRODUCTION

Successful agriculture requires a fundamental knowledge of the soil. Most farmers acquire this knowledge through experience with the soils on their farm. It is readily apparent that all soils are not the same, even on a single farm. Within an area such as a county, many types of soil may be found.

It is the purpose of the soil survey to examine these soils, to observe and define their properties and to group or classify them according to their common characteristics. The areas of different soil types are defined on a soil map and the properties of the soils and their relationship to the agriculture of the area are recorded in a soil survey report.

This report on the soil survey of Antigonish county is the means by which the above information is made available and it is the sixth in a series of reports which eventually will cover the soils of the province.

The first part of the report describes the physical characteristics of the area and the factors that affect soil formation and development. The main body of the report describes the soils and the properties which make them suitable or unsuitable for agricultural use. The latter part of the report contains a discussion of the agriculture of the area, the management of the different soils and a rating of the soils according to their suitability for use.

A most important part of this report is the soil map which accompanies it. This map shows the areal distribution of the different soils which are described and classified in the report. The scale of this map does not permit the delineation of individual soil types on a single farm, but all of the soil types found in the area are described in the report. The report has many uses, but serves primarily to furnish information to farmers and agricultural workers and those interested in land use planning, forest and wild life conservation and general geography of the area.

GENERAL DESCRIPTION OF THE AREA

Antigonish county lies at the northeastern end of the peninsula of Nova Scotia. It is bounded by Northumberland Strait and George Bay on the north, the Strait of Canso on the east, Guysborough county on the south and Pictou county on the west. The greatest distance from east to west is about 35 miles and from north to south, approximately 32 miles. It has a total area of 361,625 acres or 565 square miles.

The principal urban centre and county seat is Antigonish, situated on the Antigonish harbour. It has a population of 2157 and is about 80 miles east of Truro, 145 miles from Halifax and 140 miles from Sydney. Rural centres include Heatherton, St. Andrews, Bayfield, Tracadie, Havre Boucher, Monastery, Pomquet, Pleasant Valley, Addington Forks, Brierly Brook, Arisaig and Georgeville. Most of these are centres of fishing and farming communities.

Population and Racial Origin

The population of Antigonish county is given by the 1951 census of Canada as 11971 persons. Of these 8775 or 73.3 per cent are rural dwellers, while 20.5 per cent or 2157 persons make up the urban population of the town of Antigonish. About 74 per cent of the rural population is on the farm. The greater part of the population is of British and French origin.

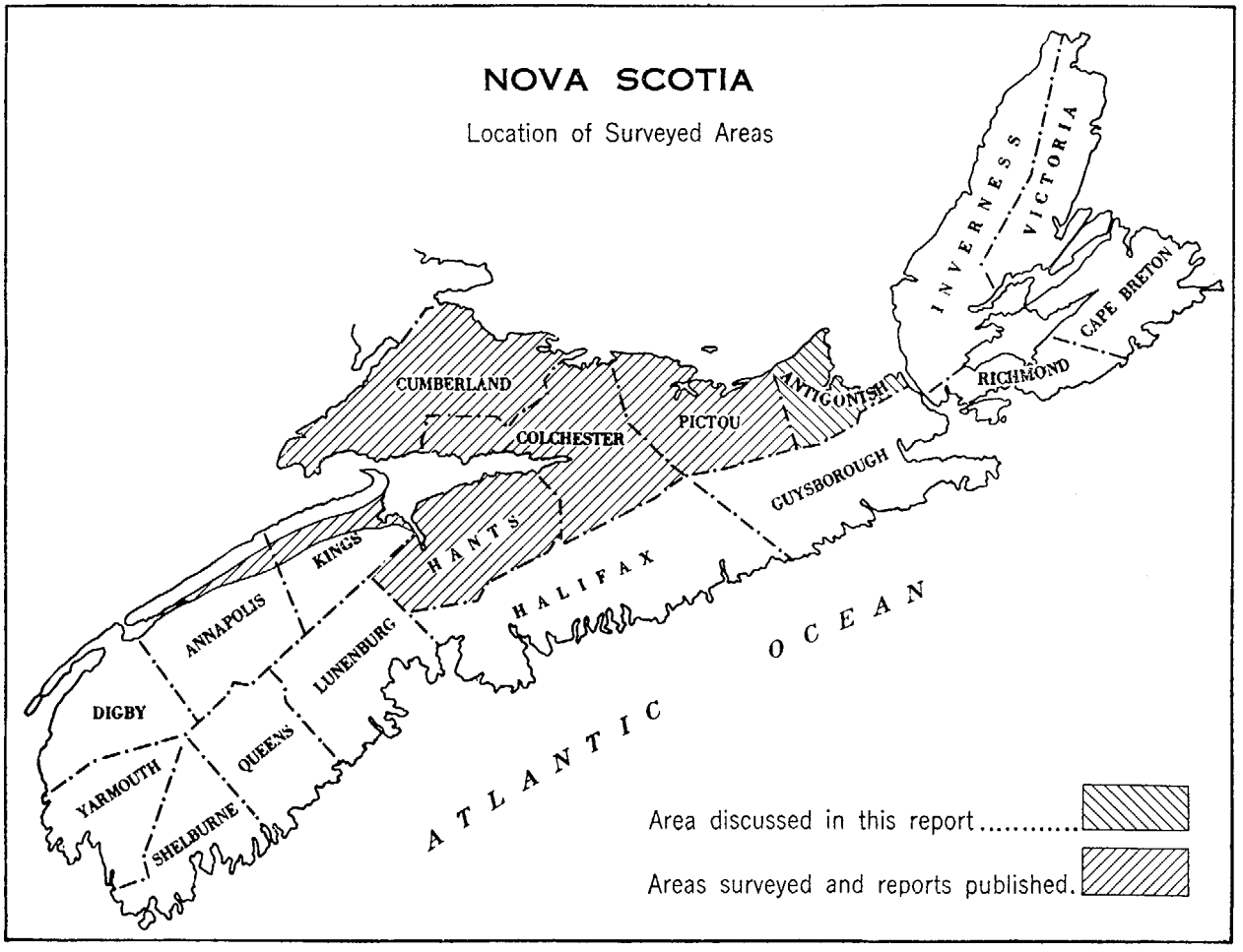

NOVA SCOTIA
Location of Surveyed Areas
INVERNESS
VICTORIA
CAPE BRETON
RICHMOND
ANTIGONISH
CUMBERLAND
COLCHESTER
PICTOU
GUYSBOROUGH
HANTS
KINGS
ANNAPOLIS
LUNENBURG
HALIFAX
DIGBY
QUEENS
YARMOUTH
SHELBURNE
ATLANTIC OCEAN
Area discussed in this report.....
Areas surveyed and reports published.

Figure 1.

TABLE I.—RACIAL ORIGIN OF ANTIGONISH COUNTY POPULATION

British Isles races	8,719
French	2,687
German	53
Netherlands	183
All others	329
Total	11,971

The population of the county reached its maximum in 1881. In the 50-year period 1881-1931, the decrease in population amounted to 54 per cent. The following figures show the trend in population over a period of seventy years.

Year	*Total Population*	*Rural Population*
1871	16,512	16,512
1881	18,060	18,060
1891	16,114	15,421
1901	13,617	11,779
1911	11,962	10,175
1921	11,580	9,834
1931	10,073	8,309
1941	10,545	8,388
1951	11,971	8,775

Transportation and Markets

Antigonish county has adequate road and railway facilities for getting produce to market. The paved highway (No. 4) from Truro to Sydney passes through James River, Antigonish, Lower South River, Heatherton, Bayfield Road, Tracadie, Havre Boucher and Auld Cove. Several good gravel roads radiate from the town of Antigonish. One (No. 20) leading to Sherbrooke passes through Salt Springs, Glen Alpine, Lochaber and Goshen. Two others—one going north through North Grant and Fairmont to Malignant Cove and the other running north along the shore through Harbor Centre, Morristown and Lakevale to Ballantyne Cove—join the shore road connecting Arisaig and Cape George. A good paved highway (No. 16) runs south from Monastery through Upper Big Tracadie to Boylston and Guysborough.

The Canadian National Railway line from Halifax to Sydney also passes across the county, in many places following the main highway. There are about 45 miles of track in the county.

The principal market for produce within the county is the town of Antigonish. Considerable livestock is shipped out of the county to such points as Moncton, St. John, Montreal, Sydney and Newfoundland. The city of Sydney provides a ready market for farm produce such as truck crops, eggs, poultry and meat as well as products of the sea. The annual tourist traffic also provides a good outlet for farm products.

Industries

Apart from agriculture, lumbering and fishing are the major sources of income in Antigonish county. The value of all forest products in 1950 was $243,205 and about 32 per cent of this was used on the farm. Approximately $165,000

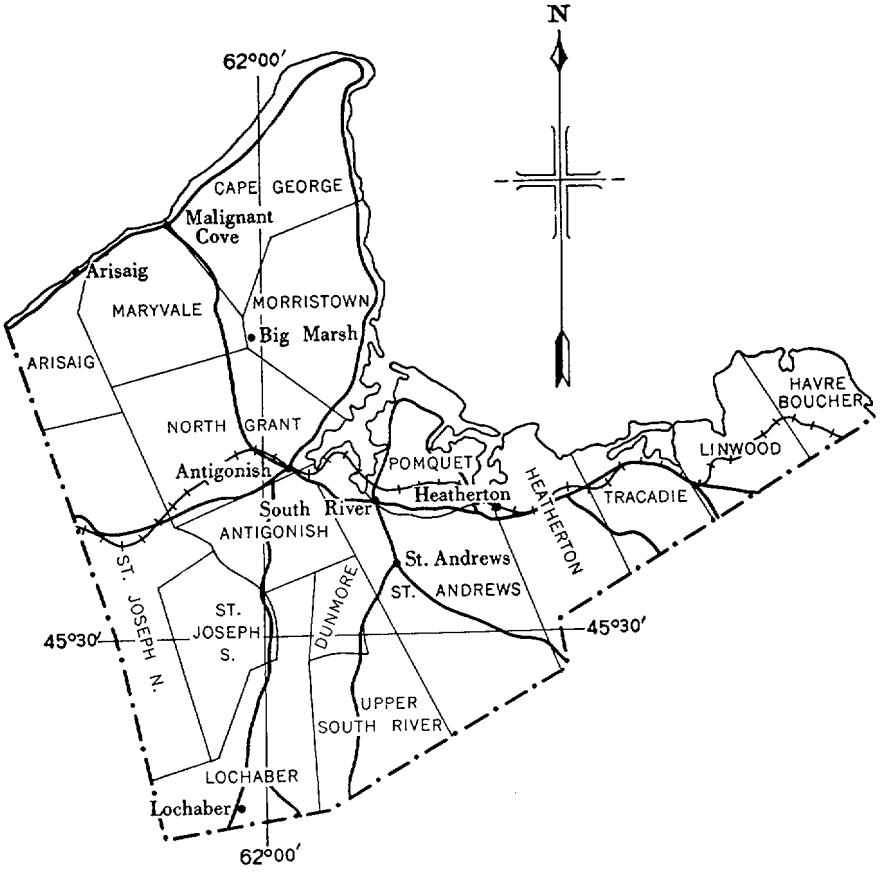
worth of forest products were sold in the form of pulpwood, firewood, railway ties, pit props and lumber. A number of sawmills are found throughout the county.

Along the shore, fishing is an important occupation. Several fish processing plants have been established and these are operated largely by co-operatives. There are no large industrial establishments in Antigonish county.

The town of Antigonish is the site of St. Francis Xavier University, which attracts students from the Maritime Provinces and many other places. It was here that the co-operative movement in Antigonish county and Nova Scotia was initiated and guided.

Antigonish county has very attractive scenery and many tourists visit the county every year. This furnishes an additional source of income from farm products.

FIGURE II



Outline map of Antigonish county showing roads, railways, municipal districts and principal towns.

FACTORS AFFECTING SOIL FORMATION IN ANTIGONISH COUNTY

The formation of soils in any area is dependent on several factors, among which are climate, vegetation, parent materials, relief, drainage, erosion and time. The climate largely determines the intensity with which the soil-forming processes take place. Over broad areas it determines the type of vegetation that will grow in an area. This, in turn, furnishes an organic medium for the development of biological activity which distinguishes the soil as a natural body from a mass of unconsolidated rock materials. The parent materials of the soils, together with the rocks from which they are derived, determine the relief and drainage and are largely responsible for the local differences found in soils.

Natural erosion is a slow process of degradation whereby materials broken down by weathering are slowly removed from the higher lands to the lower slopes and finally find their way into the streams, where they are carried into the sea. When this erosion is accelerated by the removal of vegetation, washing and gullying of the slopes occurs. The soils, which are able to maintain their equilibrium under natural conditions, are rapidly destroyed and the constant removal of material prevents soil formation from proceeding.

The type of soil that is found in any area is determined by the time that the other soil-forming factors have acted on the parent materials. Some soils require less time to reach maturity than others and the stage of maturity may often be judged by examination of the soil profile.

The Parent Soil Materials

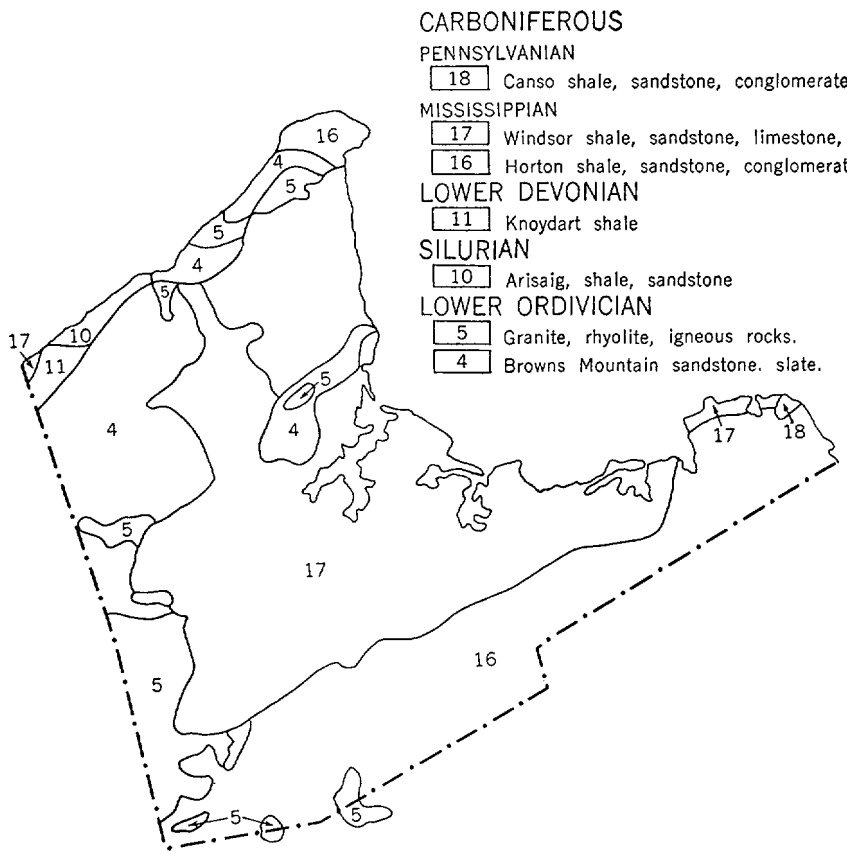
The materials from which the soil of Antigonish county have been developed are derived largely from the underlying rock formations. This material was crushed, mixed and redeposited by the glacial ice which covered the county many centuries ago. Consequently, the materials from which any one soil is developed may be derived from not one, but a variety of rocks. During the retreat of the ice sheet, glacial streams deposited gravelly outwash plains, kames, eskers, and a variety of fluvial material from which the water-deposited soils are developed. Later, consequent streams deposited material along their courses in the form of flood plains and deltas.

Figure III shows the distribution of the underlying rock formations in Antigonish county. Approximately three-quarters of the county is underlain by rocks of the lower Carboniferous age. These rocks are more easily weathered than most of the other rocks underlying the county and consequently form the lowland areas.

The Windsor series of rocks consists of fairly soft, reddish-brown and gray sandstones and shales, with some deposit of gypsum and limestone. Along the shore between Antigonish harbour and Tracadie, sandstones predominate and give rise to light-textured soils belonging to the Merigomish catena. Farther inland, the parent materials are largely fine textured and derived from shales and mudstone. The Queens, Millbrook and Woodbourne soils are developed from these materials.

The Horton series is made up of brown and gray sandstones, shales and conglomerate. In general, these rocks are harder than those of the Windsor series and the soil materials derived from them are coarse textured and stony. The Halifax and Hansford soils are developed from such materials.

FIGURE III



Geological Map of Antigonish County.

Between Arisaig and Malignant Cove, a small area of Silurian strata is found. These are black, red, gray and greenish-gray shales and sandstones of the Arisaig series. In places they are highly fossiliferous. The shales predominate and give rise to a fine textured parent material from which the Barney soils are developed.

The remainder of the county is occupied by Lower Paleozoic or Pre-Cambrian rocks. These are metamorphic materials such as argillite, slate, quartzites, schists and some granite and rhyolite. They are the most resistant rocks of the area and form the upland known as the Pictou-Antigonish highlands. The Cobequid and Thom soils are developed from these materials. A small area of Devonian rocks occurs around Knoydart. These are largely shales and some altered sediments and give rise to a medium-textured till.

The water-deposited materials consist largely of mixed sand and gravel deposits left by the glacial melt waters in the form of kames, eskers and outwash plains. The material in the kames and eskers is poorly sorted and much coarse gravel is present. On the outwash plains the materials are finer and better sorted. In Antigonish county there is much ice-contact material—sediments that have been modified by contact with the ice and subsequent melt water, but which may not have been carried very far. These deposits are usually sandy with lenses of gravel or very fine material in them.

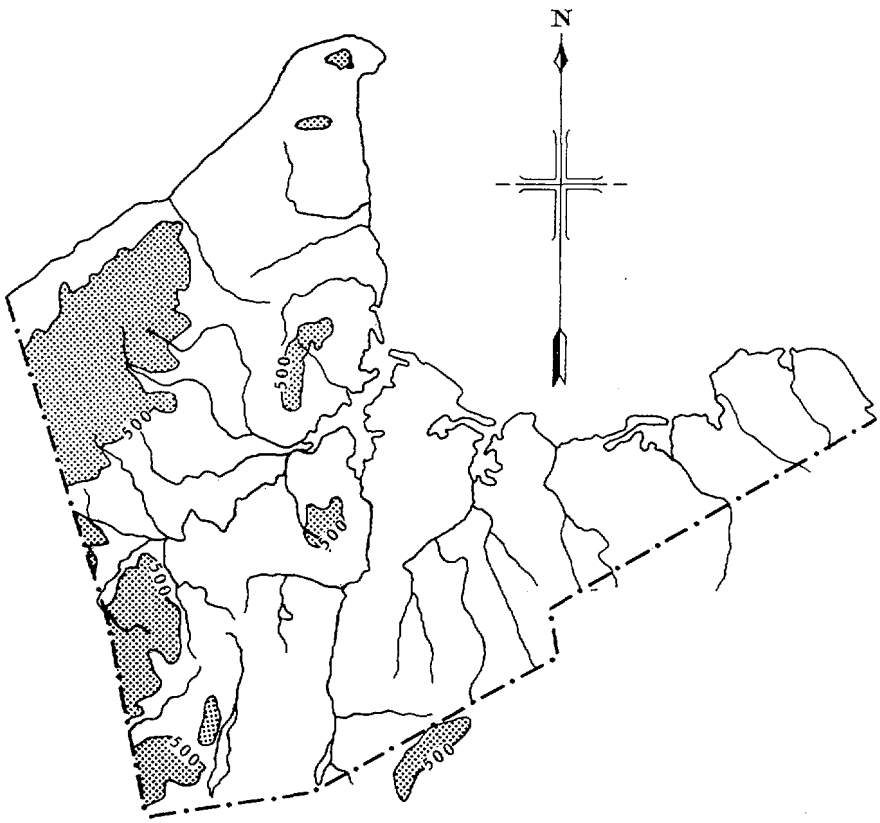
Along the courses of the post-glacial streams, deposits of fine-textured alluvium are of too recent origin to show the effects of the soil-forming factors.

Relief and Drainage

The most prominent topographic feature of the county is the Pictou-Antigonish Highland, which occupies nearly the entire western boundary of the county and extends northeastward in a triangular shaped area to Malignant Cove and Cape George. Another prominent upland feature is a roughly triangular shaped area extending northeastward from Antigonish town to the vicinity of Morristown. The upland surface of these features are plains. The highlands have an average elevation of 800 to 900 feet, but at two or three points there are hills rising above the general level of the plain. Thus Eigg Mt. has an elevation of 1000 feet and McNeil Mt. an elevation of 1010 feet. The borders of these upland surfaces are fairly well defined and they are deeply dissected by numerous streams.

The larger part of the country is occupied by a lowland plain. The lower part of this plain is underlain by Windsor rocks and is characterized by an undulating surface, well dissected by streams. Where gypsum and limestone underlie the surface, sink holes, ponds and depressions give the topography a mounded appearance. Most of this area lies around Antigonish harbour and ex-

FIGURE IV



Relief and Drainage of Antigonish County.

tends eastward to Tracadie and Havre Boucher. South of the Windsor area and also in the Cape George area, the harder Horton rocks form higher elevations in the lowland plain. Along the southern boundary of the county the hills rise to an elevation of 300 to 400 feet and form a drainage divide between rivers flowing into George Bay and the Atlantic Ocean. In the Cape George area the higher part of the plain is cut by numerous rivers which flow from the highlands into George Bay.

Antigonish county is well supplied with rivers and streams to provide adequate drainage. The principal large rivers are the West, South, Ohio, Black, Pomquet, Afton, Tracadie and Right's River. Most of the larger rivers occupy wide valleys and their lower ends meander freely in broad flood plains. They usually have many branches and tributaries. The majority of the rivers in the county flow northward or eastward into George Bay. A few short streams drain the northern side of the highlands into Northumberland Strait.

TABLE II.—MEAN MONTHLY TEMPERATURE AND PRECIPITATION AT SELECTED STATIONS.

	Antigonish (28 yrs.)		Collegeville (23 yrs.)	
	Temperature	Precipitation	Temperature	Precipitation
December	27	3.75 (14.6)*	26	4.71 (15.2)
January	20	3.12 (13.9)	20	4.36 (15.3)
February	18	2.68 (16.2)	18	3.24 (16.1)
Winter	21	9.55	21	12.31
March	28	2.46 (9.3)	28	3.18 (11.5)
April	37	2.81 (4.3)	38	3.04 (4.0)
May	48	3.43	48	3.31 (0.3)
Spring	37	8.70	38	9.53
June	57	2.56	58	2.96
July	65	2.82	64	3.05
August	64	2.87	64	4.04
Summer	62	8.25	62	10.05
September	56	4.08	57	3.69
October	48	3.77 (0.6)	48	4.65 (0.1)
November	38	4.25 (3.5)	37	4.30 (3.2)
Fall	47	12.10	47	12.64
YEAR	42	38.60 (62.4)	42	44.53 (65.7)

*Inches of snowfall. Ten inches of snow equals one inch of rain.

Climate

Antigonish county lies in the Atlantic Provinces climatic region of Canada and has a humid temperate climate. The mean annual temperature is 42 degrees and annual precipitation ranges from 38 to 45 inches. The winters are long and snow may be expected from the latter part of October until April. Snowfall accounts for about 20 per cent of the annual precipitation. Considerable variation occurs in the rainfall throughout the county and generally precipitation is somewhat higher on the highlands. About 38 per cent of the rainfall falls during the growing season.

Summer temperatures range from 50 to 75 degrees and the average frost-free period is slightly more than 100 days, being shorter on the upland than on the lowland. The growing season ranges from 180 to 190 days.

The precipitation and temperatures recorded at Antigonish and Collegeville are given in Table II. The data are compiled from reports prepared by the Meteorological Division, Canada Department of Transport, and represent averages over several years.

The Antigonish Station lies in the lowland area and the Collegeville Station is located in the higher hills along the southern boundary of the county.

TABLE III.—COMPARATIVE MOISTURE DATA AT SELECTED STATIONS.

ANTIGONISH

——	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Yr.
Potential Evaporation.....	0	0	0	.78	2.58	3.86	5.06	4.51	2.97	1.88	0.66	0	22.30
Precipitation.....	3.12	2.68	2.46	2.81	3.43	2.56	2.82	2.87	4.08	3.77	4.25	3.75	38.60
Storage Change....	0	0	0	0	0	-1.30	-2.24	-1.64	1.11	1.89	1.00	0	
Storage.....	4	4	4	4	4	2.70	0.46	0	1.11	3.00	4	4	
Water Deficiency..	0	0	0	0	0	0	0	1.18	0	0	0	0	1.18
Water Surplus.....	3.12	2.68	2.46	2.03	0.85	0	0	0	0	0	2.59	3.75	17.48

COLLEGEVILLE

——	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N	D.	Yr.
Potential Evaporation.....	0	0	0	0.89	2.58	3.96	4.86	4.51	2.96	1.88	0.52	0	22.16
Precipitation.....	4.36	3.24	3.18	3.04	3.31	2.96	3.05	4.04	3.69	4.65	4.30	4.71	44.53
Storage Change....	0	0	0	0	0	-1.00	-1.81	-0.47	0.73	2.55	0	0	
Storage.....	4	4	4	4	4	3.00	1.19	0.72	1.45	4	4	4	
Water Deficiency..	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Surplus.....	4.36	3.24	3.18	2.15	0.73	0	0	0	0	0.22	3.78	4.71	22.37

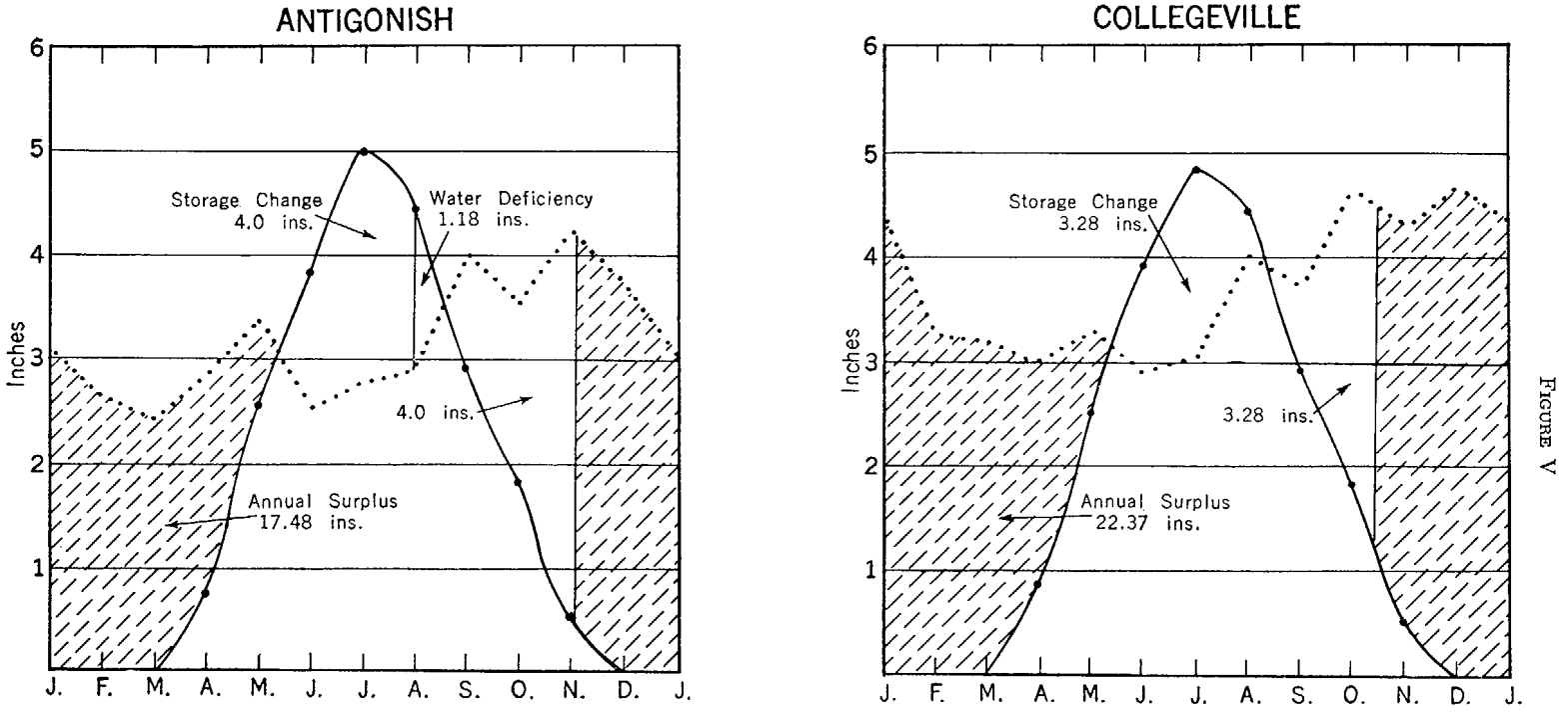


FIGURE V

Water Storage and Evaporation at Selected Stations in Antigonish County.

According to Thornthwaite* the effectiveness of the precipitation may be measured in terms of the amount of water stored in the soil for plant use. An amount of water equal to 4 inches of rainfall is regarded as the maximum storage capacity and any rainfall over this amount is surplus. During the summer months, lack of rainfall and excessive evaporation may deplete the soil moisture to a point where a deficiency exists. Such deficiency or surplus may be calculated from the temperature and precipitation data of an area. Over broad regions these data show similarities which permit classification into climatic types. Antigonish county is described as ranging from a humid to perhumid climatic type with moisture index varying from 80 to 100.

In Table III the precipitation and water storage data are given for the stations at Antigonish and Collegeville and Figure V shows the data in graphic form. The station at Antigonish shows an actual deficiency of moisture during the summer months. Evaporation begins to exceed precipitation in late June and the stored moisture is depleted in July. Water storage begins to accumulate in early September. At Collegeville the water storage reaches a very low level in August, but no actual deficiency occurs.

Vegetation

The original forest cover of Antigonish county consisted principally of spruce, balsam fir, yellow birch, maple, beech and pine. The distribution of these trees varied with the soil, drainage, slope and elevation. Since the beginning of settlement large areas of the forest have been cleared, particularly on the lowlands, where the principal tree cover now consists of second-growth red and white spruce, red maple, balsam fir and white birch on the better drained positions. The poorly drained areas carry a growth of black spruce, tamarack and alder or poplar.

On the highlands in the western part of the county, maple, yellow birch and beech constitute about 75 per cent of the tree cover in the well-drained positions and the remainder is red spruce and fir. In the southern part of the county, between the headwaters of the Ohio and Black rivers, yellow birch and maple are dominant on the ridges and red spruce in the less well-drained positions. At present about 75 per cent of Antigonish county is covered with trees.

On the cleared areas a variety of grasses are found. Timothy *(Phleum pratense)* is the principal hay grass together with some clover and alfalfa on the better managed land. Pasture grasses consist principally of brown top *(Agrostis tenuis)* with smaller amounts of red fescue *(Festuca rubra)*, Kentucky blue grass *(Poa pratensis)*, sweet vernal grass *(Anthoxanthum odoratum)* and couch grass *(Agropyron repens)*. Run-out pastures contain a major proportion of poverty grass *(Danthonia spicata)* and some hardhack. Swampy areas are covered with sphagnum, reeds and cat-tails.

Erosion

Soil erosion is rapidly becoming a serious problem in Antigonish county. Many of the high hills surrounding the lowland and the broader river valleys have been cleared for many years. While these slopes were quite fertile, good crops of hay and grain were grown on them, but gradually, as fertility was depleted, these hills were used for pastures. The steepness of slope and the type of soil usually found on these hills made them very susceptible to sheet washing and gullying by water. Today, many of the slopes are badly gullied and surface

*Thornthwaite, C. W. An Approach Toward a Rational Classification of Climate. Geog. Rev. 38: 55-94. 1948.

erosion is severe. The steeper slopes should be returned to forest but the more gentle slopes might be reclaimed for hay land or permanent pasture by using fertilizer and organic matter.

On the lowland plain, water erosion is not so severe, but on some of the finer-textured soils, erosion takes place when hoed crops are grown. This can be remedied by good management.

Most of the upland areas are forested and erosion is not a serious factor. Since most of the rivers rise in the upland area and have steep gradients at the beginning of their course, any large removal of the forest in these areas would allow the runoff to exceed the carrying capacity of the rivers and flooding would take place on the lowlands. Reforesting the steeper bare slopes and careful management of present forest lands is necessary if erosion is to be controlled.

Age

The factor of time in the development of Antigonish county soils is obscure. Few facts are available concerning the length of time that the soil-forming factors have interacted. Estimates based on the rate of ice recession indicate that the county may have been free from glacial ice for 15,000 to 20,000 years or longer. Since that time, weathering processes have acted on the soil materials, rivers have cut their valleys deeper and wider and post-glacial alluvial deposits have been laid down. The processes are still going on slowly. Many of the soil materials have not yet reached equilibrium with their environment while other materials show characteristics of maturity under prevailing conditions.

CLASSIFICATION AND DESCRIPTION OF SOILS

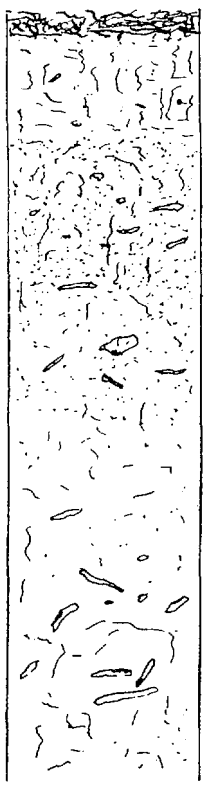
Under the conditions of climate and vegetation that are found in Antigonish county, the soils are developed by an acid leaching process known as podzolization. The decomposition of the forest litter on the surface of the soil produces acids. These are leached downwards by percolating water, carrying with them soluble bases, iron, aluminum and humic compounds. When these compounds reach a condition of lower acidity, they are precipitated. This process of solution and precipitation results in the formation of a series of layers or horizons which vary in color, texture, structure and composition. A vertical section of these horizons down to and including the parent material is called the *soil profile.* The various horizons are designated A, B and C. The A horizons are those from which soluble material is leached and the B horizons those in which the soluble compounds are precipitated. The parent material is called the C horizon. Sub-horizons may be separated on variations in color, texture and structure and designated as A_1, B_1, and so forth.

Soil classification is based on characteristics observed in the soil profile. When the soil profile has similar characteristics over several areas, the areas are mapped as the same soil type.

Location: 2 miles north of Heatherton, Antigonish County.

Site: In woods near road.

Vegetation: Spruce, birch, pine; thickly wooded.



A_0 – 1 inch – thin leaf litter, needles, etc., fibrous and felty; pH 3.9

A_2 – 5 inches – pinkish-white sandy loam; very friable; structureless; some gravel; pH 4.0

B_1 – 8 inches – reddish-brown sandy loam; medium nuciform structure; friable; fragments of sandstone; pH 4.3

B_2 – 8 inches – reddish-brown gravelly sandy loam; medium nuciform structure; slightly firm; sandstone cobbles; pH 4.8

C – weak red sandy loam till; structureless; firm; pieces of red sandstone; pH 5.0

Regional Soil Types

The dominant type of soil development in Antigonish county is best expressed on the well-drained sites. Here, the effects of climate and vegetation are reflected in soil characteristics that are common over broad areas, regardless of the parent material from which the soils were derived. These are known as the *zonal* soils. In Antigonish county the zonal soils belong to the Podzol Great Soil Group.

The characteristic development of a zonal soil in Antigonish county is described and illustrated in the diagram of the Merigomish soil shown on page 17.

On the poorly drained areas of the county, there is a greater accumulation of organic matter on the surface. The A_2 horizon in such soils is often thicker than in the well-drained soils. The B horizon is mottled or may be replaced by a grayish, mottled "glei" horizon. The very poorly drained soils may be classed as Half Bog and Bog soils. These poorly drained soils are known as intrazonal soils, since they may be found under different climatic conditions where drainage, relief or the nature of the parent material may restrict the zonal soil-forming process.

Along the intervals and river bottoms are soil materials which have not had time to develop profile characteristics, but merely show layering due to method of deposition. Such immature materials are classed as azonal soils.

Units of Classification

In Antigonish county the soils were mapped on a fairly broad basis and the unit of classification was the catena. The catena is a group of soils developed from similar parent materials. The separation of one catena from another was based on differences in the texture, color and lithology of the parent materials. Thus soils developed on reddish-brown clay loam till were separated from those developed from a gray clay loam till or a reddish-brown sandy loam till. In some cases the parent material was similar in color and texture, but had a different lithological origin which was reflected in profile development.

Within a catena, differences in drainage modify the profile characteristics and produce the soil series. The soil series is a group of soils formed from similar parent materials and having similar profiles within a narrow range of texture. Thus, in a catena one may observe a well-drained or phytomorphic (P) series, an imperfectly drained or phyto-hydromorphic (PH) series and a poorly drained or hydromorphic (H) series.

The soil catena was given a name usually referring to some geographical unit where the soil was first mapped. Thus the Merigomish catena was first mapped near Merigomish, Pictou county. Many of the soil catenas found in Pictou county also occur in Antigonish county. Where possible, the imperfectly (PH) and poorly (H) drained series were mapped out, but these series were not named.

Soil Key

The relationships of the various soil catenas mapped in Antigonish county are shown in the following table. The catenas are divided into two broad groups —those in which the soils are developed from (1) glacial till and (2) water-deposited materials. Subdivision of these groups is made on the basis of the texture and lithological origin of the parent materials. The nature and origin of the parent material is indicated for each catena.

TABLE IV.—KEY TO THE CLASSIFICATION OF ANTIGONISH COUNTY SOILS.

PODZOL ZONE	*Acreage*
A. *Soils Developed from Till.*	
1. *Clay loam parent material.*	
(a) *Queens Catena*—dark reddish-brown clay loam till derived from shales and mudstone	40,493
(b) *Woodbourne Catena*—reddish-brown gravelly clay loam till derived from reddish-brown shales and sandstone	58,662
(c) *Millbrook Catena*—reddish-brown gravelly clay loam till derived from reddish-brown and gray conglomerate, shale and sandstone	61,677
(d) *Joggins Catena*—dark gray clay loam till derived from gray shale	1,037
2. *Sandy clay loam to shaly loam parent material.*	
(a) *Barney Catena*—pale brown shaly clay loam till derived from gray shale	3,309
(b) *Kirkhill Catena*—shaly loam till derived from a mixture of gray shale and hard sandstone	19,130
3. *Sandy loam parent material.*	
(a) *Merigomish Catena*—reddish-brown sandy loam till derived from brown and gray sandstone	19,123
(b) *Hansford Catena*—light reddish-brown sandy loam till derived from coarse-textured brown and gray sandstone	12,909
(c) *Thom Catena*—pale brown sandy loam till derived from metamorphic rocks, breccia and conglomerate	90,304
(d) *Halifax Catena*—light yellowish-brown to pale olive sandy loam till derived from hard sandstones, quartzite and some slate	13,222
(e) *Cobequid Catena*—brown gravelly sandy loam till derived from igneous and metamorphic rocks	2,592
(f) *Westbrook Catena*—reddish-brown gravelly sandy loam till derived from reddish-brown conglomerate	13,740
B. *Soils Developed from Water-Deposited Materials.*	
1. *Silty clay loam parent material.*	
(a) *Stewiacke Catena*—silty clay loam deposits derived chiefly from Carboniferous rocks	8,806
2. *Gravelly sandy loam parent material.*	
(a) *Hebert Catena*—pale brown gravelly loam derived from igneous and metamorphic rocks—in outwash plains, kames and eskers	11,206
C. *Miscellaneous Soils.*	
Swamp	1,881
Peat	467
Salt Marsh	365
Pomquet Sand	1,126

Soil Survey Methods

The survey made in Antigonish county was of the detailed reconnaissance type. All roads and trails were traversed and an examination of the soil profiles was made in many locations. In places where large areas were inaccessible by car, foot traverses were made. Frequent observations on the relief, drainage and characteristics of the soils and the crops grown on them were recorded. The location of boundaries between the different soil catenas and series was ascertained by measurement on the car speedometer or by pacing. In heavily forested areas, boundaries were drawn according to the judgment of the surveyor. The boundary between two soil catenas 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.

The soil boundaries were plotted on base maps on a scale of one inch to one mile. Representative samples of the soil types were taken for analysis. These profiles were selected from undisturbed forest locations, so as to obtain some knowledge of the potential value of the soil.

DISCUSSION OF SOILS

A. Soils Developed from Till.

The soils developed from glacial till occupy about 93 per cent of the county. Of these, about 50 per cent are developed from fine textured and 50 per cent from coarse textured parent materials. The fine textured soils are represented by the Queens, Millbrook, Woodbourne, Barney and Joggins catenas. These soils occupy a large proportion of the lowland plain. Differences in the texture, structure and composition of the underlying rocks are reflected in differences in the nature of the till and form a basis for separation of the catenas. The fine textured soils are derived principally from black and gray shales in the case of the Barney and Joggins soils and reddish-brown shales, mudstone and sandstone in the case of the Queens, Woodbourne and Millbrook soils. The color of the parent rock is imparted to the till.

The coarse textured soils on the lowland plain comprise the Merigomish and Hansford catenas, whose parent material is derived from reddish-brown and gray sandstone.

On the upland, the Thom, Cobequid and Halifax soils have coarse textured till derived from igneous and metamorphic rocks. The Kirkhill soils have medium-textured till derived from shale and the Westbrook soils have coarse textured gravelly till derived from conglomerate.

Under forest cover, the soils of the area have a leached A_2 horizon under the organic surface mat characteristic of the podzol soils. Detailed descriptions of the soils developed from till are given below.

1. Clay loam parent material.

QUEENS CATENA (40,493 ACRES)

The soils of the Queens catena occur in fairly well-defined areas. The largest area occurs between Antigonish harbor and Pomquet harbor and around Antigonish town and the west side of the harbor. Smaller areas are found around Lakevale and south of Maryvale. Queens soils occupy about 11 per cent of the surveyed area.

The parent material of these soils is a reddish-brown clay loam till which, in Antigonish county, seems to have been modified somewhat by water. Fragments of soft mudstone and shale, together with gray and brown sandstone are found in the till. Many of the areas of the Queens soils are underlain by gypsum or limestone and this is reflected in the undulating and mounded topography characteristic of such areas. On other areas, the Queens soils occur on long slopes or rolling hills. Surface drainage is usually good, but the nature of the parent material slows the internal drainage and most of these soils are imperfectly drained. Small areas of well-drained Queens soils are scattered throughout, but such areas were too small to appear on the map.

In general, there is very little stone on the surface of the soil and, in some places, the till does not contain much stone. Around Antigonish harbor, the upper part of the profile is frequently almost stone free. The principal tree cover consists of spruce, hemlock, poplar, and some maple.

The description of the imperfectly drained member of the Queens catena is given in the accompanying diagram which represents the dominant profile found in Antigonish county.

A_0—2 inches of black, semi-decomposed leaf litter; felty; numerous roots; pH 4.7

A_2—3 inches of pinkish-gray clay loam; coarse crumb structure; friable; slightly plastic; pH 4.6

B_1—5 inches of reddish-brown clay loam; coarse nuciform structure; plastic; pH 4.67

B_2—6 inches of reddish-brown clay loam; massive; mottled; plastic; breaks to blocky structure; some gravel; pH 6.3

C —dark reddish-brown clay loam till; massive; mottled; plastic; some gravel and pieces of brown sandstone; pH 7.6

Where the soil occupies a well-drained position, the upper B horizon has a yellowish-red color, is more friable and the profile contains more stone fragments. The C horizon shows slight mottling and is less plastic in the well-drained profiles. The reaction of the subsoil in the profile described above is less acid than is usually the case in Queens soils found in other counties and the occurrence of limestone in the vicinity where the profile was taken may explain this condition. On both sides of Antigonish harbor and around Antigonish town, the Queens soils have a well developed structure. In the C horizon part of this structure is frequently the result of the cleavage of the original soft shale and mudstone.

Utilization

The use of the Queens soils depends largely on drainage conditions and topography. Stoniness is not much of a problem on these soils in Antigonish county, except in a few small areas. A large proportion of the Queens soils has been cleared and the greater part of this is used for hay and pasture. On the better farms where fertilizer is used, good crops of clover and alfalfa have been observed, but grain crops do not grow as well on Queens soils as on some of the other soils of the area. Where no fertilizer has been applied and fields have been in hay for long periods, low yields and poor quality are common.

The fine texture of the soil requires that it be worked when moisture conditions are right. The soils respond to lime and fertilizer, since the surface soils are quite acid and natural fertility is low. Organic matter is also needed to benefit soil structure and to promote biological activity which seems to be lacking in many Antigonish soils. The Queens soils are best suited to grass and grain

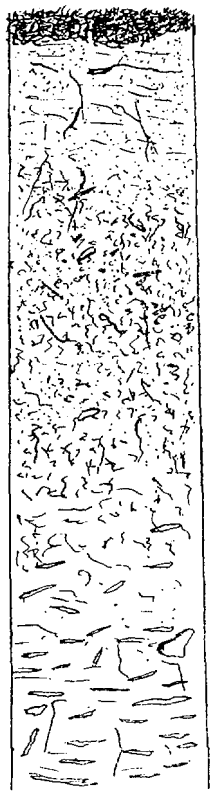
The rolling topography of the Queens soils. These heavy-textured soils are best suited to grass and grain crops. Pasture management could be improved on these soils.

growing and are not very satisfactory for vegetable crops, unless good drainage prevails. On the steeper slopes, erosion takes place under clean cultivation and such slopes should be in permanent pasture or forest. The poorly drained areas are unsuitable for agriculture at present and most of these are covered with trees.

Woodbourne Catena (58,662 acres)

The soils of the Woodbourne catena occupy about 16 per cent of the county. The largest area occurs in the southern part, extending in a strip about five miles wide from Lochaber Lake eastward to New France. A smaller area occurs in the vicinity of Monastery and Linwood. Woodbourne soils are developed from a gravelly clay loam till derived from reddish-brown shales and sandstones. In some places these sandstones contain a small amount of lime. The topography ranges from gently undulating on the tops of the hills to rolling or sloping on the valley sides. The greater proportion of the Woodbourne soils is well drained and there is enough shale and stone in the profile to facilitate moderately rapid internal drainage. In most places there is not enough stone to interfere with cultivation and the chief difficulty in this respect is shallowness to bedrock. This condition occurs over considerable areas. The Woodbourne soils are developed under a vegetation of spruce, birch and maple. A description of a well-drained Woodbourne soil is given in the accompanying diagram.

The area in the vicinity of Beauly, Marydale and Croft is very shallow and many outcrops occur. Another shallow area occurs along the road from New France to Black Avon. Here bedrock occurs at a depth of 20 inches or less and the depth of soil varies greatly within short distances. Some of these shallow areas are imperfectly or poorly drained. In this case the profile is mottled with yellowish streaks and there is a greater accumulation of organic material on the surface.



A_0—2 inches of dark brown semi-decomposed material; fibrous; loose; pH 4.7

A_2—5 inches of weak red gravelly clay loam; medium platy structure; friable; some roots; pH 4.3

B_1—7 inches of dark reddish-brown clay loam; medium nuciform structure; friable; slightly firm; some gravel and stones; pH 4.6

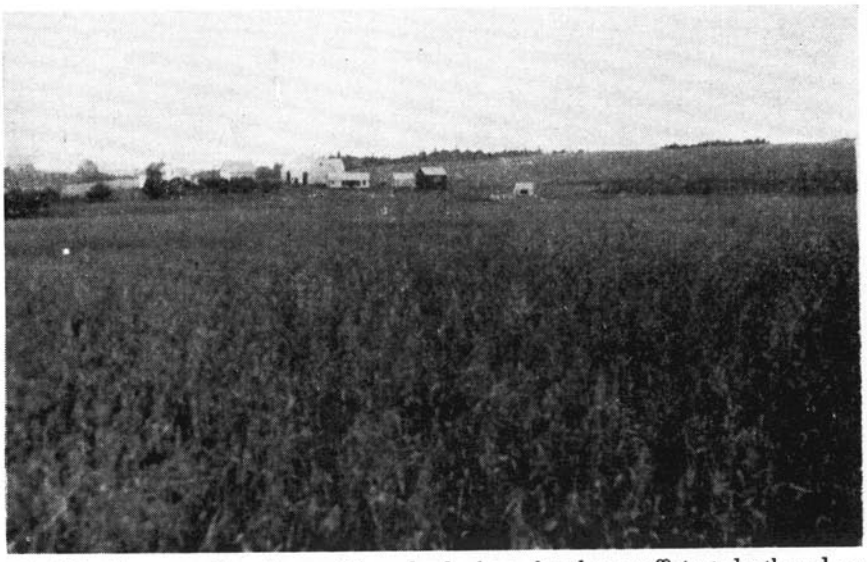
B_2—8 inches of dusky red gravelly clay loam; medium nuciform structure; slightly firm; angular sandstone cobbles; roots; pH 5.0

C —dusky red gravelly clay loam till; structureless, moderately firm; pieces of red shale and sandstone; pH 5.3

Utilization

Drainage and shallowness are the principal factors governing the use of the Woodbourne soils. Large areas of these soils have been cleared, but are now abandoned and the fields are reverting to forest. This is particularly true of the shallow areas, where forest is undoubtedly the best crop that could be grown profitably. On the deeper areas also there are many abandoned farms and run-out fields. Bare hills with little vegetation may be seen north of New France and in the area between Arisaig and McArras Brook. The Woodbourne soils appear to erode easily and it was noticed that severe surface erosion has occurred in many of these cleared areas. Along the valley of the South River instances of severe gully erosion and sheet washing may be observed. This is probably the principal reason for the lowered productivity and abandonment of these soils.

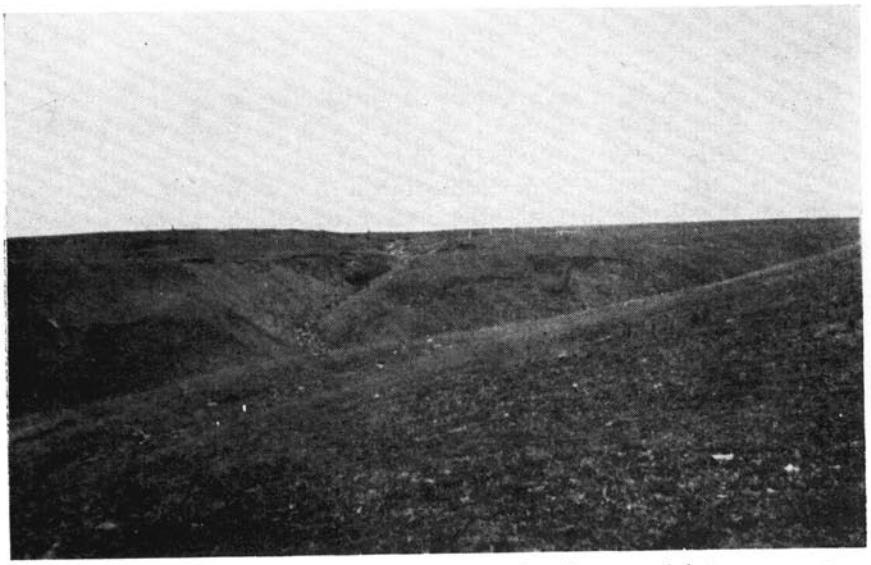
Where the soils have less slope and have been well farmed, they are highly productive. Clover and grain crops do well and good crops of potatoes have been grown. To bring back the unproductive land to a reasonably productive state, organic matter, lime and fertilizer are necessary. Organic matter is very important in these soils, since on most of the longer slopes the surface has been eroded and there is little organic material remaining. The organic matter seems to break down rapidly after clearing and where slopes are used for pasture, the sod does



The Woodbourne soils make good farm land where they have sufficient depth and are well managed.

not remain long. When care is taken to prevent erosion, hay and grain crops may be grown on the slopes, provided fertility is maintained through rotation and addition of organic matter and fertilizer.

The Woodbourne soils are well suited to forest and support a good tree growth. Areas with steep slopes or wet and shallow areas should be allowed to produce a forest crop.



This is what happens when Woodbourne soils on the slopes are left in poor pasture. Sheet erosion is quite severe and gullying takes place rapidly. There are large areas in this condition in Antigonish county.

Millbrook Catena (61,677 acres)

The Millbrook soils occupy 17 per cent of the county and are important soils in the agriculture of the county. Areas of these soils occur around Havre Boucher, south of Afton, between the South and West rivers, around Gaspereau Lake and on the west side of Antigonish harbor around Brophy, Morristown and Fairmont. The parent material of the Millbrook soils is a reddish-brown gravelly clay loam till derived from a mixture of shale, fine grained gray sandstone and conglomerate. In a few places the soil resembles the Queens soils and where they are associated, it is difficult to distinguish between them. Ordinarily the Millbrook soils contain more gravel than the Queens soils. The topography ranges from undulating to rolling and the Millbrook soils are found frequently on long slopes on hilly topography. Surface drainage is usually good, but the C horizon of these soils is often compact and moisture moves through the soil along the top of this horizon, resulting in imperfect drainage. On the more level hilltops, internal drainage is slow and many wet spots occur. Most areas may be regarded as imperfectly drained. The Millbrook soils contain a moderate amount of stone, most of them of small size. Where these are too numerous, they must be removed before cultivation can be carried on. The principal tree cover consists of spruce and red maple. A description of a profile taken near Beech Hill is given in the accompanying diagram.

Around Havre Boucher the profile is generally browner than usual. On the better-drained areas the upper B horizon is a yellowish-brown to light reddish-brown color and shows no mottling. Part of the mottling is due to the decomposi-

A_0—2 inches of semi-decomposed moss and leaf litter; greasy; fibrous; pH 3.7

A_2—2 inches of light reddish-brown clay loam; structureless; moderately plastic; small stones; roots; pH 3.8

B_1—6 inches of reddish-brown clay loam; fine nuciform structure; plastic; shale and sandstone fragments; slightly mottled; pH 4.5

B_2—3 inches of reddish-brown clay loam; medium nuciform structure; plastic; mottled; pH 4.6

C—dark reddish-brown gravelly clay loam till; coarse platy structure; stone fragments; mottled; pH 4.8

tion of the fine shale fragments which show various green and yellow streaks when cut with a shovel. The cultivated surface soil is a dark reddish-brown loam to clay loam. The C horizon becomes very hard when dry and restricts the passage of water. The leached A_2 layer is often thin in the well-drained soils, but well developed in the poorer-drained areas. The poorly drained soils have 8 inches of black organic material underlain by 8 to 10 inches of mottled grayish-brown loam. This is underlain by a mottled yellowish and reddish brown layer which rests on the dark reddish-brown mottled C horizon.

The area south of Gaspereau Lake contains considerable gravel and is somewhat better drained. West of Lakevale the parent material is sandier than usual and is a very fine sandy loam to silty clay loam in texture.

Utilization

Considerable areas of the Millbrook soils are cleared but most of these are used for hay or pasture. About 38 per cent of Millbrook soils are imperfectly drained. Where the drainage is not too poor and the excess water tends to be lost fairly rapidly, good crops of hay and grain may be grown under good management. In general, low yields are the rule unless fertilizer has been used, but due to the moisture-holding capacity of these soils, yields in dry seasons may be better than on some of the other soils in the area. The area around Havre Boucher is stony and considerable stone has been cleared from the fields. Good crops of grain and potatoes were observed here. South of St. Andrews, the Millbrook soils are somewhat heavier in the surface layers and require care in handling. Many good farms may be seen between Salt Springs and Glen Alpine, where the topography is hilly. Long slopes are subject to sheet and gully erosion and this is a problem of soil management. The soils respond well to fertilization and good crops of grain have been grown where fertilizers were applied. These soils should be well adapted to permanent pasture.

Joggins Catena (1,037 acres)

The soils of the Joggins catena are not extensive, occupying only 0.3 per cent of the surveyed area. Small areas of these soils occur near Tracadie and Bellefontaine. The Joggins soils are developed from a fine textured till derived from soft gray and black shales. These soils are extensive in other parts of the province, particularly near the coal basins. The topography is gently undulating. Surface drainage is variable, but internal drainage is usually slow and there are no well-drained members of this catena in Antigonish county. In general, the Joggins soils are quite free from stone, with the exception of fine shale fragments. Most of the areas of these soils are cleared, but where forested, vegetation consists of wire birch, poplar, red maple, spruce and larch.

The soil in undisturbed condition has a 2-inch layer of semi-decomposed organic material on the surface. This is underlain by a gray loam varying in thickness from 2 to 5 inches. It is usually mottled and develops its maximum thickness in the more poorly drained positions. The B horizon is a dark yellowish-brown clay loam with a fine to medium blocky structure. It shows definite mottling. In the lower part of the horizon, the cleavage faces are coated with colloidal clay and the soil is highly mottled with orange and yellow streaks. The parent material, at a depth of 18 to 20 inches, is a grayish-brown to reddish-brown mottled clay loam. It has a coarse blocky structure and is plastic, often stiff and impervious and contains considerable fine shale fragments.

Utilization

These soils are among the poorest drained in the county and this is accompanied by a low natural fertility. They are used for hay and sometimes for grain, but yields are generally low unless fertilizer is applied. Drainage conditions can be improved and fertility built up, but the use of these soils for crops other than hay in questionable.

2. Shaly clay loam to shaly loam parent material.

BARNEY CATENA (3,309 ACRES)

The Barney soils occur in a single area between Malignant Cove and Arisaig and occupy only a small percentage of the county. These soils are developed from a very shaly clay loam till derived from Silurian shales. In Antigonish the topography of the Barney soils is generally rolling to hilly, but along the shore there are level to undulating areas where the till has been deposited over old beaches. The greater proportion of the soils are well drained. There is sufficient slope to permit moderately rapid runoff and the soil is porous enough to facilitate good internal drainage. Stoniness is not generally a problem on the Barney soils in Antigonish, but occasional shallow spots and outcrops occur. Vegetation consists of fir, spruce, maple and birch. A description of a well-drained member of the catena is given in the accompanying diagram.

A_0—2 inches of partly decomposed organic material; black and granular; many roots; pH 3.7

A_2—4 inches of pinkish-gray loam; fine platy structure; friable; shale fragments, pH 4.3

B_1—8 inches of yellowish-brown loam; medium granular structure; very friable; shale fragments; pH 5.2

B_2—8 inches of pale brown clay loam; fine nuciform structure; friable; numerous shale fragments; some slabs; pH 5.4

C —grayish-brown shaly clay loam till; slightly firm; structureless; numerous shale fragments and flags; pH 5.6

On the shallower areas the profile may range from a few inches to ten inches in depth. Where the till has been deposited over old terraces, the drainage is somewhat better and the soil has a lighter texture.

Utilization

Not much of the Barney soil is under cultivation. Hay, grain and potatoes are the principal crops. The soils are low in natural fertility and when cleared and cultivated do not stand up well unless organic matter and fertilizer are added. When well managed they seem to produce good crops and are suitable for most of the crops grown in the area. Where the soils are shallow, they are better suited to forest. The soils seem to be very subject to erosion especially on the steeper slopes.

Kirkhill Catena (19,130 acres)

The soils of the Kirkhill catena are found in the southern part of the county in the vicinity of South River Lake. They occupy about 5.30 per cent of the county. These soils are developed from a dark grayish-brown or reddish-gray loam till derived from hard shales and some gray sandstone. They are more open and porous than the Barney soils and usually more stony. In some places the shales are thinly bedded and the resultant till is deeper and heavier textured, while in others the shale is coarse and blocky and the till is stony and shallow. In general, the topography of the Kirkhill soils is hilly, with an undulating microrelief. The character of the topography and the nature of the shale, which often has a vertical dip, provides good external and internal drainage. There is usually considerable stone on the Kirkhill soils, but this is not always the case and where the till is deeper, the hills are smooth. Forest cover consists of maple, birch, spruce, fir and hemlock with a predominance of hardwoods on the higher slopes. The following is a description of a well-drained Kirkhill soil.

A_0—2 inches of semi-decomposed leaf litter; felty; numerous roots; pH 3.8

A_2—5 inches of gray sandy loam; weak platy structure; friable; shale fragments; roots; pH 4.0

B_1—8 inches of yellowish-brown sandy loam to loam; medium crumb structure; friable; roots; shale fragments; pH 4.3

B_2—6 inches of light brown loam; medium crumb structure; slightly firm; shale fragments and occasional flags; pH 4.7

C —dark grayish-brown loam till; firm; porous; contains large flags and angular cobbles of shale; pH 5.0

Where the Kirkhill soils are poorly drained the surface is often peaty to a depth of several inches and the profile has a deep leached layer.

Utilization

Very little of the Kirkhill soil is farmed in Antigonish county and several abandoned farms were observed on this soil. Former cleared areas are used for grazing, but are slowly reverting to forest. Where cultivated, hay and pasture are the chief uses of this soil. Past experience seems to indicate that the soil will not stand up under prolonged cultivation. Organic matter disappears rapidly after clearing and steep slopes are easily eroded. Kirkhill soils are better suited to forestry than agriculture. Small areas where the texture of the soil is somewhat heavier than usual may be suitable for permanent pasture. Often the Kirkhill soils occupy a watershed or drainage divide and leaving these areas in forest provides erosion control.

3. Sandy loam parent material.

MERIGOMISH CATENA (19,123 ACRES)

The soils of the Merigomish catena occur along the shore of George Bay from Cape Jack to Antigonish harbor and occupy about 5 per cent of the county. These soils are developed from a modified till of sandy loam texture derived principally from gray and brown sandstones.

A_0—1 to 3 inches of black leaf litter; F layer thin; H layer black, greasy mor; fibrous; felty; pH 4.5

A_2—5 inches of pinkish-gray sandy loam; structureless; very friable; roots; pH 3.8

B_1—6 to 8 inches of reddish-brown sandy loam; platy structure; very friable; sandstone fragments; roots; pH 5.0

B_2—8 to 10 inches of reddish-brown gravelly sandy loam; fine nuciform structure; slightly firm; sandstone cobbles; pH 5.1

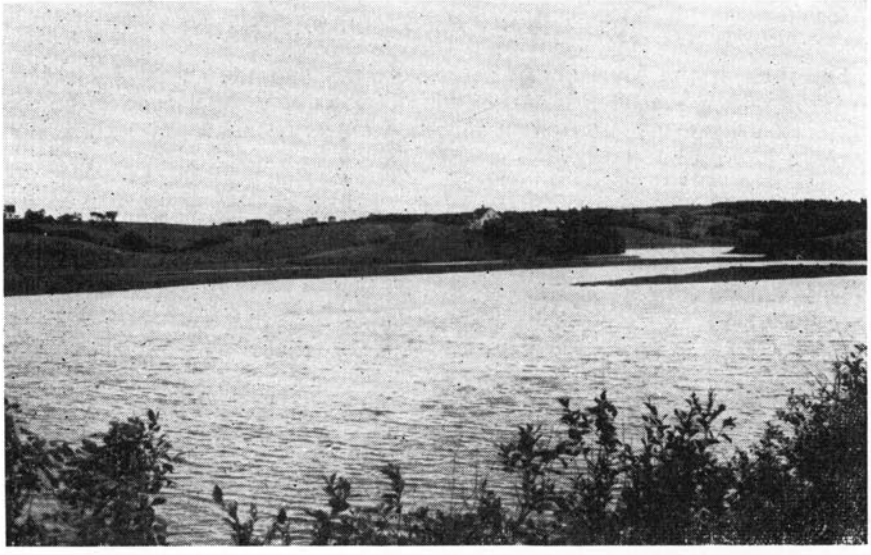
C—weak red sandy loam; structureless; firm; porous; pieces of sandstone; pH 5.2

The texture ranges from a very sandy loam north of Pomquet Station to a sandy clay loam around Bayfield and Tracadie. Variations in the texture of the till occur within short distances. The Merigomish soils have an undulating topography comprising gentle knolls and drumlinlike ridges. Drainage both external and internal, is good in these soils except in a few depressional areas between the knolls and some of the more level areas where the drainage is imperfect to poor.

The Merigomish soils generally do not contain enough stone to interfere with cultivation. A few stony areas occur north of Heatherton but these are small. Fragments and pieces of gray and brown sandstone are scattered through the profile.

Vegetation consists chiefly of second-growth spruce, fir, poplar, birch and occasional pine.

A description of the well-drained member of the Merigomish catena is given in the accompanying diagram.



The Merigomish soils are among the best agricultural soils in the county. In many cases farms on these soils could be improved through better management.

In the poorly drained positions the parent material is often compact and highly mottled and the surface is mucky in appearance. The well-drained cultivated surface soil is a light brown sandy loam to plow depth. The profile is darker colored where these soils are close to the Woodbourne soils. The depth of till averages 5 to 10 feet with a maximum of 20 feet in a few places.

Utilization

The Merigomish soils are among the best agricultural soils in the county, but in many cases farms are poor because of lack of management. Many of the farm owners are also fishermen who do not have the time necessary to develop the soil to its full extent. The greater proportion of these soils has been cleared. Merigomish soils are well suited for growing the crops common to the area. Besides hay and grain, potatoes and truck crops may be grown on Merigomish soils with reasonable success. Crop rotations are generally shorter on these soils

than on most of the soils of the county. The maintenance of organic matter is important in these soils. The soils are very acid and require lime and fertilizer for successful crop production. Some erosion takes place where hoed crops are grown on the slopes, but generally erosion is not so severe as on some of the other soils of the area.

With proper management these soils are among the most productive in the county.

Hansford Catena (12,909 acres)

The Hansford soils are found in the northern part of the county on both sides of the Heffernan Road between Big Marsh and Greendale. They are developed from sandy loam parent materials derived from coarse-textured gray and brown sandstones. They occupy a broadly undulating topography in which there are many depressional areas. In general, the Hansford soils in Antigonish county are imperfectly drained, but a few well-drained areas are found on the ridges. Over most of the area the soils are too stony to be suitable for agricultural purposes.

Vegetation consists of mixed stands of spruce, fir, maple and birch.

The uncultivated profile has a 2- to 3-inch layer of black, felty, semi-decomposed leaves and forest litter on the surface. This is underlain by 6 to 8 inches of grayish sandy loam, which is loose, porous and contains flat, angular pieces of gray sandstone. In the more poorly drained positions these layers are very thick and mottling occurs in the A_2 horizon. The B horizon is a yellowish-brown sandy loam with granular structure and friable consistency. It becomes redder in color with depth and grades into the reddish-brown sandy loam parent material at a depth of 15 to 20 inches. This material is quite firm and contains considerable stone. Usually sandstone cobbles and boulders are found on the surface.

Utilization

Little farming is done on these soils in Antigonish county. A few small areas have been cleared where less stone and better drainage occurs, but these areas are not productive. Hay and pasture are the principal uses of this soil. Small acreages of potatoes and grain are grown, but yields are low. Natural fertility is low and at present the Hansford soils may be regarded as marginal or submarginal agricultural soils.

Thom Catena (90,304 acres)

The soils of the Thom catena occupy a considerable area in the western part of the county. These are the principal soils found on the highlands and are a continuation of the Thom soils found in Pictou county. Thom soils are developed from a dark grayish-brown sandy loam till derived from shales, gray conglomerate and metamorphic material. The till is usually shallow. On the top of the highlands the Thom soils have an undulating topography, but since the highlands are highly dissected numerous steep slopes occur. Drainage is usually good due to the porous nature of the soil, but on the steeper hillsides the runoff is rapid and tends to make the soils droughty in summer. Poorly drained depressions occur where the nature of the topography or the tightness of the subsoil restricts the movement of water. Stoniness is variable and usually varies with the depth of the till. In Antigonish county many areas are shallow and rock outcrop occurs. Where forested, the principal tree cover consists of maple, birch, spruce, fir and hemlock. A profile description of a well-drained Thom soil is given in the accompanying diagram.

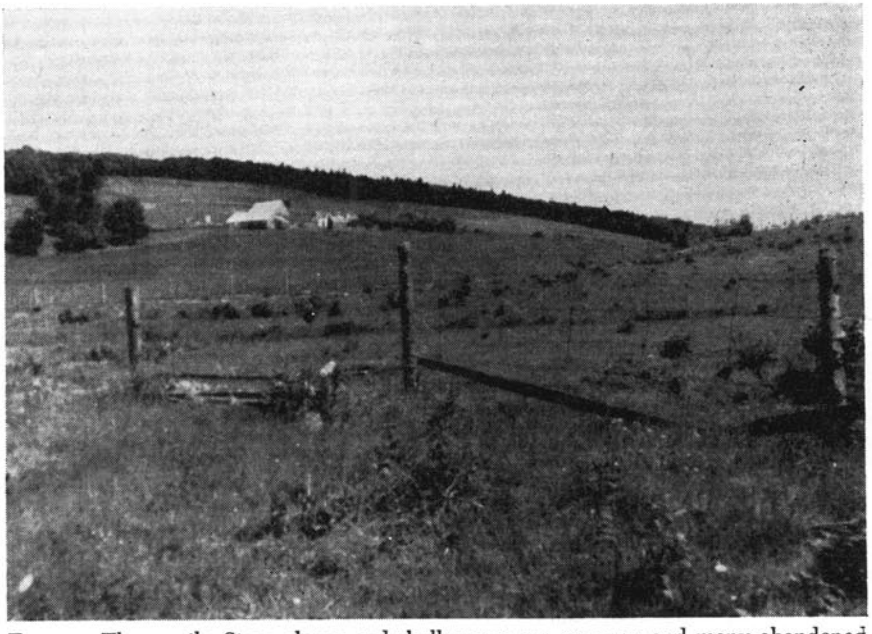
A_0—1 inch of leaf litter, needles and semi-decomposed organic matter; fibrous; pH 3.5

A_2—4 inches of pinkish-gray sandy loam; fine granular structure; very friable; pH 3.7

B_1—8 inches of dark yellowish-brown sandy loam; granular structure; friable; numerous angular stone fragments; pH 4.2

B_2—10 inches of yellowish-brown sandy loam; medium granular structure; friable; porous; numerous stone fragments; pH 4.5

C—dark grayish-brown or light reddish-brown sandy loam; structureless; firm; many stone fragments and angular cobbles; pH 5.0



Farm on Thom soils. Steep slopes and shallowness are common and many abandoned farms are found on these soils. The ridges support a good growth of hardwoods.

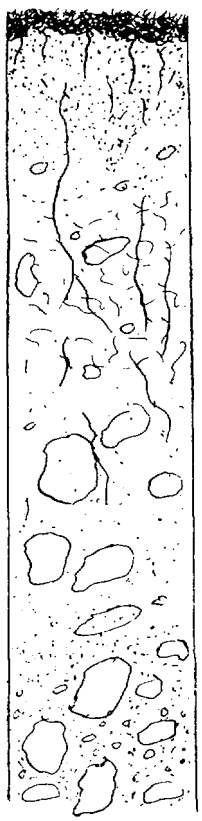
In the vicinity of Georgeville, the C horizon has a reddish-brown color due to the character of the metamorphic material present, but the upper profile is a yellowish-brown color. The poorly drained soils are usually shallow and very stony.

Utilization

Large areas of the Thom soils have been cleared, but many of these have been abandoned as farm lands. Although Thom soils support a good forest growth, they deteriorate quickly under cultivation, particularly on the hillsides. The porous nature of the soil and its hilly topography result in too rapid drainage and in dry years crops suffer from lack of moisture. On the more level areas where drainage is good, it is possible to bring the Thom soils to a fairly productive state through the use of organic matter, lime and fertilizer. Good stands of clover and grain have been seen on such areas. However, most of the cleared areas have a hilly topography and have been used for hay for many years. The natural fertility of this soil is low and poor yields are obtained. Where farms have been abandoned, the relief, distance from market and excessive drainage are factors which make crop production unprofitable. Erosion is severe on some of the steeper slopes and gullying is evident in many places. Some of the areas formerly cleared are reverting to forest and this is the best use of the Thom soils.

Halifax Catena (13,222 acres)

The Halifax soils are found in small areas in the southern and eastern parts of the county. These soils are developed from a gritty, sandy loam till derived



A_0—1 to 2 inches of poorly decomposed organic material; matted roots; fibrous; pH 4.0

A_2—3 to 5 inches of gray sandy loam; very gritty; structureless; very friable; roots; some sandstone fragments; pH 4.5

B_1—3 to 6 inches of strong brown sandy loam; medium granular structure; firm; some gravel and angular cobbles; pH 5.0

B_2—10 to 12 inches of yellowish-brown coarse sandy loam; coarse granular structure; firm; occasional stones and boulders; pH 5.2

C—light yellowish-brown sandy loam; coarse granular structure; firm; quartzite and sandstone cobbles and occasional boulders; pH 5.4

from hard sandstones and quartzites with a small amount of hard slate. The topography varies from rolling to hilly with an undulating micro-relief. Drainage over the area is variable over short distances. Short stony ridges are interspersed with poorly drained areas. On the ridges, the open, porous nature of the soil facilitates good internal drainage. Over most of the area, the soils are very stony and numerous shallow spots occur. In the vicinity of Auld Cove, gray conglomerate boulders litter the surface and in most cases the soils are too stony for agricultural purposes. Tree cover includes spruce, fir, birch, maple and pine. A general description of a well-drained Halifax soil is given in the accompanying diagram.

In the poorly drained positions the B horizon may be slightly indurated, the whole profile is mottled with yellow streaks and the surface layer is thick and peaty. Where the till has a depth of 8 to 10 feet it consists of a matrix of coarse sandy material in which quartzite and sandstone boulders and cobbles are embedded. Generally the till is not more than 3 to 4 feet deep in Antigonish county. Where these soils occur near the Woodbourne soils, the C horizon is browner in color and not so coarse in texture.

Utilization

The Halifax soils are nearly all forested in Antigonish county and little attempt in made to farm them. The stoniness of the soil and its aimless drainage pattern precludes the clearing of any large well-drained areas, even though the stone could be removed. The best use for these soils is forestry.

Cobequid Catena (2,592 acres)

Only small areas of the Cobequid soils are found in Antigonish county. These soils are associated with the Thom soils on the highlands in the western

A_0—2 inches of moderately decomposed organic matter; F layer thin; H layer fibrous, greasy mor; very friable; pH 4.0

A_2—2 inches of pinkish-gray sandy loam; very patchy; very friable; pH 4.3

B_1—6 inches of dark reddish-brown sandy loam; fine granular structure; mellow; some stones; pH 5.0

B_2—12 inches of dark grayish-brown sandy loam; medium granular structure; very friable; some angular rocks; some roots; pH 5.2

C —very dark grayish-brown sandy loam; firm; full of angular cobbles and stones; pH 5.5

part of the area. Cobequid soils are developed from a sandy loam till derived from a mixture of acid igneous and metamorphic rocks. These soils lie on the steep sides and undulating top of the highlands and have good drainage. Water passes through the soil fairly rapidly and there are very few poorly drained areas. The Cobequid soils are quite stony and often shallow and, in Antigonish county, the soils are practically all covered with forest consisting of maple, beech, birch, spruce and hemlock. The accompanying diagram and description is that of a well-drained Cobequid soil a few miles south of James River.

In a few places the till has a dark reddish-brown color. There are traces of an A_1 horizon in the profile and the A_2 is variable in depth. Rock material consists of a hard, angular greenish-gray felsite, a reddish-brown felsite, diorite, granite and some shale.

Utilization

The small area of the Cobequid soils in Antigonish county should be left in forest. Stoniness and topography would make clearing difficult.

Westbrook Catena (13,740 acres)

The soils of the Westbrook catena occur in two well-defined areas in Antigonish county — one around North Grant and Pleasant Valley and the other around Cape George. The Westbrook soils have gravelly sandy loam parent material derived from a reddish-brown conglomerate. The topography ranges from rolling to hilly and, in the Cape George area, the Westbrook soils have a

A_0—2 inches of black leaf litter; F layer thin, H layer thin and fibrous; fluffy; pH 3.8

A_2—2 inches of light reddish-brown sandy loam; fine granular structure; moderately friable; numerous roots; pH 4.0

B_1—6 inches of reddish-brown sandy loam; medium granular structure; very friable; small angular stones; pH 4.5

B_2—8 inches of reddish-brown gravelly sandy loam; coarse granular structure; slightly firm; gravel and cobbles; pH 5.0

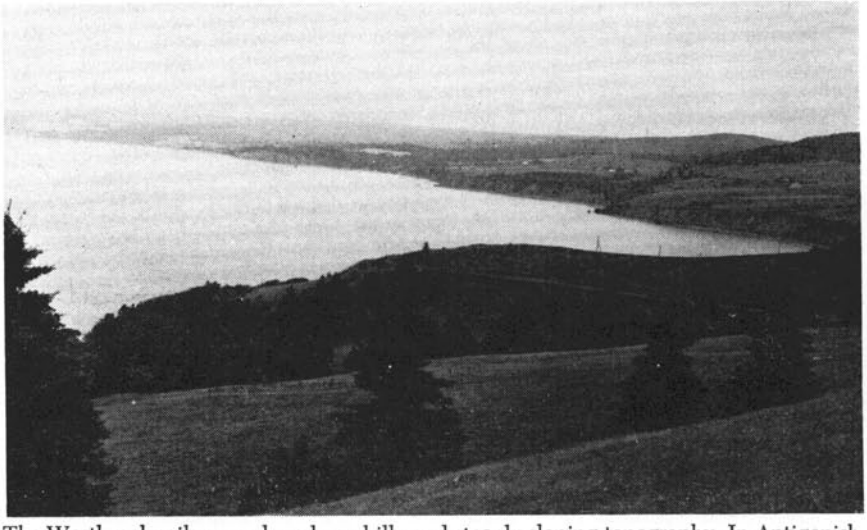
C —dark reddish-brown gravelly sandy loam; firm; very gravelly; pH 5.4

very dissected topography. Both the surface and the internal drainage are moderately rapid. Stones do not usually interfere with cultivation, but shallowness is often a determining factor in agricultural use. Tree cover consists principally of maple, beech, hemlock, fir and spruce. The Westbrook soil described in the accompanying diagram is typical of the well-drained profiles found in Antigonish county.

Around North Grant the till is fairly deep, but north of this and around Cape George many outcrops occur and the soils are shallow.

Utilization

Where the till is fairly deep the Westbrook soils make good farm land. Enough fine material is in the soil to provide a fair moisture-holding capacity. Fairly large areas of this soil are cleared and some good farms are seen, particularly in the area around North Grant, where topography and depth of soil are favorable. Other areas, such as around Cape George, are shallow and have steep slopes. Erosion is severe on these slopes and they should be allowed to return to forest.



The Westbrook soils occur largely on hilly and steeply sloping topography. In Antigonish county these soils have been widely used for sheep pasture as shown in foreground. Such slopes could be better left in forest.

With proper management, the better Westbrook soils are quite productive. They require organic matter and the maintenance of a fair level of fertility for successful crop production. They seem to run out rapidly when this is neglected. Westbrook soils are suitable for hay, grain and potatoes, but care must be exercised to prevent erosion with hoed crops.

B. Soils Developed from Water-Deposited Materials

The water-deposited sediments in Antigonish county consist of those deposited by streams flowing within or away from the glacial ice sheets and those materials deposited by post glacial and more recent streams.

The fluvio-glacial deposits occur as fairly well-sorted outwash plains and poorly sorted kames, eskers, and ice-contact materials. These materials have been weathered sufficiently long to develop profile characteristics. The Hebert soil catena is developed on these materials.

The post glacial and more recent deposits occur as flood plains along the river courses. These materials do not show any profile characteristics other than a layering due to deposition. These are the parent materials of the Stewiacke soil catena. The water-deposited materials are scattered widely throughout the county and form the main agricultural soils in some areas.

1. *Silty clay loam parent material.*

STEWIACKE CATENA (8,806 ACRES)

The Stewiacke soils occupy 2.5 per cent of the county. The parent material of these soils is a silty clay loam alluvial deposit. In Antigonish county this deposit almost invariably overlies gravel. The depth to the gravel averages 25 to 30 inches, but there are places where it is only a few inches from the surface. These soils have a level to very gently undulating topography and most of the areas are well drained. The soils are stone-free except for occasional shaly gravel fragments in the profile.

The surface soil is a dark reddish-brown silt loam to a depth of 8 to 10 inches. This is underlain by a dark reddish-brown to weak red silt loam. At a depth of 25 to 30 inches the soil rests on a shaly gravel. Near the ridges this gravel is often found at a depth of 8 to 10 inches.

The Stewiacke soils in Antigonish county differ in depth from those in other counties and may be regarded as a shallow phase of the Stewiacke soils. They are properly classed as Stewiacke soils over gravel. Poorly drained areas occur south of Ohio and Glassburn.

The soils on the intervals could be used to better advantage than for sheep pasture. Thom soils in background.

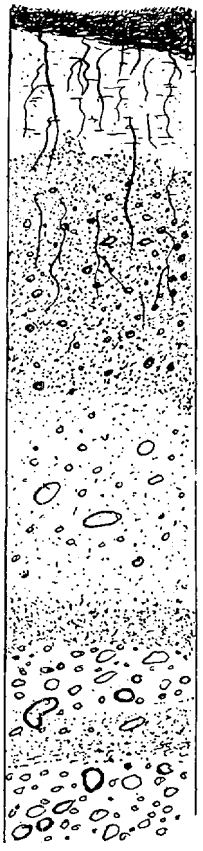
Utilization

The Stewiacke soils are very fertile and easily cultivated. In many cases they form the most important soils on a farm. Hay and grain are the principal crops grown on these soils and good yields are obtained. They are very responsive to additions of organic matter and fertilizer. The use of these soils for crops other than hay is sometimes limited by their tendency to be flooded. On large areas it might be profitable to prevent flooding by the use of dykes or by lowering the river level.

2. *Gravelly sandy loam parent material.*

HEBERT CATENA (11,206 ACRES)

The Hebert soils are widely scattered throughout the county, but have a considerable area. The material from which the soils are developed is a gravelly sandy loam derived chiefly from igneous and metamorphic materials. There is a wide range in the gravel content and in the amount of sorting in the Hebert soils. Around Havre Boucher the material is coarse, poorly sorted and frequently contains boulders, while at James River the finer material is usually found on the outwash plains and the coarser material on the terraces, kames and eskers. Drainage is usually rapid in these soils and consequently they tend to be droughty. In only a few places stoniness interferes with use. Topography and excessive drainage are the limiting factors in use. Vegetation consists of spruce, fir, pine, poplar and birch.



A_0—2 inches of dark gray poorly decomposed organic matter; fibrous; loose; pH 3.8

A_2—6 inches of light gray sandy loam; medium granular structure; loose; some gravel; roots; pH 3.5

B_1—10 inches of yellowish-brown sandy loam; medium granular structure; loose; considerable gravel; roots; pH 4.5

B_2—6 inches of dark brown sandy loam; medium granular structure; loose; numerous cobbles and some gravel; pH 4.8

C —dark, grayish-brown gravelly sandy loam; slightly firm; some large cobbles; pH 5.0

The accompanying diagram represents the more coarse-textured soils. Many profiles contain less gravel and more sand. Around Brierley Brook and also north of Maryvale there are numerous kames, eskers and outwash plains in which the material is very mixed. Sandy and gravelly lenses interspersed with finer material are often found. Along the Ohio River and around Lochaber Lake gravelly terraces are interspersed with gravelly modified till, one grading imperceptibly into the other. Most of this material was included with the Hebert soils.

Utilization

Most of the Hebert soils are unsuitable for agriculture because of their excessive drainage, poor topography or both. In places, where there is sufficient fine material to retain some moisture and the topography is suitable, fairly good crops may be grown. The soils have a low natural fertility and require fertilizer and the maintenance of organic matter where crops are grown. When these conditions are fulfilled, it is possible to grow hay and clover on these soils. They are also suitable for hoed crops. In general, very little of the Hebert soil is suitable for cultivation and where possible other soils on the farm should be used for agricultural purposes.

C. Miscellaneous Soils

SWAMP (1,811 ACRES)

The areas mapped as swamp are scattered throughout the county and they may be found associated with nearly all of the soil catenas. Swampy areas occur in depressions where the water cannot drain away or on more level areas where the bedrock restricts the downward movement of water. On most of the areas the water table is high and the soils are wet for the greater part of the time. Vegetation consists of black spruce, tamarack, poplar and fir and the non-forested areas are covered with sedges, reeds, cat-tails and other water-loving plants.

These soils have a thick poorly decomposed organic mat on the surface. This is usually underlain by a grayish, mottled "glei" horizon which rests on a fairly compact mottled subsoil. These soils are not suitable for agricultural purposes.

PEAT (467 ACRES)

Only a small area of peat occurs in Antigonish county. The largest single area is found along the main highway between South River and Pomquet Forks. Peat occupies depressional areas which were formerly the sites of shallow lakes which have been filled in with vegetation. Very little tree growth occurs on these areas, except for small stunted spruce or tamarack.

Practically all of the peat mapped consists of a surface layer of sphagnum moss, sedges and reeds to a depth of one to three feet. Below this are layers of the same material in various stages of decomposition. The peats belong to the great group of Bog Soils and in Antigonish county they are of no agricultural value.

SALT MARSH (365 ACRES)

Salt marshes occur in scattered areas along the coast of George Bay. They consist of sediments deposited by the tidal rivers and which are flooded by the tidal waters. They have a level topography and are free from stone and covered with a mixture of salt marsh grass, black grass, sea blite and spurrey.

The deposits are fine textured reddish-brown materials and resemble the poorly drained Stewiacke soils. The depth of the deposits varies from 5 to 15 feet. Salt marsh soils are not used for agricultural purposes in Antigonish county.

Pomquet Sand (1,126 acres)

The areas mapped as Pomquet sand are found along the shores of George Bay and Northumberland Strait. They consist principally of beaches deposited by the waves. They are composed of coarse gray sand, often rimmed on their landward side by a deposit of rounded stones and gravel or by a wave-cut cliff. In the vicinity of Pomquet Harbour these soils are quite extensive and sand dunes occur. In other places the sandy deposits occur as bay mouth bars, tombolas and spits formed by the action of the marine currents.

These deposits are unsuitable for agriculture but have some value as recreation spots.

AGRICULTURE

Early Settlement and Agriculture

Antigonish county was first visited by Champlain, who mentions the Indian village of Tracadie in the reports of his voyages in 1631. The first settlement seems to have taken place about the middle of the eighteenth century, when Acadian families settled at Pomquet and Tracadie. The long narrow plan of their original farms still remains today. In 1784 the first British settlement was made by disbanded officers and soldiers of the Royal Regiment of Volunteers. Following the arrival of the Highland Scots at Pictou in 1773, Scottish settlements spread along the north shore of the country from Arisaig to Cape George. The first Scottish church in the country was erected at Arisaig in 1792. About 1800 a Loyalist settlement was made near the mouth of Antigonish harbor. This was moved inland after a few years to form the town of Antigonish.

There is little or no record of early agriculture. Crops were raised on the river flood plains and intervals where tillage was easy and the soil was fertile. The clearing of the forest was slow at first, but after 1800 and up to 1880, the influx of settlers and the demand for land resulted in rapid clearing, sometimes of land that proved unsuitable for agriculture.

The earliest census data on the county date from the year 1861. The population reached its maximum in 1881 and the amount of farm land occupied reached a maximum in 1891. Since that time the decline of population and, with it, agricultural production, has been very great. An interesting and informative study of this decline and its causes is reported by Longley and Chown.* Some of the following data are taken from this report.

In the 50-year period between 1881 and 1931, population decreased 54 per cent and the number of farms 30 per cent. The acreage of improved land dropped from 127,749 acres to 46,246 acres for the same period. Similar declines in the acreage of field crops and the production of livestock, except sheep and poultry, followed the loss of population. Several reasons are given for this decline. Early settlers were largely self-sufficing and food could easily be obtained from the forest and stream, as well as from the sea. As industries developed and opportunities for employment in larger centres were attractive, more people were drawn from the hard labor of the farm to more remunerative employment. Many of the farming areas were located on poor soil, rough topography or were at considerable distance from market. Such areas were abandoned first and are now reverting to forest. Increase in the number of occupations and decrease in the non-farm rural population such as blacksmiths, shoemakers, tanners and carpenters or builders are given as reasons for the decline. The rural population of Antigonish county has decreased more than any other county in the Maritime Provinces. Soil erosion and loss of soil fertility have probably played a part also.

Present Agriculture

The census of 1951 shows that about 45 per cent of the country is occupied by 1,164 farms. This is in contrast to the peak year of 1891, when 76 per cent of the area was occupied by 2,710 farms. The average size of a farm is 135 acres, but this ranges from an average of 191 acres in the Upper South River district

*Longley, W. V. and Chown, W. F.—Antigonish County—A Study of Land Utilization, Farm Production and Rural Living. N. S. Dept. of Agriculture. Bulletin No. 118, 1936.

to 51 acres in the Havre Boucher district. The average improved land per farm for the county is 30 acres, but this varies widely. The largest areas of improved land are found in the Antigonish, St. Andrews, Heatherton, Lochaber and North Grant districts.

The largest amount of improved land per farm occurs in the Upper South River, Lochaber, North Grant and Heatherton districts and ranges from 40 to 80 acres per farm. About 28 per cent of the farms are over 180 acres in size and there are seven farms of more than 560 acres.

Table V shows the area and condition of farm land in Antigonish county as given by the 1951 census.

TABLE V.—AREA AND CONDITION OF LAND IN ANTIGONISH COUNTY 1951

Total land area	346,240 acres
Occupied land	156,758 acres
Occupied farm land—improved	
All crops	24,306 acres
Field crops	24,198 acres
Pasture	9,121 acres
Other uses	1,507 acres
Total	34,934 acres
Occupied farm land—unimproved	
Woodland	81,294 acres
Other	40,530 acres
Total	121,824 acres
Number of farms	1,164
Average area per farm	135 acres
Average improved area per farm	30 acres

The principal field crops grown in the county are hay, oats, potatoes, barley, wheat and roots. About 77 per cent of the field crop acreage is devoted to hay and 15 per cent to oats. The acreage in field crops has been decreasing since 1941. The small acreage devoted to corn and roots emphasizes the lack of a crop rotation. The largest acreages of field crops are grown in the districts of Antigonish, St. Andrews, Pomquet, Cape George and Heatherton. The greatest variety of crops is grown in the Pomquet district, which is one of the leading dairy and poultry sections. Nearly 40 per cent of the occupied area consists of natural and improved pasture. Much of this requires fertilization and reseeding to increase the present carrying capacity.

The acreage of field crops in Antigonish county is given in Table VI. below.

TABLE VI.—ACREAGE OF FIELD CROPS IN ANTIGONISH COUNTY 1941 AND 1951

Crop	*1941*	*1951*
Hay	20,162 acres	18,591 acres
Grain cut for hay	87 acres	948 acres
Oats	4,888 acres	3,532 acres
Barley	719 acres	209 acres
Potatoes	829 acres	549 acres
Roots	232 acres	150 acres
Mixed grain	55 acres	142 acres
Wheat	438 acres	59 acres
Corn	8 acres	

Mixed livestock farming occurs on nearly one-half of the farms in the county. The principal livestock raised are sheep, cattle and poultry. The production of meat, milk, wool and eggs furnishes the chief source of farm income. Milk production in 1951 was approximately 21,288,000 pounds (based on figures obtained for May 1951).

The districts of Antigonish, St. Andrews, Pomquet and Heatherton produced the bulk of the milk, poultry and eggs. The raising of beef cattle is centered chiefly in the Cape George and St. Joseph districts, while St. Andrews, Cape George and Antigonish districts are the largest sheep-raising centers. Table VII. shows the livestock population in the county, as given by the census figures.

TABLE VII.–LIVESTOCK POPULATION OF ANTIGONISH COUNTY 1941 AND 1951

	1941	*1951*
Horses	2,431	1,698
Cattle	11,924	9,413
Sheep	19,405	12,534
Swine	1,812	1,589
Poultry	60,340	48,544

Many of the farms along the shore derive part of their income from fishing. Several lobster canneries and fish processing plants have been established. In the Cape George area as much as 30 per cent of the farm income may be derived from fishing. The sales of fish from the cooperatives at Arisaig and Havre Boucher in 1948 totalled $139,377.00. A few farms have small orchards and the total number of all fruit trees was 1282 in 1951, with a production valued at $1636.

In Antigonish county about 99 per cent of the farms are owner operated and the value of all farms in 1951 was $5,967,937. The revenue from farm products was $1,215,060, of which field crops yielded 5 per cent, animal products 81.4 per cent and forest products 13.6 per cent.

The co-operative movement is very strong in Antigonish county and a large number of Credit Unions and organizations are scattered throughout the county. Most of the farm produce is marketed through these co-operatives and farm supplies of feed, fertilizer, merchandise and machinery are purchased at reduced cost to the farmer.

The Utilization and Management of Antigonish County Soils

The percentage of occupied land in Antigonish county is the second largest in the province and is exceeded only by Kings county. The greater proportion of agriculture is located on the lowlands bordering George Bay and along the valleys of the principal rivers. According to the 1951 census about 77 per cent of the field crops is hay. Hay and grain crops together occupy nearly 97 per cent of the crop land. This would seem to indicate lack of proper rotation and need for better soil management.

Farming practices and the type of farming have changed little from the early days of settlement. The introduction of modern farm machinery has not been so rapid as in some of the other counties, since many farmers cannot afford to finance expensive machinery. This has been overcome partly by the co-operative ownership of the larger types of machinery, such as binders and threshing machines. The use of lime and fertilizer is increasing.

The use of the soil depends largely on its physical characteristics such as topography, drainage, stoniness and texture. In Antigonish county most of the areas where these factors are favorable have been occupied. The present problem confronting the farmer is one of proper soil management and the maintenance

of soil fertility. Soil management will vary with the different types of soil, but soil fertility can be maintained generally by the use of organic matter, lime and fertilizer. The maintenance of organic matter levels in Antigonish county soils is of great importance.

The fine textured soils of the county are those of the Queens, Woodbourne, Millbrook and Joggins catenas. The Queens soils, because of their position on the lowland and their accessibility, are probably the most intensively cropped of the fine textured soils. In Antigonish county, these soils are relatively free from stone. They are used chiefly for hay and grain crops and are probably better suited to these crops than the other soils of the area. Their slow internal drainage and fine texture discourage the growing of potatoes and garden crops. While surface drainage is usually fairly good on the more rolling or undulating areas, it may be necessary to provide some artificial drainage on the more level areas. Soil management on the Queens soils involves plowing at the proper time and the maintenance of a good supply of organic matter. Green manuring crops produce good results on these soils. The soils respond well to additions of lime and fertilizer, but the proper amounts of these amendments to add should be determined by consultation with the Agricultural Representative or Fieldman.

The Woodbourne and Millbrook soils occur on higher or more rolling relief than the Queens soils. Many areas of these soils have been cleared and abandoned or used for many years for sheep pasture. Considerable areas of the Woodbourne soils are shallow and suitable only for forest. Generally, these soils are used for hay, grain or pasture. The Woodbourne soils, when they have sufficient depth, make good crop soils provided fertility is maintained and they are slightly better crop soils than the Millbrook soils. Woodbourne soils are usually well drained. The Millbrook soils have good surface drainage, but water percolates slowly through them. Hay crops are better on Millbrook soils in the dry years than on the Woodbourne and Queens soils. These soils, particularly the Woodbourne soils, are eroded easily where they occupy long slopes, and many of the cleared areas are now badly gullied and washed. The maintenance of organic matter is important and lime and fertilizer are needed for successful crop production. Millbrook soils seem to make good pasture when properly managed and it is probable that pasture will continue to be an important use of these soils. This will require careful management of the slopes in order to minimize erosion. The proper use and method of application of fertilizers, the use of suitable grass mixtures and controlled grazing are some of the factors involved.

The Joggins soils are the most poorly drained of the fine textured group. In places, they have sufficient slope to have good surface drainage. Natural fertility is low in these soils. Hay is the principal crop grown and only a small acreage is under cultivation in the county. Generally, the Joggins soils are among the less desirable agricultural soils.

The soils of the Barney and Kirkhill catenas are medium to coarse in texture and frequently the shale rock from which they are developed is close to the surface. Some areas of the Barney soils are cultivated and hay and grain give good yields. Small acreages of potatoes have been observed also, and it would seem that where the Barney soils have sufficient depth they are suitable for agriculture. The more rolling areas are usually shallow and inclined to be droughty in summer. These areas are better left in forest. The Kirkhill soils are usually stony and shallow and have too rapid drainage to make them suitable for agriculture. Some areas have been cleared and are now used for pasture. On both the Barney and Kirkhill soils, successful crop production depends on a good supply of organic matter and the use of lime and fertilizers. Generally, these soils are better suited to forest and will produce an excellent stand of trees.

The coarse textured soils include those belonging to the Merigomish, Hansford, Thom, Halifax, Cobequid and Westbrook catenas. Only the Merigomish, Westbrook and Thom soils are used to any extent for agriculture. The Merigomish soils are among the most suitable agricultural soils in the county. They have an undulating topography and are fairly free from stone, well-drained and suitable for most crops grown in the area. They are well suited to hoed crops, although hay and grain give good yields under good farming practices. Like all soils in the area, organic matter, lime and fertilizer are important for good crop yields. These soils lie along the shore, where fishing is part of the source of farm income and consequently these soils do not receive the attention necessary to make them produce as they should. They are easily tilled and are probably adapted to a shorter rotation than most of the soils in the county.

The Westbrook soils are limited in use by topography and shallowness. They are generally well drained, but have steep or broken slopes and are too droughty for suitable crop production. Where these conditions are not so severe and the soils have a good depth, the Westbrook soils make good farm land. Hay, grain and roots may be grown successfully, when organic matter, lime and fertilizer are used. This is true also of the Thom soils, although they are less suitable for agriculture than the Westbrook soils. Large areas of both of these soils were cleared in the early days and are now abandoned or used for rough pasture. Pastures are poor and weedy and suffer severe erosion on the steeper slopes. These should be allowed to revert to forest. On the smoother areas, fertilization and reseeding might make good grazing land, provided good management practices are maintained.

The soils of the Halifax, Hansford and Cobequid catenas are mostly unsuitable for agriculture, because of rough topography and stoniness. These areas support a good forest growth.

Along the river valleys, the soils of the Hebert catena occur as gravelly terraces, kames, eskers and outwash plains. These soils are generally too droughty for crop production. In general, they are open, gravelly, excessively drained soils and support a vegetation of pine or, when cleared, poverty grass. On some of the more level areas, lenses of fine sand or silt occur in the deposit and, on these areas, the moisture supply is sufficient to support crop growth. However, profitable crop production requires the maintenance of a good supply of organic matter and heavy fertilization. This is usually too expensive to warrant crop production on the Hebert soils, unless to grow a very special crop which commands high prices.

The interval land along the rivers of the county includes the soils of the Stewiacke catena. These soils are very fertile and their physical nature makes them suitable for crop production. In Antigonish county the soils are not so deep as the Stewiacke soils found in some other counties and they tend to drain somewhat more rapidly. At present they are used principally for hay and grain. Their principal disadvantage is their susceptibility to flooding. They are fairly acid and require liming. They give good response to fertilizer applications and under proper management are probably the most productive soils in the county.

In general, the soils most suitable for agriculture in the county are the Stewiacke, Queens, Woodbourne, Millbrook and Merigomish. Large areas of the Woodbourne, Millbrook, Thom and Kirkhill soils which have been cleared are suitable for grazing with proper management and they will probably be used largely for this in the future. The steeper slopes of these soils should be reforested. The control of erosion is important in Antigonish county. At present surface erosion by sheet washing is severe in many places, particularly along the slopes of the larger river valleys.

Land Use Capability and Crop Rating for Antigonish County Soils

Among the more important factors that influence the production of crops in an area are climate, topography, drainage, stoniness and soil fertility. In Antigonish county the climate is favorable for the growing of most crops produced in humid temperate areas. The other factors, while they do not influence greatly the type of crop that is grown, govern the ability of the soil to produce crops economically. The ability of a soil to produce a crop is best measured by the yield obtained, since this reflects the characteristics inherent in the soil and also its management. Thus a soil of low fertility under good management might produce yields equal to or better than those obtained from a highly fertile soil under poor management.

TABLE VIII.–SOIL RATINGS FOR SELECTED CROPS IN ANTIGONISH COUNTY

Soil	Hay	Grain	Potatoes	Roots	Vegetable Crops	Pasture
Class I—Good Crop Land						
Stewiacke (well drained)	E	G	G	G	G	G
Merigomish (well drained)	G	G	G	FG	FG	F
Class II—Fair to Good Crop Land						
Queens (well drained)	E	G	FG	FG	F	E
Queens (imperfectly drained)	E	G	F	F	F	E
Millbrook (well drained)	G	G	F	F	F	G
Class III—Fair Crop Land						
Millbrook (imperfectly drained)	G	FG	F	FP	FP	G
Woodbourne (well drained)	G	G	G	F	F	G
Woodbourne (imperfectly drained)	F	FP	FP	FP	P	FG
Stewiacke (imperfectly drained)	G	FG	FP	FP	FP	F
Merigomish (imperfectly drained)	G	F	FP	FP	P	F
Class IV—Fair to Poor Crop Land						
Joggins (imperfectly drained)	F	F	P	P	P	FG
Westbrook (well drained)	FG	FG	FP	FP	FP	FP
Barney (well drained)	F	FP	G	FG	G	FP
Kirkhill (well drained)	FP	FP	F	FP	FP	FP
Thom (well drained)	FP	P	P	P	P	FP
Class V—Poor Crop Land						
Cobequid (well drained)	P	P	P	P	P	FP
Halifax (well drained)	P	P	P	P	P	P
Hebert (well drained)	P	P	F	FP	FG	P
Hansford (imperfectly drained)	FP	FP	P	P	P	P
Hebert (imperfectly drained)	P	P	FP	P	FP	P
Barney (poorly drained)	P	P	P	P	P	P
Merigomish (poorly drained)	P	P	P	P	P	P
Millbrook (poorly drained)	P	P	P	P	P	P
Queens (poorly drained)	P	P	P	P	P	FP
Woodbourne (poorly drained)	FP	P	P	P	P	FP
Hebert (poorly drained)	P	P	P	P	P	P
Stewiacke (poorly drained)	P	P	P	P	P	P
Pomquet sand	P	P	P	P	P	P
Swamp	P	P	P	P	P	P
Salt Marsh	FP	P	P	P	P	P
Peat	P	P	P	P	P	P

E: excellent; G: good; F: fair; P: poor; FG: fair to good; FP: fair to poor.

In table VIII an attempt is made to rate the soils according to their suitability for crops commonly grown in the county. In Antigonish county the average yields from any soil type or catena are difficult to obtain, so that crop requirements, soil characteristics and field observation play an important part in the determination of the rating. These ratings are very general. Some soils are especially favorable for certain crops, but may not rate so high for general use. Areas of soil classed as good cropland may contain smaller areas that are unsuitable for crop production such as the areas of poorly drained catena members. A more detailed type of survey would be necessary to classify such areas. The ratings are regarded as applying to crops grown in the area under prevailing systems of management and the soils have been classed as excellent, good, fair or poor for the selected crops. The characteristics of the soils have been discussed previously in the report.

LAND USE CLASS I

	Acres
Stewiacke (well drained)	7,315
Merigomish (well drained)	18,643
	25,958

These soils are rated as good crop land. They are well drained, quite free from stone and easily tilled. They are suitable for most crops grown in the area. The Stewiacke soils are very fertile and produce good crops but are sometimes subject to flooding. Both the Merigomish and Stewiacke soils are more suitable for cash crops than the heavier soils of the county, but they will also produce good yields of hay and grain. These soils respond well to fertilizer and for best results a program of liming to reduce acidity should be followed. The Merigomish soils require an adequate supply of organic matter as they tend to become depleted in this constituent under cultivation. Little erosion occurs on the Stewiacke soils, but on the steeper slopes of the Merigomish soils, some erosion takes place when hoed crops are grown.

LAND USE CLASS II

	Acres
Queens (well drained)	2,931
Queens (imperfectly drained)	36,972
Millbrook (well drained)	37,785
	77,688

The soils rated as good to fair crop land are equally as productive as those of Class 1, but are not so well suited for as wide a range of crops. The Queens and Millbrook soils are fairly fine textured and produce good crops of hay and grain and are excellent pasture soils. A large proportion of the Queens soils are imperfectly drained which makes them generally less suitable than the Class 1 soils for hoed crops, but they are not too wet for grass or grain crops. A large part of the farming in Antigonish county is done on these soils. The Queens soils in Antigonish county are not quite so acid as those found in other parts of the province, but they do respond to liming and this should be planned for in the rotation. Millbrook soils also require liming for successful crop production. Both of these soils require careful management, both in the nature of tillage practices and in application of fertilizers. Organic matter improves the physical condition of these soils and may be added in the form of manure or by plowing under green manuring crops. The Queens and Millbrook soils are well suited to dairy farming.

LAND USE CLASS III

	Acres
Millbrook (imperfectly drained)	23,802
Woodbourne (well drained)	57,709
Woodbourne (imperfectly drained)	525
Stewiacke (imperfectly drained)	966
Merigomish (imperfectly drained)	448
	83,450

The soils of this class are used as crop land and, in most cases, they will produce yields about equal to those obtained on the soils of Class 11, but their stoniness, shallowness, topography or drainage limit their use. The Millbrook soils are capable of producing good yields of hay and grain and are probably more productive than some of the other soils in this class, especially in a dry season. The Woodbourne soils are excellent farm soils where they have sufficient depth and good topography, but large areas of these soils are shallow or occupy steep slopes where forestry should be encouraged. They seem to erode easily and lose their organic matter rapidly on cultivation. The Stewiacke and Merigomish soils in this class are suitable for hay crops and also give fair yields of grain in the drier seasons. None of the soils of this class, with the exception of the Woodbourne soils are suitable for root or vegetable crops because of imperfect drainage. The Millbrook soils make excellent pasture particularly when fertility requirements are met and grazing management is practised. All of the soils are acid and require liming. The maintenance of organic matter is important in these soils.

LAND USE CLASS IV

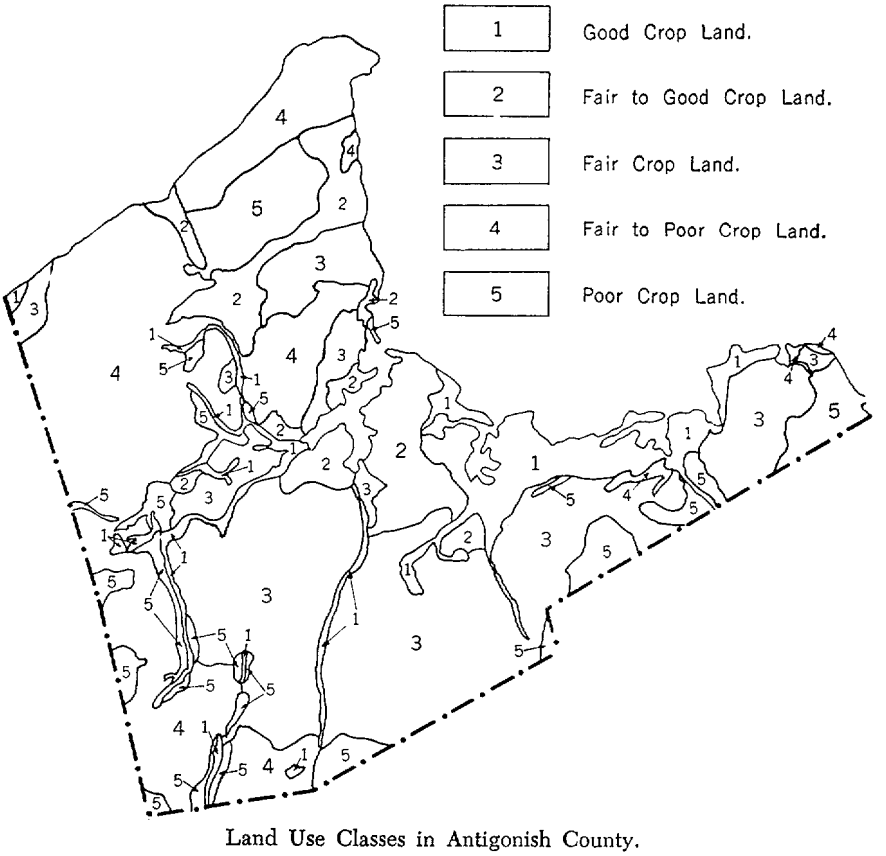
	Acres
Joggins (imperfectly drained)	1,036
Westbrook (well drained)	13,741
Barney (well drained)	3,277
Kirkhill (well drained)	19,129
Thom (well drained)	90,304
	127,487

The soils in this class have such factors as stoniness, shallowness, rough topography or poor drainage that makes them only fair to poor crop land. There are small areas of each of these soils that are suitable for crop production and for certain crops the yields may be equal to those on some of the better soils of the area. Certain sections of the Westbrook and Barney soils are suitable for general farming. The Barney soils produce good crops of potatoes, but the areas where these may be grown are limited. The Kirkhill and Thom soils have been extensively cleared, but generally the steep slopes and shallowness of these soils has resulted in many abandoned farms. Some areas are suitable for grazing with proper fertilization and management, but forest is the most suitable crop for a large part of these soils. The Joggins soils are fine textured and have slow drainage, but they may be used for hay. The yields on all of the soils in this class are low unless a good supply of organic matter is maintained and lime and fertilizer are used. Many of the areas with steep slopes that are now cleared should be allowed to revert to forest.

LAND USE CLASS V

	Acres
Cobequid (well drained)	2,592
Halifax (well drained)	13,222
Hebert (well drained)	11,084
Hansford (imperfectly drained)	12,909
Hebert (imperfectly drained)	102
Barney (poorly drained)	32
Merigomish (poorly drained)	32
Millbrook (poorly drained)	89
Queens (poorly drained)	589
Woodbourne (poorly drained)	429
Hebert (poorly drained)	19
Stewiacke (poorly drained)	525
Pomquet sand	1,126
Swamp	1,811
Salt marsh	365
Peat	467
	45,393

FIGURE VI



Land Use Classes in Antigonish County.

The soils in this class are not generally suitable for crop land. Combinations of stoniness, topography, drainage or droughtiness make these soils less suitable for crops than most of the other soils of the area. Some areas of the Cobequid soils are suitable for grazing, but unless these are now cleared, they should be left in forest. Small areas of the Hebert and Hansford soils are being farmed, but the farms are of a submarginal type and usually the chief source of income is derived elsewhere. Some areas of the Hebert soils are cultivated as part of the farm crop land, and where they have sufficient moisture-holding capacity, they are suitable for cash crops. Some portions of the poorly drained Queens, Woodbourne and Millbrook soils may be used for rough pasture and it is sometimes possible to improve these areas by drainage with an open ditch. The Pomquet sand is used as a source of construction material for concrete and the beaches where this soil type occurs have some value as recreational spots. Certain small areas of the salt marsh produce a coarse hay suitable for use in ice storage or as bedding for cattle. The remainder of the soils in this class are generally unsuitable for agriculture, but can, in most cases, support a good tree growth and should be used for this purpose.

DISCUSSION OF ANALYTICAL DATA

The physical and chemical compositions of four soil profiles of Antigonish county are shown in Tables IX and X. These profiles were all taken under virgin conditions and are fairly representative of the soils most suited for agriculture in the county.

Mechanical Analysis

Mechanical analysis of these soils was made by the Bouyoucos Hydrometer Method. The whole sample was screened through 2 mm. mesh sieve and the soil with diameter of 2 mm and under was used for mechanical analysis.

For textural classification the size group of soil separates was as follows:

Gravel—3″—2 mm in diameter
Sand—2 mm—.05 mm in diameter
Silt—.05 mm—.002 mm in diameter
Clay—below .002 mm in diameter.

All soils containing 30 per cent or more gravel have been classed as gravelly. Textural classification was made using the U.S.S.C. soil textural classification triangle 1947.

The soils analyzed range from medium to fine in texture, the gravel content in the Woodbourne, Merigomish and Millbrook soils is fairly large and in some cases is sufficient to interfere with cultivation.

The Queens soils are fairly free from gravel and stone in this area and are very heavy textured and drain very slowly.

Soil Reaction

With the exception of Queens, all the soils analyzed have a low pH throughout the profile. In the case of the Queens, the pH reaches 7.6 in the parent material. This is a high pH for soil parent material in Nova Scotia but does occur occasionally in till derived from calcareous mudstone and soft shales and where drainage is so slow that the bases have not been removed from the lower horizons. All of the soils would benefit from an application of ground limestone sufficient to raise the pH to above 6.0.

Potassium

It is doubtful if any of these soils with the possible exception of Merigomish would give a response to potash applications for a number of years under normal cropping conditions. Two of the soils, Woodbourne and Millbrook, have a fairly high available potassium content in the B horizon well within reach of most field crops. The Queens shows a fair amount of available potassium throughout the profile probably sufficient to meet plant requirements for some time.

The total supply of potassium in these soils is good and this should act as a reservoir to replenish the supply of available potassium as it is removed by cropping and leaching. However, it is not known just how much potassium is released in this way in any one year and soils differ widely in this respect.

Calcium

The Queens soils have an adequate supply of calcium in the subsoil to supply crop needs for many years. The other soils are relatively low in this element and an extended period of cropping would deplete it to a low level unless lime is applied.

While the Merigomish soil shows a fairly high content of available calcium in the A horizon, the total amount in this horizon on any one acre would not exceed 100-200 lb. and a total of 300-400 lb. of calcium to a depth of 14". This supply is entirely inadequate to support plant growth for any length of time.

The Millbrook soil is somewhat better supplied with this element than the Merigomish but here again the supply is inadequate.

While the Queens soil contains an adequate supply of available calcium in the subsoil, applications of ground limestone to this soil as well as the other soils of the county should give beneficial results.

Magnesium.

The total magnesium content of the Antigonish soils is sufficient to supply all plant needs for a very long period, however, only a small proportion of this total supply is readily available for plant use. It is doubtful if magnesium deficiency would occur on these soils under normal cropping conditions. An application of dolomitic limestone would eliminate any tendencies that the soil might develop in that direction.

Phosphorus

The supply of readily available phosphorus in these soils is low for the most part. The subsoil of the Queens soil is the exception and contains a relatively large amount of this element. The pH of this subsoil is fairly high—6.3 to 7.6—and this factor is largely responsible for the high available phosphorus content. It is not known whether the phosphorus is made available at the high pH or is rendered less liable to fixation processes in a soil that has never been acid. Quite possibly, raising the pH of these soils would raise the content of available phosphorus to a marked degree.

TABLE IX.—CHEMICAL AND PHYSICAL ANALYSIS OF REPRESENTATIVE SOIL PROFILES

Horizon		Depth in Inches	Loss on Ignition	CHEMICAL ANALYSIS												PHYSICAL ANALYSIS				
				pH	Total N %	Total P_2O_5 %	Total SiO_2 %	Total R_2O_3 %	Total CaO %	Total MgO %	Total K_2O %	Exchangeable Bases mc/100 gms. Soil				Gravel %	Sand 2-.05 mm. %	Silt .05-.002 mm. %	Clay below .002 mm. %	Texture
												H	Ca	Mg	K					
Woodbourne Catena (P)	A_0	0–2	54.13	4.78	1.48	0.35	31.53	11.20	0.97	0.91	0.92	37.40	22.82	7.00	1.25	—	—	—	—	—
	A_2	2–7	7.24	4.30	.24	.11	70.17	19.55	.28	.74	1.72	11.96	2.80	1.20	.11	33.3	25.2	46.8	28.0	GCL
	B_1	7–14	9.13	4.65	.26	.19	63.26	22.98	.15	1.19	1.77	17.32	1.35	.82	.44	24.0	26.6	48.0	25.4	L
	B_2	14–22	6.14	5.05	.14	.14	63.90	25.33	.24	1.59	1.87	9.16	.52	.26	.10	35.0	28.2	42.6	29.2	GCL
	C	22 +	3.54	5.29	.05	.12	66.81	26.46	.30	2.15	2.26	4.44	.28	.14	.04	36.0	43.6	33.2	23.2	GL
Merigomish Catena (P)	A_0	0–1	54.81	4.50	1.15	0.19	37.82	5.28	0.76	0.27	0.43	43.90	20.83	4.40	1.48	—	—	—	—	—
	A_2	1–6	1.61	3.78	.03	.05	92.78	4.06	.20	.17	.39	3.84	.16	.28	.03	20.4	46.6	47.6	5.8	SL
	B_1	6–14	4.99	5.00	.09	.09	77.53	13.44	.23	.68	1.05	8.56	.28	.17	.07	22.7	34.6	47.6	17.8	L
	B_2	14–22	2.95	4.85	.06	.09	80.29	14.42	.26	.96	1.15	6.24	.12	.09	.06	28.2	34.6	43.6	21.8	L
	C	22 +	1.82	4.97	.03	.10	82.65	12.85	.28	.95	1.34	4.40	.22	.25	.04	22.5	40.6	43.6	15.8	L
Millbrook Catena (P)	A_0	0–2	67.65	3.72	1.42	0.23	24.47	5.91	0.43	0.29	0.62	76.30	10.00	3.57	0.56	—	—	—	—	—
	A_2	2–3	5.74	3.82	.16	.11	77.84	13.61	.28	.50	1.75	13.76	1.33	.76	.12	8.0	14.2	54.0	31.8	SLCL
	B_1	3–10	6.80	4.48	.16	.13	64.28	24.31	.34	1.41	2.75	13.60	.60	.39	.49	20.0	25.2	42.0	32.8	CL
	B_2	10–15	4.83	4.62	.09	.12	64.92	27.64	.34	1.62	2.72	7.84	.40	.31	.12	32.0	27.6	41.0	31.4	GCL
	C	15 +	4.07	4.83	.05	.11	63.39	27.28	.27	1.87	3.09	6.16	.48	.43	.07	33.0	30.0	35.8	34.2	GCL
Queens Catena (PH)	A_0	0–2	82.66	4.75	1.47	0.28	9.01	5.40	1.22	0.54	0.57	51.50	31.30	9.28	1.79	—	—	—	—	—
	A_2	2–8	6.59	4.62	.14	.07	68.15	18.91	.54	.93	2.23	11.88	3.04	2.17	.19	21.0	20.0	38.8	41.2	C
	B_1	8–14	5.00	4.67	.11	.06	63.81	27.19	.27	1.67	2.60	7.56	2.14	2.40	.22	18.0	19.2	31.6	49.2	C
	B_2	14–20	4.26	6.30	.05	.10	62.46	28.31	.36	2.22	3.50	2.90	7.90	5.38	.27	8.5	15.2	29.2	55.6	C
	C	20 +	4.59	7.65	.05	.14	60.84	26.16	1.19	2.59	3.35	0.00	9.96	2.90	.24	5.2	18.2	28.2	53.6	C

TABLE X
AVAILABLE NUTRIENTS IN POUNDS PER ACRE*

Catena	Horizon	Depth	P	Ca	Mg	K
Woodbourne P.....	A_0	0–2	17	881	162	94
	A_2	2–7	64	1118	288	85
	B_1	7–14	38	539	197	343
	B_2	14–22	44	208	62	80
	C	22+	80	112	34	32
Merigomish P.....	A_0	0–1	19	804	102	111
	A_2	1–6	24	64	67	27
	B_1	6–14	28	112	41	55
	B_2	14–22	0	48	22	48
	C	22+	8	88	60	28
Millbrook P.....	A_0	0–2	10	386	83	42
	A_2	2–3	8	531	182	94
	B_1	3–10	4	240	94	384
	B_2	10–15	12	160	74	97
	C	15+	20	192	103	56
Queens pH.....	A_0	0–2	9	1208	215	135
	A_2	2–8	18	1216	521	151
	B_1	8–14	8	856	576	169
	B_2	14–20	244	3160	1291	214
	C	20+	564	3984	696	184

* Calculated on the basis of 193,000 lb. of soil per acre to a depth of 6″.