Soil Research Institute
CARTOGRAPHY
Research Branch, Ottawa

SOIL SURVEY

of

COLCHESTER COUNTY

NOVA SCOTIA

by

R. E. WICKLUND and G. R. SMITH
Nova Scotia Department of Agriculture

REPORT No. 3—NOVA SCOTIA SOIL SURVEY
TRURO, N. S. — 1948

Experimental Farms Service
Dominion Department of Agriculture
In Co-operation with the Agricultural College, Truro,
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Mr. P. C. Stobbe, Supervisor of Soil Surveys, Central Experimental Farm, Ottawa, inspected the survey work and reviewed the manuscript.

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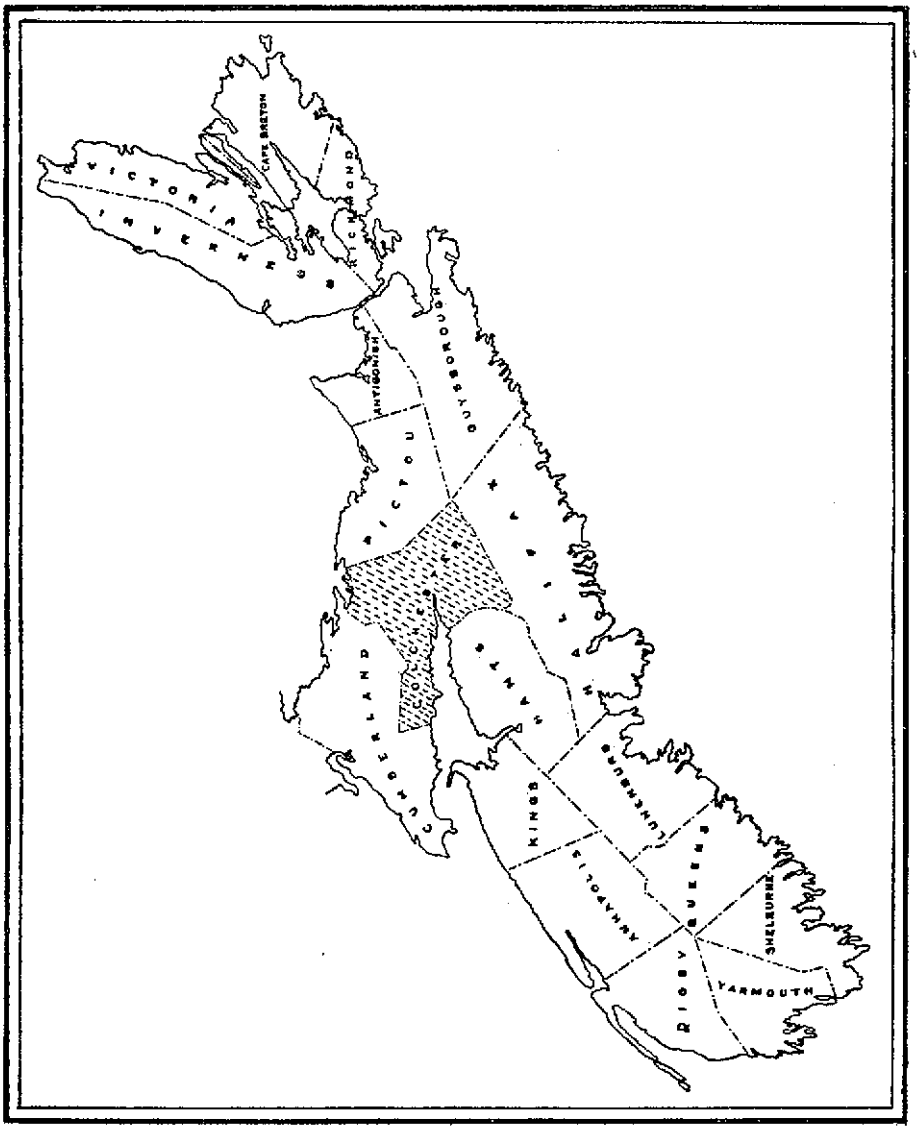


FIGURE 1. Sketch map showing location of Colchester County, N.S.

INTRODUCTION

The reconnaissance soil survey of Colchester county was begun in 1941, but only a small portion was completed during that year. The remainder of the county was surveyed in 1943-44.

This report presents the accumulated information obtained from a number of years work. The soil map showing the location and distribution of the different types of soil accompanies the report. It should be emphasized that this is a reconnaissance survey and therefore is on a scale too small to show such detailed variations in soil types as may occur on individual farms. The necessity of mapping such detailed variations is of importance only in areas where an intensive type of farming is practised and may be done wherever necessary in the future.

The report itself presents such data on the rock formations in the county, the drainage, the climate and the native vegetation, as to show their influence upon the kind of soil development that occurs and also what effect these factors have on the types of farming which are being practised. A description of each soil mapped is given together with a discussion of its use for agricultural purposes. Such discussions are necessarily general since it is difficult to obtain basic information relating to crop yields and fertilizer practices that will apply to specific soil types. Recommendations and suggestions are made for crop management on the basis of physical and chemical analysis and information on the behavior of the soil as was gathered during the course of the survey.

A section on soil rating is given in which the soils are classified with regard to their agricultural use and possibilities. In the absence of crop yield information the rating has been made chiefly on the basis of the physical and chemical characteristics of the soil. This tentative rating may be altered as more information particularly from soil fertility experiments which are now being established, has been obtained.

The aim of the survey is to supply basic information about the soil, such as its location, origin, characteristics, present use and suggestions for its future use. Such information is embodied in the report and the soil map and should be of interest not only to the practical farmer but also to the extension man and the research worker. To the information given any one of the workers mentioned could add more, but that which is given should provide a starting point for a more systematic study of the soil.

SOIL SURVEY

of

COLCHESTER COUNTY, NOVA SCOTIA

GENERAL DESCRIPTION OF THE AREA

Location and Extent

Colchester county lies in the north central part of the province of Nova Scotia between 62°45′ and 64°15′ west longitude and 45°00′ and 45°45′ north latitude. It is the fourth largest county in the province having an area of 903,799 acres or approximately 1,412 square miles. Most of the county has land boundaries except at its northern extremity where it is bounded by the Northumberland Strait and the southwestern part which is bounded by the Cobequid Bay, the latter being an inland extension of the Bay of Fundy.

The county occupies a central location in the province and as a result most of the railway lines pass through it as well as the major highway systems. Its greatest distance from north to south is approximately 50 miles and from east to west approximately 68 miles. The adjacent counties are, Pictou on the east, Halifax and Hants on the south, Cumberland on the north and west. All points in the county are readily accessible from Truro, the county seat, which is located at the head of the Cobequid Bay. Many are served by railroad and highway systems.

Geology

The geological formations occurring in Colchester county have been mapped in varying detail by geological surveys. The solid rock formations have been identified as to their geologic period and the nature of the rock material has been described. From the standpoint of the soil, the surface geological deposits are of greatest importance since they constitute the parent materials of soils. The nature of the rock material from which these deposits are derived to a large extent determines the agricultural value of the soil. Very little attention has been given by geologists to the surface geology of the province so that its identification and interpretation has become the duty of the soil surveyor.

Surface Deposits

The surface deposits consist chiefly of glacial till which is a material made up of broken rock fragments ranging in size from the finest clay to immense boulders. In addition to being a mixture of different sized particles it may also consist of a mixture of several different kinds of rocks such as sandstones, shales, conglomerates, etc. The proportions of the various sizes of material which are present depend upon the nature of the rock from which it has been derived. Hard rocks like granite break into large fragments ranging in size from boulders to gravel. The sandstones vary in their degree of coarseness or fineness and consequently may weather down to coarse sand or to fine sand containing large amounts of silt and clay. The complete weathering of shales generally produces clay but since they vary in hardness and their resistance to weathering, many tills derived from

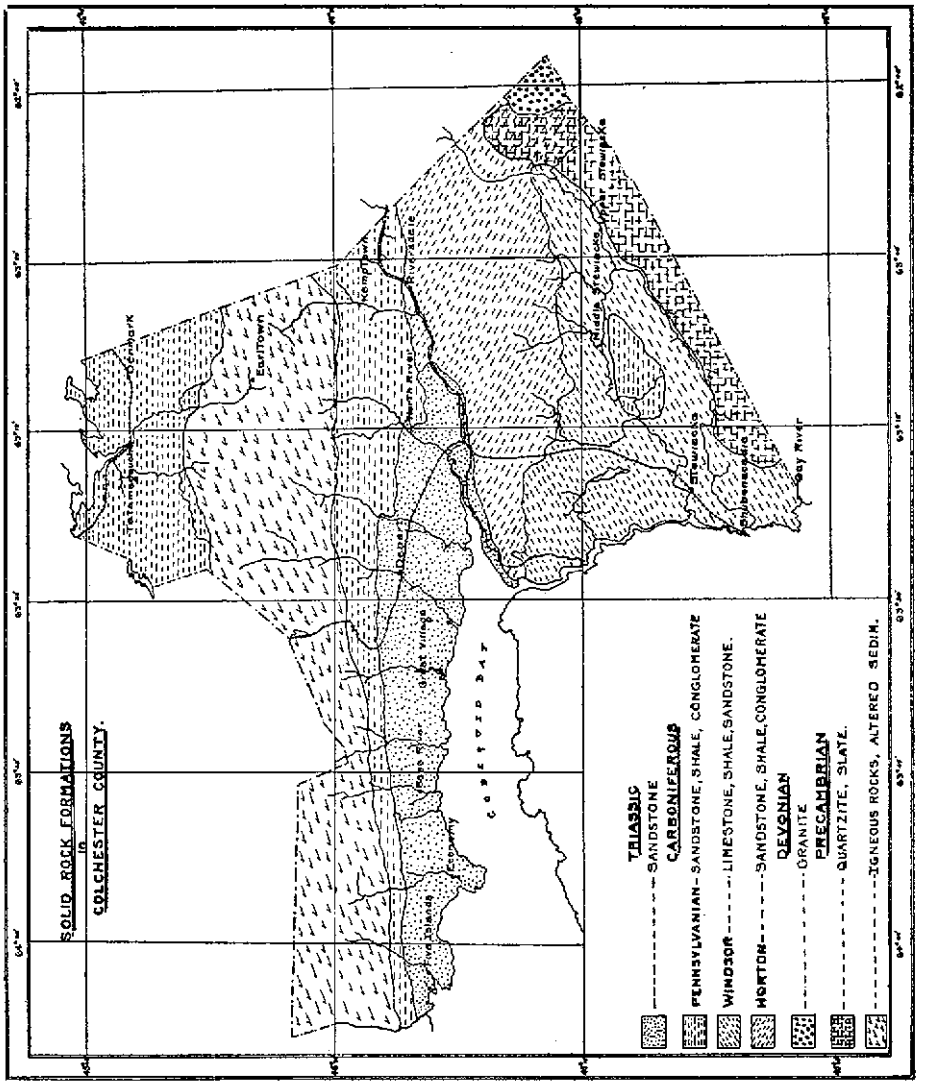


FIGURE 2. Sketch map of Colchester County showing solid rock formations.

them may contain very little clay. Tills derived from conglomerate rocks are invariably gravelly and the amount of silt and clay present varies according to the quantity of these particles that made up the cementing materials of the rock.

In Colchester county mixtures of different kinds of rocks do not occur to so great an extent as might be expected, thus indicating some peculiarities in glaciation which as yet cannot be explained. It may be that further identification of the soil parent materials and their disposition will help to explain this glacial phenomenon. Because the glacial material has not been moved very far from its origin, soil boundaries often coincide with the solid rock boundaries and the soil material possesses therefore many of the characteristics of the underlying rock.

In the development of the soil the age of the different geological formations is not so important as the texture and composition of the rock material. Consequently it may occur that till derived from a Precambrian shale and till derived from a Carboniferous shale may provide parent material for the development of identical soils.

Solid Rock Formations

The solid rock formations that occur in Colchester county are shown in Fig. 2. It will be seen that three principal kinds of rock are represented, namely igneous, sedimentary and metamorphic. The Cobequid Mountains make up the main area of igneous rocks which extend across the northern half of the county from Earltown in the east to Five Islands in the west. These rocks are composed chiefly of syenite, diorite and felsite with granite occurring only occasionally.

Two other small areas of igneous rocks are present in the county, one adjacent to Economy, the other occurring in the southeast corner of the county. The area at Economy is known as Economy Mountain and consists of Triassic trap rock. It is probably an isolated portion of the North Mountain. The area in the southeast corner of the county is identified as Devonian granite. This is a biotite granite, a large part of which has weathered fairly completely giving rise to gravelly soil parent material.

The largest portion of the county has superficial deposits underlain by sedimentary rocks. These rocks belong to two geologic periods namely, Triassic and Carboniferous. The Triassic rocks are soft red sandstones containing some calcareous cementing material. They occur along the Cobequid Bay region and extend continuously from Five Islands to Truro. Although these rocks are classified as sandstones they include some broad variations in texture, ranging from fine conglomerate to shale. These variations in the texture of the rock material will to some extent account for the variations in texture of the glacial till. These rocks are flat lying and in this respect differ from the adjacent Carboniferous rocks which are tilted in varying degrees.

The Carboniferous rocks are separated into two divisions, Upper and Lower Carboniferous, the Upper Carboniferous rocks occurring predominantly in the northern half of the county and the Lower Carboniferous rocks in the southern half of the county. These divisions do not appear to have any significance from a soil development standpoint since various coloured sandstones, shales and conglomerates appear in each group. These rocks underlie the largest area of the county, comprising the entire plains area north of the Cobequid Mountains and the greater part of the area south of the Cobequid Mountains. They consist of grey and brown sansdtones, grey and brown shales, grey and purplish red conglomerates and to a less extent, limestone and gypsum.

The Metamorphic rocks occur in two distinct areas, as isolated localities on the Cobequid Mountains and as a long narrow ridge forming the southern boundary of the county. On the Cobequid Mountains these rocks are classed as altered Paleozoic sediments and consist of grey quartzites and slates. The till overlying these deposits contains so much igneous material that the soils developed from it are indistinguishable from those occurring on the adjacent igneous areas.

The southern ridge known locally as the Gay River ridge, is a section of the Atlantic upland and is joined to it only at its eastern extremity. These rocks are classed as Precambrian and consist of bluish grey slates which are tilted almost to a vertical position. Erosion has smoothed the surface so that the ridge has relatively gentle sloping flanks and a flat top. The colour and composition of the slate appears identical with the Carboniferous slates occurring between Parrsboro and Five Islands.

Landscape Areas

Colchester county contains three fairly well defined landscape areas. These areas may be distinguished in Fig. 2 which shows the solid rock formations in the county. The Cobequid Mountains or that area shown in Fig. 2 as being derived from igneous rocks, extend through the northern half of the county forming a distinctive landscape area with a regular and well defined north and south boundary.

A smaller but also distinct landscape area consists of the slate and shale ridge extending along the southern boundary of the county and known locally as Gay River ridge. Wittenburg and Dean are located in this area which is a portion of what is generally known as the Atlantic upland.

The remainder of the county including all that which is underlain by sedimentary rocks makes up what may be termed a lowland area. It extends from Five Islands in the west to Kemptown in the east and south to Gay River, and also includes the area lying north of the Cobequid Mountains or north of Central New Annan and The Falls. These areas will be referred to as the Cobequid, the Gay River ridge and Lowland landscape areas respectively.

The different topographic features of the county are associated with the areas mentioned. The Lowlands vary from level to rolling whereas the hilly and mountainous topography is generally associated with the Cobequid and Gay River ridge. Local hilly areas do occur within the Lowland such as Penny Mountain adjacent to North River and Economy Mountain adjacent to Five Islands. Other hilly areas occur in association with the numerous rivers flowing into the Cobequid Bay but these are in reality steep erosion channels carved out of an otherwise moderately level plateau. Elevations in the Lowland area range from nearly sea level to 825 feet, the highest altitude occurring along the county boundary in the vicinity of Riversdale.

The Cobequid area although spoken of as a mountain has few of the rugged features generally associated with that name. The general topography varies from rolling to hilly. Where the mountain rises from the Lowlands, the slopes are steep and deeply cut by erosion channels which gives it a mountainous appearance. The highest altitude in the county is 1150 feet with the average for the area being approximately 900 feet.

The Gay River ridge area rises to an altitude of approximately 750 feet and is a characteristic landscape area as a result of its abruptness rather than the height of its elevation. The valley of the Stewiacke River running along its base further accentuates the contrast with the Lowlands. Steep slopes occur along its boundary with the Lowlands whereas the topography of the ridge is characterized by its smoothness and is nearly level to undulating throughout its length.

Climate

The climate of Colchester county corresponds closely to that of other northern counties of the province such as Cumberland and Pictou, which together comprise a climatic region within the Maritime Provinces[1]. This climate is described in general terms as humid and temperate.

The climatic data given in Table (1) show the variations in temperature and precipitation between different locations within the province. They include all

[1]The climate of the Maritime Provinces, D. F. Putman. Can. Geog. Journal, Vol. 21, 1940.

the available data up to 1931. Among the locations shown those at Pictou, Truro and Upper Stewiacke may be said to occur within the same climatic region. The others are more widely dispersed and show some considerable variations.

The temperatures between the locations mentioned tend to show very minor differences. It is generally assumed that the north shore has a somewhat later spring season than that which occurs in the southern parts of Colchester county. A comparison of the temperatures shown at Pictou and Truro fails to justify this assumption. The average temperatures for the months of May and June are slightly higher at Pictou than at either Truro or Upper Stewiacke. The same trend also holds for the remaining months of the year.

The amount of precipitation at the different locations mentioned is more variable than temperature differences. Truro has a yearly precipitation of 11 inches less than Halifax and 4 inches more than Upper Stewiacke. It should perhaps be emphasized that such differences in precipitation are not so significant within the Maritime zone as they would be in other parts of the Dominion. The precipitation during the optimum growing season, May-August inclusive, shows little variation within Colchester county being 12.4 inches at Truro and 12.05 at Upper Stewiacke. Such precipitation is adequate for all growing crops and droughty seasons that do sometimes occur are therefore abnormal.

Within the surveyed area extremes in temperature and precipitation seldom occur. The precipitation during the winter months alternates between snow and rain. The soil is usually frozen at this time so that precipitation is lost as run-off. The spring season is late because of the prevalence of northeasterly winds and frequent precipitation, which often delays seeding operations until June. These factors in combination with heavy textured soils limit those areas to certain kind of crops. The length of the frost free period within the county ranges from 100 to 120 days, being slightly longer at the north shore than it is in the interior. The length of the growing season ranges from 180 to 190 days.

TABLE 1—CLIMATIC DATA

——	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	May-Aug.
					AVERAGE TEMPERATURES (°F)									
Pictou	21	20	29	39	50	59	66	65	58	48	39	27	43	56·6
Truro	19	19	28	38	49	58	64	63	56	46	37	25	42	55·3
Upper Stewiacke	17	17	28	38	48	58	64	63	56	46	34	24	41	54·8
Nappan	17	17	27	38	48	58	63	63	57	48	34	22	41	54·6
Kentville	20	19	29	40	49	59	66	64	57	49	36	24	43	56·0
Halifax	23	23	30	39	49	58	65	65	58	49	39	28	44	55·8
					AVERAGE PRECIPITATION (inches) 10 inches snow = 1 inch rain									
Pictou	4·46	3·44	3·72	3·16	3·04	2·68	2·38	4·35	3·26	4·05	4·12	3·35	42·01	12·45
Truro	4·71	3·67	4·06	2·97	3·01	2·89	2·90	3·67	3·02	4·37	4·39	4·40	44·06	12·47
Upper Stewiacke	3·89	3·56	3·36	3·17	2·32	2·67	3·11	3·95	3·15	4·16	3·68	3·66	40·68	12·05
Nappan	2·15	2·71	2·83	2·93	2·17	3·00	2·96	3·35	2·70	4·00	3·50	3·28	35·58	11·48
Kentville	3·15	3·24	2·75	2·98	2·06	2·65	3·10	2·81	3·02	4·65	3·82	3·86	38·09	10·72
Halifax	5·59	4·52	5·02	4·50	4·17	3·70	3·90	4·53	3·55	5·25	5·40	5·39	55·52	16·30
					AVERAGE SNOWFALL (inches)									
Pictou	19·4	19·6	15·0	8·2	1·2					0·1	3·7	14·0	81·2	1·2
Truro	22·4	22·0	14·4	7·5	0·5					0·4	5·7	16·2	89·1	0·5
Upper Stewiacke	16·6	16·5	10·4	4·4						0·3	4·4	13·6	66·2	
Nappan	9·6	16·6	8·6	7·2	T					T	6·2	10·0	58·2	T
Kentville	15·4	18·2	11·7	4·1	0·5					0·1	6·9	18·5	75·4	0·5
Halifax	20·4	20·2	13·0	5·8	0·6					0·2	3·0	13·9	77·1	0·6

Drainage

In this section discussion of the drainage conditions in the county is confined to external features only. Drainage as it applies to the soil will be discussed in connection with each type of soil and in the section on soil management.

Some of the external drainage features of Colchester county may be seen in Fig. 2. It will be noticed that the position of the landscape areas govern the direction of flow of the many rivers and streams that occur in the county. In the northern half of the county the main rivers rise in the Cobequid Mountains and empty into the Cobequid Bay and Tatamagouche Bay. In this area very few lakes occur so that the precipitation enters a drainage channel without much delay. As a consequence the flow of water in the rivers fluctuates rapidly corresponding to the degree of precipitation. In addition the majority of the rivers are short and have a steep gradient and therefore must carry large volumes of water during times of heavy precipitation.

The Lowland area lying south of Truro and Riversdale is drained by streams flowing into the Stewiacke River. In this area stream gradients are gentle but a sufficient number of streams have developed to give the area a relatively complete drainage system. Swampy areas and small lakes are present only where the topography is level. The Stewiacke River drains a larger area than any other river in the county. During certain seasons therefore it must carry relatively large volumes of water and when precipitation is particularly heavy it overflows its banks flooding considerable portions of the valley land. In general the stream flows slowly and fine sediments have accumulated throughout its length thus giving rise to areas of soil materials that rank among the best in the county.

The Lowland area lying north of the Cobequid Mountains has the least satisfactory drainage system. The French and Tatamagouche rivers provide the main drainage channels but the level nature of the topography has prevented stream development. Consequently the territory is characterized by numerous small swamp and poorly drained areas.

Native Vegetation

The native vegetation within the surveyed area is forest and possesses the same variations in composition that occur in the province in general. The composition of the forest can be divided into three types as follows, pure hardwoods, pure conifers, mixed conifer and hardwood. Pure hardwoods make up seven per cent of the green forest area, pure conifers 20 per cent and mixed conifer and hardwood 73 per cent.[1]

Among the coniferous trees the dominant species are red spruce, white spruce, black spruce, balsam fir, red pine, hemlock and larch. The broad leaved trees consist chiefly of beech, sugar maple, yellow birch, wire birch, paper birch, aspen and alder. Because of the diversity of the topography and soils it is difficult to assign a specific character to the forests but to some extent the distribution of some of the species tend to follow the landscape areas and the drainage condition of the soil.

The Lowland area is characterized by mixed conifer and hardwood and is composed of the species mentioned. In the better drained positions the dominant species are red spruce, white spruce, fir, beech, sugar maple, yellow birch, paper birch and aspen. The poorly drained areas consist chiefly of black spruce, larch, wire birch and alder. Red pine and jack pine are not common but are found on gravelly soils such as the outwash plains in the vicinity of South Branch.

The Cobequid Mountain landscape area consists at present of mixed woods vegetation. The soils in this area however reflect a development characteristically different from that which has taken place on the Lowland areas. The colour of the

[1]Forest conditions of Nova Scotia — B. E. Fernow. 1912.

soil and the greater content of organic-matter accumulation in this area would seem to indicate that they have developed predominantly under hardwood vegetation.

Virgin forest stands do not occur in Colchester county. The entire area consists of cleared and cut over land with large areas of non-cultivated land being devoted to pasture. In such cases natural grass vegetation is thin and when not grazed too heavily the areas revert to forest vegetation with white spruce being the dominant species.

The only areas in the county where forest vegetation has not become established are the marshlands or the marine deposits occurring chiefly at the mouths of the main rivers. These areas support a luxuriant growth of grass which can be divided into two sections on the following basis; areas which are above tide level and areas periodically flooded by tide waters. The marshland occurring above tide level possesses variable drainage conditions as a result of fresh water drainage from the surrounding uplands and contains therefore a variable flora. In general the grasses occurring here will consist of the following, red fescue, couch grass, wild barley, manna grasses, broad leaf grass and certain species of rushes.

The salt marsh areas or those periodically flooded by tides possess a vegetation consisting of salt marsh grass, fox grass, black grass and also certain species of rushes.

The areas above tide level are the only arable portions of the marshland and are usually seeded down to cultivated grasses and clover of which timothy and red clover constitute the main varieties. They become quickly established and persist indefinitely as long as the hay is cut. Abandoned fields however soon revert to their natural grass vegetation.

Agricultural History and Development

The agricultural history and development of Colchester county date back to the middle of the eighteenth century when settlement was begun by the Acadian French. These settlements were concentrated along the shores of the Cobequid Bay and Tatamagouche Bay and had become fairly well established when the expulsion of the French took place in 1755. Subsequent settlement by the English made use of farm clearings which were begun by the French at these points. Settlement then as now consisted of clearing the forests which was a slow and laborious process.

Colchester county is one of the leading agricultural counties of the province, but the trend of development has been similar to that which occurred in the province as a whole. In the province the number of farms and the areas of improved land reached their maximum around 1891 and declined steadily to 1941. The rural population also decreased over the same period but the number of farms suffered a greater decrease than the rural population so that the remaining farms did not lack people to operate them.

Settlement in the rural areas has followed a definite pattern in which farms were started with a small outlay of capital and the prospective settlers worked in the woods or lumber mills during the winter and increased the size of their clearings in the summer until sufficient land was cleared to support them. Fortunately in Colchester county, settlement began on the better soil areas of the county so that there has been a continuity and to some extent an intensification of agriculture in these favourable areas as compared with other areas in the province where soil conditions were not so favourable.

The variety of crops grown is limited by the climate and no great change in crops has taken place over a period of years. The Census of Canada reports the principal crops grown in the province in 1900 as hay, oats, potatoes, wheat, buckwheat and turnips, and in 1940 as hay, potatoes, oats, turnips and barley. Hay has continued to be the principal crop grown amounting to approximately one half the

value of all field crops, but its importance as a cash crop has decreased since 1920 because of diminishing local demand. The recent trend in agriculture is toward greater diversity of crops and an increase in dairying and poultry raising.

This trend in agriculture is accentuated to a large extent in Colchester county. Table (2) gives the distribution of crops and the number of livestock by areas and subdivisions. The areas are divided partly on the basis of related soils and partly on natural landscape areas. Each of the areas varies in size so that they are not strictly comparable on that basis, but the relative concentration of the different crops and livestock are indicated by the subdivisions. Field crops show a fairly even distribution over the county with a tendency for more barley to be grown on the north shore than anywhere else. Barley however, is not grown to any great extent, the number of acres in the county being 1,331 whereas acreage seeded to oats is 10,207. Oats and cultivated hay also show a fairly even distribution over the county. Crops such as potatoes and turnips are produced in the greatest abundance in the Cobequid shore and Truro areas. The figures given in the table show an inadequate crop rotation program in which the Truro area holds but a slight advantage. Thus of the field crops grown in the county cultivated hay makes up 76 per cent of the total, oats 17 per cent while barley, potatoes and turnips each contribute approximately 2 per cent.

The numbers and kinds of livestock produced in the county show a definite concentration in certain areas. The number of milch cows as compared with other kinds of livestock, with the exception of poultry, indicates that dairying ranks first among the agricultural enterprises. Some concentration of milch cows occurs at Tatamagouche where one of the largest creameries of the province is located but its source of milk supply extends greatly beyond the county limits. In this area the dairy product is sold as cream and the buttermilk from the creamery is used by the farmers in raising hogs. The greatest concentration of milch cows is in the Truro and Stewiacke areas. In these areas large quantities of whole milk are produced not only for the Truro market but also for the Halifax and at times the Sydney markets. The relative concentration of hogs in this area is accounted for by the location of the military camp at Debert which has resulted in increased production during the last few years.

The raising of poultry both for meat and eggs is a rapidly growing enterprise. Nearly every farm has a few chickens and a few specialized poultry farms are scattered throughout the county. The census reported 19 poultry farms in 1941 with the number of birds totalling 107,404 and the value of egg production $102,075. The number of poultry increased considerably between 1941 and 1944. The dominant breeds are New Hampshire and Light Sussex from which hybrids are produced in growing numbers. The figures in Table (2) indicate the greatest concentration of poultry in the Truro area but otherwise a fairly even distribution exists over the county.

In the value of forest products Colchester county ranks third in the province. As a farm product its value in 1940 amounted to $271,546, and was exceeded only by field crops and animal products. The forest products consist mostly of logs for lumber, firewood, pulpwood, railway ties and pit props. Few if any tracts of virgin timber remain and the depletion of the forest is continuing rapidly. Because of its importance as a source of farm income the preservation of forest tracts on a sustained-yield basis should be encouraged.

SOIL SURVEY METHODS

Soil surveying consists of the examination, classification and mapping of soils in the field.

In this survey the soils were examined systematically in many locations. Test pits were dug and exposures such as those in road or railroad cuts were studied. Each excavation exposed a series of distinct soil layers or horizons called collectively

TABLE 2—DISTRIBUTION OF CROPS AND NUMBER OF LIVESTOCK BY AREAS AND SUBDIVISIONS (COLCHESTER COUNTY)*

Areas	Subdivisions	Acreage in Crops						Cattle					
		All Field Crops	Barley	Oats	Cult'd Hay	Potatoes	Turnips & Swedes	Horses	Milk Cows	Others	Sheep	Swine	Poultry
		Acres	Acres	Acres	Acres	Acres	Acres	No.	No.	No.	No.	No.	No.
North Shore	Brule	3,322	187	519	2,350	38	51	167	647	194	93	284	3,827
	Tatamagouche	3,864	200	824	2,664	57	62	268	896	273	198	256	4,795
	Waugh's River	2,480	53	435	1,892	40	31	175	542	155	40	101	3,112
	Total	9,666	440	1,778	6,906	135	144	610	2,085	622	331	641	11,734
Cobequid Mt. and Adjacent Areas	Earltown	3,535	118	658	2,605	49	38	186	773	238	348	140	3,873
	Kemptown	691	3	151	501	18	7	45	117	60	58	11	939
	New Annan	2,987	75	663	2,081	49	44	233	774	224	418	261	2,868
	Total	7,213	196	1,472	5,187	116	89	464	1,664	522	824	412	7,680
Cobequid Shore	Economy	1,786	23	242	1,396	34	36	128	454	332	462	142	8,458
	Five Islands	906	3	166	677	47	10	81	205	125	250	32	845
	Lower Londonderry	1,920	63	323	1,421	42	56	154	544	294	266	139	8,679
	Middle Londonderry	3,076	32	529	2,343	95	59	205	625	242		175	4,999
	Upper Londonderry	3,376	49	562	2,527	119	80	239	845	253	73	486	2,867
	Lower Onslow	3,406	116	419	2,657	67	111	240	1,070	353		289	3,112
	Total	14,470	286	2,241	11,021	404	352	1,047	3,743	1,599	1,051	1,263	28,960
Truro Area	Clifton	3,538	36	618	2,415	166	225	197	1,149	234	27	138	15,040
	North River	4,430	71	813	3,258	87	53	293	1,285	400	192	96	3,723
	Salmon River	3,228	51	520	2,410	91	97	236	1,016	299	59	287	11,390
	Total	11,196	158	1,951	8,083	344	375	726	3,450	933	278	521	30,153
Stewiacke Area	Brookfield	3,229	17	512	2,560	58	48	221	1,113	225	67	82	2,533
	Gay's River	2,029	21	270	1,671	35	31	106	714	126	101	69	5,267
	Lower Stewiacke	2,826	38	364	2,299	41	53	189	1,011	249	81	131	4,130
	Middle Stewiacke	2,656	33	504	1,988	54	60	181	798	561	198	140	5,314
	Upper Stewiacke	4,977	114	891	3,767	87	99	332	1,256	595	976	295	8,210
	Total	15,717	223	2,541	12,285	275	291	1,029	4,892	1,756	1,423	717	25,454
Total of All Locations		58,262	1,303	9,983	43,482	1,274	1,251	3,878	15,834	5,432	3,907	3,554	103,981

* Data compiled from Census of Canada, 1940.

the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, was studied in detail; and the colour, structure, porosity, consistency, texture, and content of organic matter, roots, gravel and stone were noted. The drainage both internal and external, and other external features, such as the relief or lay of the land, were taken into consideration, and the interrelation of the soil and vegetation was studied.

Observations of the soil were made by carrying out car or foot traverses along roads, and trails in the county. Borings were made at intervals ranging from quarter of a mile to a mile depending upon the variability of soil. Where the roads were not accessible by car, foot traverses were made throughout the area and location being maintained by pacing and from the details shown on the base map such as streams, trails, lakes, etc. Where soil boundaries occurred they were joined arbitrarily between traverses, the lay of the land often acting as a boundary guide. All areas in the county were investigated in order that the information would be complete.

The base maps used in the survey were supplied by the Department of Mines and Ressources and consisted of maps compiled from aerial photographs. They contained the boundaries of all natural features as lakes and streams as well as the roads and many of the logging trails in the county. Such maps provided excellent control for locations and thus a constant check on pacing. Aerial photographs were used to good advantage in the forest areas for foot traverses along logging trails. The base maps were drawn on the scale of one mile to one inch and for a large part of the area contained contour lines with fifty-foot intervals. Many of the soil boundary lines in the river valleys were found to coincide with the contour lines and consequently they were a convenience in mapping.

In addition to the mapping of the soils, samples were collected from representative profiles for mechanical and chemical analysis. Some of these samples were collected during the course of the survey but the majority were taken near the close of the seasons work. Only virgin profiles were selected and an attempt was made to include every soil association mapped. Locations for sampling were selected to represent as nearly as possible the normal soil within each association.

SOIL CLASSIFICATION

The soils of Colchester county vary greatly from the standpoint of origin as well as in characteristics of texture and drainage. Theses factors are important in that they affect the use which can be made of the soil. The purpose of soil classification is to organize in a brief form such information in order that the soils mapped may be distinguished one from another. Such a scheme involves the grouping of soils which have certain common characteristics. The scheme must show the relationships between the groups from a genetic or from a soil development standpoint and therefore involves a consideration of the soil material as well as the factors responsible for soil formation.

The soils have been classified into Associations, Associates and Classes. The Association is the highest category and includes groups of soils which have developed on the same kind of parent material. Within each Association, the individual soils which have differently developed profiles as a result of the effect of local soil climate, (chief of which is drainage), are named Associates, and may be spoken of as the well drained Associate or the poorly drained Associate, etc. Any one of these Associates may he the dominant soil and is given the Association name. Soils which are similar in all other respects but differ somewhat in texture are separated into textural classes. Several textural classes may occur within each Association but can only be separated in a detail survey. In this report a broad textural separation has been made in the Hebert and Cumberland soil Associations.

The unit of mapping used in the survey was essentially the Association. Wherever possible the Associates were also mapped but because of the small mapping scale and irregularly spaced traverses usually only one Associate was mapped in each Association. This was in all cases the poorly drained Associate.

The following soil key is based on both, the origin and parent material textural grouping of the soils in the county. Twenty-one soil Associations and five miscellaneous soils were identified and mapped, the name for each soil Association being derived from a town or geographical place with which the soil is related.

Soil Key

A_1 Soils developed on glacial till.

B_1 Clay loam to clay parent material.

1. Nappan Association.....Clay loam soils developed on red clay loam to clay till, derived from red and brown shales and sandstones.
2. Queens Association.....Clay loam to clay soils, developed on reddish brown clay loam to clay till, derived from red and brown shales and sanstones.
3. Londonderry Association..Clay loam soils developed on purplish brown clay loam till, derived from shale and fine grained purplish brown sandstone.
4. Diligence Association.....Clay to clay loam soils developed on olive grey clay loam to clay till, derived from grey shales.

B_2 Sandy clay loam parent material.

1. Pugwash Association.....Sandy loam soils developed on reddish brown sandy loam to sandy clay loam till, derived from reddish brown sandstones.

B_3 Sandy loam parent material.

1. Truro Association.....Sandy loam soils developed on red sandy loam till, derived from medium grained red sandstones.

B_4 Shaly sandy loam to shaly loam parent material.

1. Kirkhill Association.....Shaly loam soils developed on greyish brown shaly sandy loam till, derived from grey shales and slates.

B_5 Gravelly sandy loam to gravelly clay loam parent material.

1. Westbrook Association....Gravelly sandy loam soils developed on brown gravelly sandy loam to gravelly clay loam till, derived from purplish red conglomerate.
2. Harmony Association.....Gravelly sandy loam soils developed on dark brown gravelly clay loam till, derived from dark brown sandstone.

B_6 Gravelly sandy loam parent material.

1. Portapique Association....Gravelly sandy loam soils developed on greyish brown gravelly sandy loam till, derived from purplish brown conglomerate.

2. Shulie Association.....Gravelly sandy loam soils developed on light brown gravelly sandy loam till, derived from coarse grey sandstone.
3. Wyvern Association.....Sandy loam soils developed on greyish brown gravelly sandy loam till, derived from granite, syenite, diorite, felsite.
4. Cobequid Association.....Gravelly loam soils developed on brownish grey gravelly sandy loam till, derived from granite, syenite, diorite, felsite.
5. Folly Association.....Gravelly loam soils developed on light brown gravelly sandy loam till, derived from grey sandstone and grey conglomerate.
6. Thom Association.....Gravelly sandy loam soils developped on grey gravelly till, derived from sandstone breccia.
7. Gibraltar Association.....Gravelly sandy loam soils developed on grey gravelly till, derived from granite.

A_2 Soils Developed on Kames, Eskers, Outwash and Fluviatile deposits.

B_1 Gravel and cobblestone parent material.

1. Hebert Association—

Hebert sandy loam—Sandy loam soils developed on sand and gravel.

Hebert gravelly sandy loam—Gravelly sandy loam soils developed on gravel and cobblestone.

A_3 Immature soils developed on Alluvial deposits.

B_1 Clay to silty clay loam parent material.

1. Stewiacke Association.....Relatively uniform deposits of brown silty clay loam and clay.

B_2 Gravel and sand parent materials.

1. Cumberland Association—

Cumberland sandy loam—Poorly sorted and irregularly stratified deposits of sand and gravel.

Cumberland gravelly sandy loam—Poorly sorted and irregularly stratified deposits of gravel and cobblestone.

A_4 Immature soils developed on delta and marine deposits.

B_1 Silty clay loam to clay parent material.

1. Acadia Association.....Silty clay loam and clay deposited chiefly by tidal waters.

A_5 Miscellaneous soils.

1. Muck—Organic soils. Dark brown to black well decomposed organic material 12″ or more in depth.
2. Peat—Organic soils. Brown fibrous non-decomposed organic material 12″ or more in depth.
3. Swamp—Mineral soils continually saturated with water, usually with shallow muck or peat like surface.
4. Salt Marsh—Recent marine deposits, constantly reworked by tides.
5. Eroded slopes—Steep eroded slopes along stream and river channels.

TABLE 3—ACREAGE OCCUPIED BY EACH SOIL ASSOCIATION AND ITS ASSOCIATES

Soil Association	*Total Acres*	*Per cent of Total Area*
Nappan	46,118·4	5·1
Poorly drained Associate	1,510·4	
Queens	140,870·4	15·9
Poorly drained Associate	4,915·2	
Londonderry	13,368·8	1·4
Poorly drained Associate	230·4	
Diligence	21,506·4	2·3
Pugwash	45,747·2	5·0
Poorly drained Associate	889·6	
Truro	66,521·6	7·5
Poorly drained Associate	19,046·4	
Kirkhill	47,289·6	5·2
Westbrook	15,091·2	1·6
Harmony	64,236·8	7·4
Poorly drained Associate	889·6	
Portapique	14,220·8	1·5
Poorly drained Associate	710·4	
Shulic	115,868·0	12·8
Poorly drained Associate	857·6	
Wyvern	15,686·4	1·7
Cobequid	200,454·4	22·5
Folly	16,032·0	1·7
Poorly drained Associate	435·2	
Thom	6,144·0	·6
Gibraltar	3,545·6	·3
Stewiacke	19,283·2	2·1
Poorly drained Associate	5,222·4	
Cumberland (Gravelly phase)	5,945·6	·6
Cumberland (Sandy phase)	5,004·8	·5
Hebert (Cobbly phase)	12,179·2	1·3
Hebert (Gravelly phase)	10,668·8	1·1
Acadia	5,465·6	·6
Muck	128·0	·02
Peat	614·4	·08
Swamp	4,185·4	·4
Salt Marsh	2,150·4	·2
Eroded Land	5,452·8	·5
TOTAL ACREAGE	903,799·8	100·00

SOIL DEVELOPMENT

In order that a clearer understanding of the soils described in this report will be possible, a brief description is given of the type of development that is common to all Nova Scotia soils. The soils of the province have developed certain characteristics as a result of a number of factors, the chief of which are climate, vegetation (including living organisms), parent material and drainage. The following description of a soil profile (which is a vertical cross section of the soil) illustrates the common type of development and is followed by a discussion of the effects produced by the different factors mentioned, in the development of the soil.

A_0	Surface—2″– 4″ thick.	Leaf litter consisting of leaves, evergreen needles, and other partly decomposed organic debris. Acid.
A_2	Surface—2″– 8″ thick.	Grey leached horizon, occurring immediately below the A_0 horizon. Acid.
B_1	Subsoil—6″–10″ thick.	Yellowish brown horizon, usually porous, some form of crumb structure. Acid.
B_2	Subsoil—4″– 8″ thick.	Dark brown horizon, more compact than B_1 but no characteristically defined structure. Weak forms of cube and nut structure. Acid.
C	Parent Material.	Unweathered or slightly weathered material. Usually acid.

All virgin soils possess the characteristics or some modification of the characteristics of the soil profile just described. These are known collectively as podzols and the process of development is called podzolization. In the surveyed area all

the upland soils possess the podzol characteristic but it is usually lacking in alluvial or "interval" soils.

Soil materials consist of two portions which are usually designated as the organic and inorganic portions. In the cultivated soils these portions are always mixed in the surface layer as a result of cultivation. In the uncultivated or virgin areas, there are distinct zones of separation of these two ingredients and as indicated in the profile description given above, the organic layer occurs in greatest concentration at the surface of the soil, while the remainder of the soil is largely inorganic.

This feature is characteristic of soils developed under forest, the dead vegetation accumulating at the surface with no significant amount of organic matter being added to the soil by the decay of tree roots. The surface organic matter is in the form of leaves, evergreen needles and mosses which decompose very slowly and therefore are in a semi-decomposed state. Such organic matter is generally low in essential plant nutrients and although cultivation does speed the decomposition, the total content is usually inadequate for many types of agricultural crops.

In the main all podzol soils owe their acidity and low content of plant nutrients to a process of leaching. This is a process in which the nutrients are carried down from the surface soil by percolating water. The process is both mechanical and chemical and occurs to some extent in all soils regardless of their texture or origin of their parent materials. Some of the leached products from the surface layer are deposited in the subsoil but most of the more soluble compounds are carried through the soil and enter the water of drainage channels. This loss of bases, the most important of which is calcium, leaves a soil that is acid in reaction. The parent materials are also acid indicating that the effect of weathering may extend to a considerable depth.

Among the soils occurring in Colchester county the greatest amount of leaching has taken place in the till soils derived from Carboniferous sandstones. This includes most of the Lowland areas north and south of the Cobequid Mountains. These areas contain soils of various textures, the texture of the till itself ranging from sandy loam to clay. The process of podzolization appears to be equally as well developed on the clay soils as it is on the light textured soils. In the poorly drained areas and depressions the development of the grey leached layer is particularly pronounced and has given rise to the use of the local term "grey clay". This is the poorest portion of the soil and soils having a grey layer with a thickness of six inches or more make exceptionally poor agricultural soils.

The Alluvial or "Interval" areas and the marshlands do not show the podzol development that is characteristic of the upland soils. This is due to the fact that seasonal floods and in the case of the marshlands the continual rise and fall of the tides, have been continually adding fresh material to the surface and thus preventing the normal development to take place. The alluvial soils however are all acid showing that the process of leaching is at work but has not had an opportunity to progress very far. Large areas of the Truro dykelands also are acid to some depth, these areas however include only those beyond the influence of the tidal waters.

From the description given of the type of soil development it will be evident that the use of the soil for agricultural crops will call for remedies of certain deficiencies in the soil that occur under natural conditions. These deficiencies will vary with different types of soil and each soil will call for its own special set of remedies. Although the general process of podzolization is fairly well understood, its effect on different kinds of parent materials under different conditions of local climate requires a considerable amount of study.

The occurrence of purely organic soils such as peat and muck is widespread and they occur both on upland and lowland locations under permanently saturated moisture conditions. In the formation of peat the predominant vegetation is

sphagnum moss which accumulates from season to season and remains in an undecomposed state. Such an accumulation of organic material may reach a depth of several feet, or may be only a few inches in depth overlying the inorganic part of the soil. Peats are invariably strongly acid but never develop a grey leached layer such as is found in mineral soils.

Muck soils are the black organic materials that occur in depressions and may be due partly to silting and partly to the decomposition of accumulated organic matter. They occur less frequently than the peat soils and may be found at any location. They also vary in depth ranging from a few inches to two feet. None of the muck soils develop the characteristics of a podzol being simply black organic matter from the surface to its depth.

DESCRIPTION AND DISCUSSION OF THE SOILS

Soils Developed on Glacial Till

The soils developed on glacial till are the largest, in numbers and in area covered, that occur in Colchester county. They occupy all the area with the exception of the beds of stream and river valleys, local gravel areas and marshland or dykeland areas, and are frequently referred to as "Upland Soils".

As described in the section on geology, till is an unstratified, unconsolidated mixture of clay, silt, sand, gravel and stone and may consist of different kinds of decomposed or semi-decomposed rocks. Because there are so many different varieties of solid rock in the county, the till derived from them has the same complexity. The till ranges in texture from clay to gravelly and stony materials and owes its texture chiefly to the nature of the rock material from which it has been derived. Variations in colour are perhaps the most striking characteristics of the till. The majority of the tills derived from the Triassic and Carboniferous rocks are red, the most brilliant red being associated with the Triassic deposits. The yellow and grey tills are derived from grey sandstones and shales and provide a remarkable contrast with neighbouring red tills. In the soil profile descriptions which follow it may seem that undue emphasis is placed on colour, yet it is one of the characteristics which shows up most prominently in field inspection of the soils and serves as a reliable aid in the separation of parent materials.

The colour of the rock material and therefore the colour of the till can be associated with the agricultural value of the soil in this area. The weathering of red and brown rocks is accomplished more readily and more completely than in the case of the grey rocks and as a consequence the soils developed on till derived from these rocks are more friable and less stony. Fig. 3 which is a generalized map of the surface geological deposits and soil parent materials of the county shows the relationship between the till and the solid rock. The better agricultural districts in the county occur in the plains area north of the Cobequid Mountains, the area bordering the Cobequid Bay and extending from Bass River to Truro, and various areas between Truro, Stewiacke, Shubenacadie and Upper and Middle Stewiacke. All of these areas possess red and brown tills but with a wide range in texture.

In the following soil descriptions the nature of the till is described for each Association in the discussion of the parent material of the soil.

Nappan Association

The Nappan soils are among the most important soils that occur in Colchester county. They are clay loam soils developed in brownish red and red clay till. These are the reddest heavy textured soils that occur in the county, which in the field serves as one of their chief distinguishing characteristic.

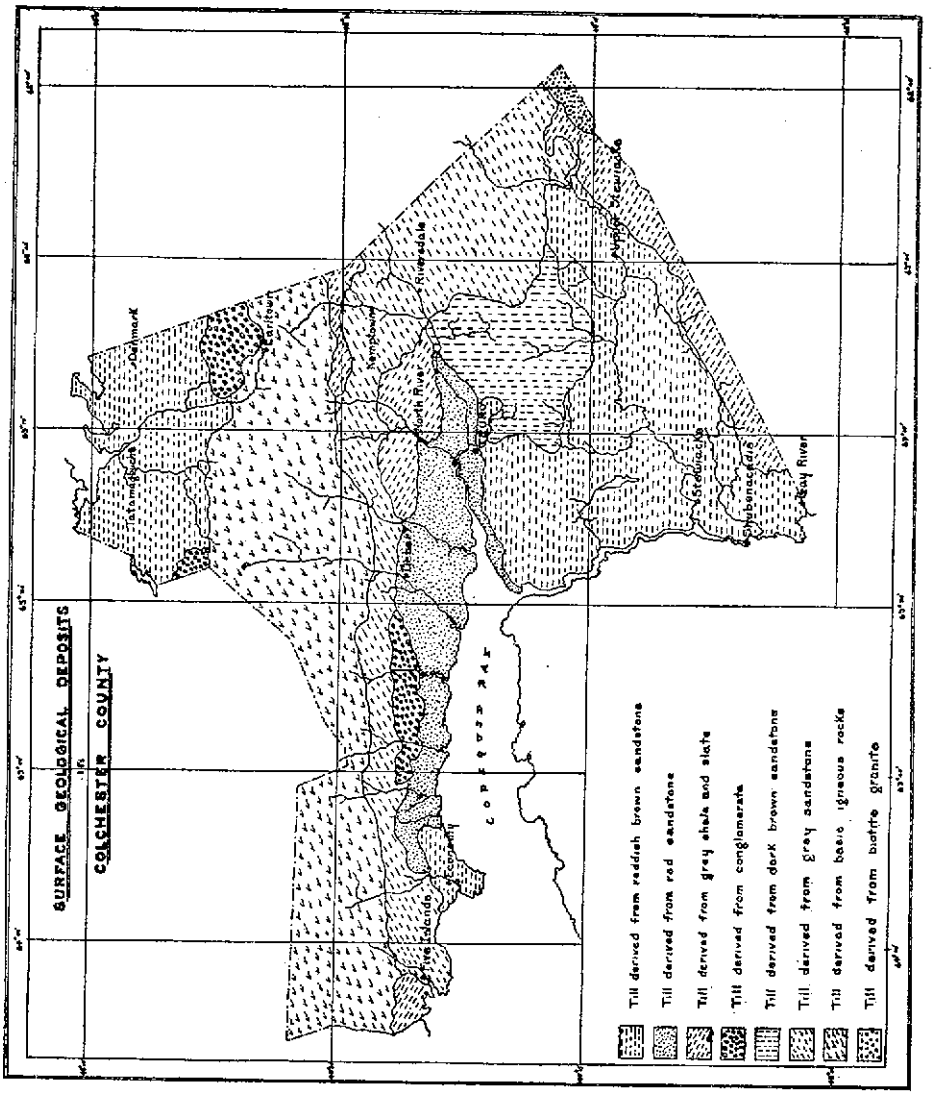


FIGURE 3. Sketch map of Colchester County, showing Surface Geological Deposits.

The area occupied by these soils is 46,118 acres or 5.1 per cent of the county area. They occur at three separate locations within the county; at Upper Economy, at Princeport and as a rather extensive block of land between Mattatal lake and Tatamagouche. These soils have also a wide occurrence within the province being located in Cumberland, Pictou, Hants and possibly in adjacent counties.

The topography of the Nappan soils varies from gently undulating to rolling with the gently undulating topography predominating. External drainage varies with the topography but is usually fair unless many small surface depressions occur to trap the surface run-off. Internal drainage is imperfect and is one of the chief drawbacks of this soil. This condition is relieved somewhat during a part of the summer when the soil dries out but a certain degree of mottling within the profile indicates that such a condition is of short duration. There are few stones to interfere with cultivation.

In the cultivated condition the Nappan soil has a brownish red clay loam surface, with a tendency to cloddy structure if worked when wet. Such a structure is difficult to avoid as the soil has a high water holding capacity causing the clay to run together. Drying and further cultivation however reduces the soil to a friable condition. The surface is nearly always strongly acid. The "B" horizon is a yellowish brown, slightly mottled clay loam having usually a granular to small crumb structure and extending to a depth of 20 inches. This horizon becomes more compact with depth but never sufficiently compact to become impervious to percolating water. Although tree roots extend into this layer those of cultivated crops are scarcely noticeable indicating that they are chiefly confined to the surface layer. This horizon is also acid in reaction.

The parent material which occurs at a depth of 20 to 24 inches below the surface is a brownish red or red clay, stiff and compact with a cheesy consistency. This material contains a large amount of micaceous flakes together with small fragments of micaceous sandstone. The reaction of this material varies considerably but is usually strongly acid. This condition is due partly to weathering but more significantly to the absence of calcareous cementing material in the sandstone from which it is derived.

The poorly drained associate occurs in small depressions and on level areas where surface run-off is slowed up. In a cultivated field these soils show up markedly by their grey or white surface. They indicate the areas in which the depth of the A_2 or grey leached layer extends below plough depth. The occurrence of such areas is widespread but they are usually small and therefore only the largest can be shown on a reconnaissance scale.

The texture of the surface soil varies somewhat and includes such textures as loam, clay loam and clay. The loam texture is the most desirable since it imparts greater friability to the soil than does a clay and this results in an improvement in drainage. Clay loam textures predominate and are used as the soil name for this Association. The following is a description of a representative, uncultivated soil profile:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Black, semi-decomposed organic material—leaf litter; evergreen needles, deciduous leaves, moss; pH 4·5.
A_2	2"– 6"	Ashy grey clay loam; weak platy structure; contains streaks of yellow limonite; sticky when wet; numerous roots; pH 4·3.
B_1	6"–11"	Yellowish brown clay loam; tendency to platy structure but crumbles to granular structure; slightly mottled with limonite; pH 4·6.
B_2	11"–16"	Light brownish red clay; fairly well developed nut structure; firm to compact but pervious; shows glistening effect due to small mica particles; cheesy consistency; pH 4·8.
C	16"+	Brownish red clay till; compact, stiff; slowly permeable; stone and pebbles of sandstone; black carbonaceous material. pH 5·5.

Utilization of Soils

The settlement and utilization of the Nappan soils have been influenced by their location within the county. Some of the soils near the shore in the vicinity of Tatamagouche have probably been cultivated since the beginning of settlement around 1775. However even up to the present time no great tracts of land on which these soils occur are being cultivated. Farms are scattered over the area but the acreage cultivated is small, and is being devoted mainly to hay and pasture.

In the other areas of the county as Upper Economy and Princeport a somewhat better utilization is made of the soil. These latter areas are better favoured with drainage and also probably derive some benefit from being inland. In these areas more of the farm area is under grain and cultivated crops. Since adequate crop rotations are not as a rule practised on these soils it would seem that the adoption of proper rotation practices would greatly add to the improvement of the soil.

The possibility of future expansion on these soils is limited. Natural expansion which has taken place in the past may be taken as a guide and the indications point to a contraction of the cultivated area. The reason is due to certain undesirable characteristics of the soil chief of which is its heavy texture. The heavy texture combined with heavy precipitation produce an imperfectly drained soil. As a consequence the management of the Nappan soils should be first concerned with drainage. On fields with a fairly good slope the use of tile drains would largely solve the problem but such an expenditure on level areas is not to be recommended.

Cultivating these soils when they are still wet produces a hard and cloddy seed-bed that may persist for the remainder of the season. Such a practice has been found to reduce the yields of grain crops by as much as fifty per cent. On the other hand if the soil is cultivated when relatively dry a friable surface soil is developed and subsequent baking of the soil does not occur. In some spring seasons when rain fall continues longer than normal there is a temptation to cultivate the soil before it is dry. In such a case even a further delay in seeding will probably prove advantageous.

The Nappan soils are relatively fertile and in this respect rank first among the clay till soils in the county. For satisfactory crop production they do require additions of lime, fertilizer and manure. Until further information has been obtained it is recommended that the following rates of 2-12-6 fertilizer be applied; for grain 300 to 500 pounds per acre, and for field roots 400 to 600 pounds per acre. For potatoes and garden crops a 4-8-10 fertilizer is recommended and applied at the rate of 1200 to 2000 pounds per acre.

In the management of these soils special emphasis needs to be placed on the necessity of liming and increasing the organic-matter content of the soil. The use of lime should precede or at least accompany the use of fertilizers. Sufficient evidence has been gathered to date to prove that a better use is made of applied fertilizers and a greater return in crop yields results from the use of lime. The limestone should be applied at the rate of two tons per acre to the ploughed soil and harrowed in. The crop rotation should then be shortened to four or five years and a second application of limestone of two tons per acre again he applied to the ploughed land. Subsequent applications of limestone may then be made at intervals of eight to ten years.

The improvement in the organic-matter content is usually accomplished by the use of barnyard manure. Where this is not available the aftergrowth following the third cutting should be allowed to accumulate and ploughed down in the fall. To further maintain the organic-matter content it will probably be necessary to grow a special green manure crop.

These soils are most favourable for the production of grain and hay crops. Because of its heavy texture it is not as satisfactory for field roots or for commercial potato growing.

Queens Association

The soils of the Queens Association rate second in importance among the heavy textured till soils in the county. They are clay to clay loam soils developed

on reddish brown clay till. On the basis of colour alone they are somewhat difficult to distinguish from the Nappan soils, the distinction being that the Nappan soils have a basic red colour whereas that of the Queens soil is brown. The parent material is a tough intractable clay that tends to be hard and impermeable.

The area occupied by these soils is 140,870 acres or 16 per cent of the county area. The occurrence of these soils is widespread. They include practically all the county area lying south of Green Oaks and Brookfield to Gay River and the upland surrounding the Stewiacke valley. In the northern part of the county they occur around Brule and as an isolated area south of Denmark. Their distribution within the province is as widespread as that of any other Association, occurring in Cumberland, Pictou, Hants and possibly other adjacent counties.

The topography of the Queens soils varies from gently undulating to rolling with the smoother type of topography being the predominating feature. Where the rolling topography occurs it is usually in association with stream and river valleys. The Queens soils are imperfectly drained, the least satisfactory drainage being associated with the smooth and level topography. This condition applies both to external and internal drainage since the slopes seldom have a gradient sufficient to provide adequate run-off and the compaction and toughness of the clay prevents free movement of water through the soil. Seepage spots occur on the slopes of the hills and remain well on into the summer. The amount of stone occurring in these soils is variable but as a rule there are not sufficient to interfere seriously with cultivation. The very stony areas that do occur are small.

The cultivated Queens soil is characterized by a brown loam to clay loam surface with a structure that varies with the moisture content. As a rule there is not a great deal of granulation so that the soil puddles readily, a condition that can be observed even in grassland fields. These surface soils are always strongly acid. The "B" horizon is a yellowish brown clay loam, usually strongly mottled with orange and yellow stains. The structure of this horizon varies from fine crumb to weak nutty and its thickness is 9 or 10 inches. This horizon becomes more compact with depth and when dry is hard and almost indurated. Roots of cultivated crops do not penetrate this horizon to any extent being confined chiefly to the surface layer. This horizon is also strongly acid in reaction.

The parent material which occurs at a depth of 16 inches consists of a reddish brown clay till that is almost invariably hard and compact. Being derived from a Carboniferous sandstone it contains a large amount of black carbonaceous material which gives it a characteristic that is useful in identification. This material is usually less acid than the upper part of the profile and is the richest part of the soil with respect to mineral plant nutrients. It is doubtful however if plant roots ever penetrate to a sufficient depth to make use of this supply.

The poorly drained associate occurs on level and depressional areas where water accumulates and remains for the greatest part of the year. When cultivated these areas can be recognized by their grey or white surface. They may occur as small local areas in a cultivated field or may cover some fairly extensive area. Only the larger areas have been mapped in this survey. The surface textures vary from loam and clay loam to clay, the clay loam texture occurring most commonly. A description of a representative uncultivated soil profile is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown organic layer consisting of evergreen needles and sphagnum moss, pH 4·6.
A_2	2"– 7"	Grey and white clay loam. Large platy structure, when dry crushes to powdery mass, slightly mottled with orange and yellow stains, pH 4·6.
B_1	7"–11"	Yellowish brown clay loam, fine platy structure that crushes to fine crumb, firm but not compacted, strongly mottled with orange and yellow stains, pH 4·6.
B_2	11"–16"	Reddish brown clay, large nut-like structure, firm and compacted, moderately impervious, contains some carbonaceous material, pH 4·6.
C	16"+	Reddish brown clay till, stiff and compact, contains fairly large amounts of black carbonaceous material, relatively stone free, pH 5·0.

Utilization of Soils

The widespread occurrence of the Queens soils results in considerable use being made of them for agricultural purposes. Among the areas occurring in the county the soils at Brule have probably been settled and cultivated for the greatest length of time. This area is practically all cleared and represents a fairly prosperous agricultural section. The major crops grown are hay and grain with oats being the principal grain crop. The soils in this area are heavy textured which together with smooth and level topography results in imperfect drainage. As a consequence the soil is not adaptable for any great variety of crops and its present use probably represents the best use that can be made of this soil.

The large area in the southern part of the county is sparsely settled and cultivated. An aerial view of the district would show that the cleared land and cultivated fields occur along the major roads, the slopes and part of the upland adjacent to river valleys, and the areas adjacent to and surrounding towns and villages. The large towns themselves have grown in conjunction with the agricultural expansion of the district surrounding them. In addition the location of some small industries such as creameries, lumber mills or factories in the towns have helped to centralize settlement and to some extent the agricultural settlement has been subsidiary.

The Queens soils occurring in this district are as heavy textured as any to be found in the county. It would appear that unless there is an expansion of the small industries located at various points the expansion of agriculture has reached its maximum. There is a preference among farmers for alluvial soils and where they occur in abundance the use of the upland Queens soil takes place in conjunction with it.

The major problems associated with the management of these soils are the maintenance of adequate drainage and an improvement in fertility. Drainage is perhaps the most difficult to overcome since tile drains are necessary to give satisfactory results. They are costly to install but a farmer short of cash can often materially improve the drainage conditions of his land by constructing shallow ditches in the low parts of the fields with the idea that later when funds are available he can put in more efficient tile drains. It should be realized however that lands which are saturated with stagnant water are "late" in the spring, and winter heaving is more severe than on well drained soil.

The Queens soils possess a fair degree of fertility which makes them suitable for the growing of hay and grain crops. Additions of lime, fertilizers and manure are necessary however for maximum production. These soils are extremely acid and the use of limestone is particularly important. Such applications should not be confined to one or two applications but should be a regular treatment within the rotation. It is recommended that two tons of ground limestone per acre be applied to the ploughed land and harrowed in. The crop rotation should be shortened to four years and a second application of two tons per acre be given to the ploughed land. Subsequent applications may then be lengthened to include an application every eight or ten years. Commercial fertilizers are in general use and for these soils the following fertilizers and rates appear most satisfactory; for grain 300 to 500 pounds per acre of 2-12-6; for field roots 400-600 pounds per acre of 2-12-6; for potatoes and garden crops 1200 to 2000 pounds per acre of 4-8-10.

Some improvement in the organic-matter content of these soils is also essential and can be accomplished to some extent by the use of barnyard manure. Where this is not available some addition should be made in the form of green manure. In the fourth year of the crop rotation the aftergrowth following the hay cut should be allowed to accumulate and be ploughed down in the fall. If such a crop contains legumes there is a greater improvement of the soil than if the crop contains grass alone.

These soils are suitable chiefly for the production of hay and grain crops. Because of their heavy texture and imperfect drainage they are not suitable for commercial potato growing nor for extensive vegetable crops.

Londonderry Association

The Londonderry soils are of no great agricultural importance in the county. They are clay loam to clay soils developed on purplish brown or "chocolate" brown clay till. In texture and constitution they are very similar to the Queens soils but show a marked contrast in the colour of the till. They are in many cases a semi-residual soil and are therefore shallow over bedrock.

The area occupied by these soils is 13,389 acres or 1.4 per cent of the county area. They occur in the county as small localized areas in the vicinity of Economy, Pleasant Hills, Londonderry, Kemptown, Harmony and Hilden. While most of these areas are wooded others are cleared and cultivated, the cultivated areas being those occurring at Economy, Londonderry, Harmony and Hilden.

The soils occur on moderately undulating topography and as a rule possess fair external drainage. Internal drainage varies from imperfect to good although seepage spots are a common occurrence on slopes. This feature indicates that water moves through these soils somewhat more readily than it does through other heavy textured soils in the county. The majority of these soils are characteristically free of stone.

The cultivated surface of the Londonderry soils consists of a greyish brown clay or clay loam. Structure is not well developed so that when wet they are usually puddled. The surface soil is always strongly acid in reaction. The "B" horizon is a light brown clay having a tendency to a weak granular or small nut structure. Some mottling with limonite is present in this layer but is not very marked. As a rule this portion of the soil is friable and permeable. The reaction is strongly acid. The parent material is a purplish brown clay till that is moderately stiff and compact. In the semi-residual soil the parent material consists of clay mixed with large amounts of partly decomposed shale and grading into undecomposed shale rock with depth.

The surface textures of the Londonderry soils consist of clay and clay loams. The silt content is usually high, giving the soil a smooth and even texture. The description of a typical uncultivated soil is as follows:

Horizon	*Depth*	*Description*
A_0	0″– 2″	Partly decomposed organic layer consisting of leaves, moss and evergreen needles, pH 4·6.
A_2	2″– 8″	Pinkish grey loam to clay loam, platy structure, slightly mottled, good root development, pH 4·5.
B_1	8″–13″	Light brown clay, small nutty to granular structure, firm, cohesive, some root development, pH 4·6.
B_2	13″–17″	Purplish brown clay, coarse nutty structure, compact but pervious, contains some shale fragments, pH 4·8.
C	17″+	Purplish brown clay till, compact, contains angular shale fragments, pH 4·8.

Utilization of Soils

The location of the Londonderry soils has probably more than any other factor influenced the use which has been made of them. The area at Economy is adjacent to the highway which from the early times of settlement has been the main road in that district. Since some good alluvial soils occur in this area these upland soils are not cultivated to any great extent. At the present time they are used chiefly for pasture which generally is of poor quality and is often reverting to white spruce. As stated previously these soils are shallow over bedrock, possess heavy

textures and imperfect drainage. Their reversion to forest vegetation should probably be encouraged.

In the vicinity of the town of Londonderry some cultivation of these soils is being carried on. The texture of these surface soils are also heavy, drainage is imperfect and considerable stone may be present. This area however is surrounded by soils which are less suitable for agricultural use. A contraction in the cultivated land is now taking place.

The best areas of these soils occur in the vicinity of Harmony and Hilden where considerable acreages are cleared and cultivated. Because of their proximity to Truro their settlement probably dates back some considerable time. Mixed types of farming are practised in which the principal crops grown are hay and grain. These soils are not suited to the growing of field roots nor for commercial potato production.

The management of these soils presents the same problems that are associated with Queens and Nappan soils. Attention needs to be paid to the improvement of drainage and to increasing fertility.

Diligence Association

The Diligence soils are perhaps the least suitable for agricultural purposes of the heavy textured soils that occur in the county. The surface texture is clay and the soil is developed on a grey till. The yellow coloured profile and grey coloured parent material are a characteristic feature and provide a striking contrast with neighbouring red till soils. They are semi-residual soils with shale fragments occurring in the profile and blending gradually into undecomposed shale at an average depth of two feet.

These soils occupy an area of 21,506 acres or 2.3 per cent of the county area. In the western part of the province they occur as small isolated sections which have no agricultural significance. A relatively large area of these soils occurs north of Truro extending in a belt from Manganese Mines to north of Belmont. This is the largest single area that occurs in the northern part of the province. Outside of Colchester county their distribution does not appear to be very great. They occur to some extent in Cumberland county and may be present in other adjacent counties.

The topography of the Diligence soils is gently to moderately undulating but with steep slopes adjacent to river valleys. Drainage varies to some extent with the slope of the land but in general the gradient is not sufficient to provide adequate run-off. Consequently both external and internal drainage is imperfect. Stones are not present to any great extent except near the boundary with the Shulie soils where there may be sufficient to interfere with cultivation.

The cultivated surface of the Diligence soils is a mottled greyish brown clay or clay loam that is sticky and puddled when wet. In the dry state some weak granular structure is developed but is difficult to maintain. This horizon is invariably strongly acid. The "B" horizon consists of a yellowish grey clay that possesses a blocky structure which breaks and crumbles readily when dry. This horizon is mottled with orange and yellow stains, is cohesive and relatively impervious and is strongly acid.

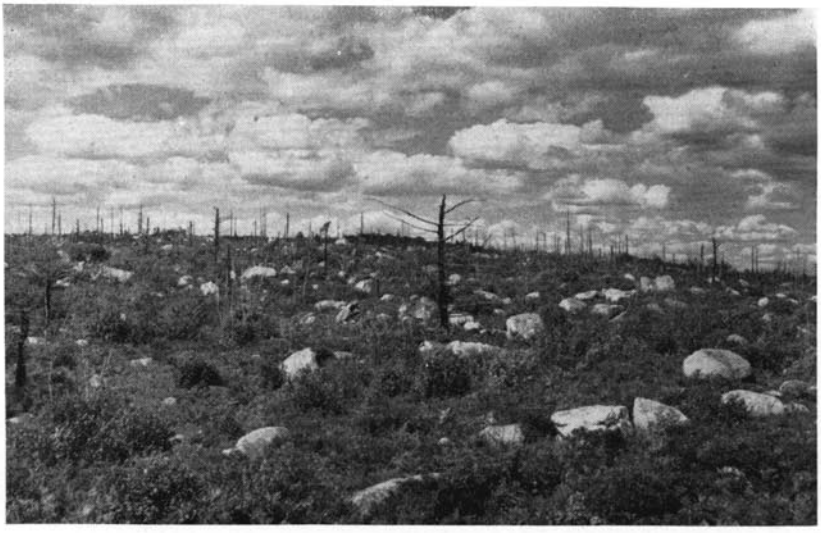
The parent material consists of olive grey clay till derived from soft grey shales. On weathering this material becomes strongly mottled and this is partly responsible for the mottled colours found in the soil profile.

The poorly drained Associate occurs in small areas and if mapped out would give an intricate pattern to the soil map. In these soils the grey leached layer is more deeply developed than in the imperfectly drained soil and a glei-like layer is present in the subsoil.

PLATE I

Upper: Landscape of the Portapique Association. Gently rolling topography.
Lower: Landscape of the Truro Association. Level to gently undulating topography.

PLATE II



Granite boulders and fire barrens occurring on Gibraltar Association.

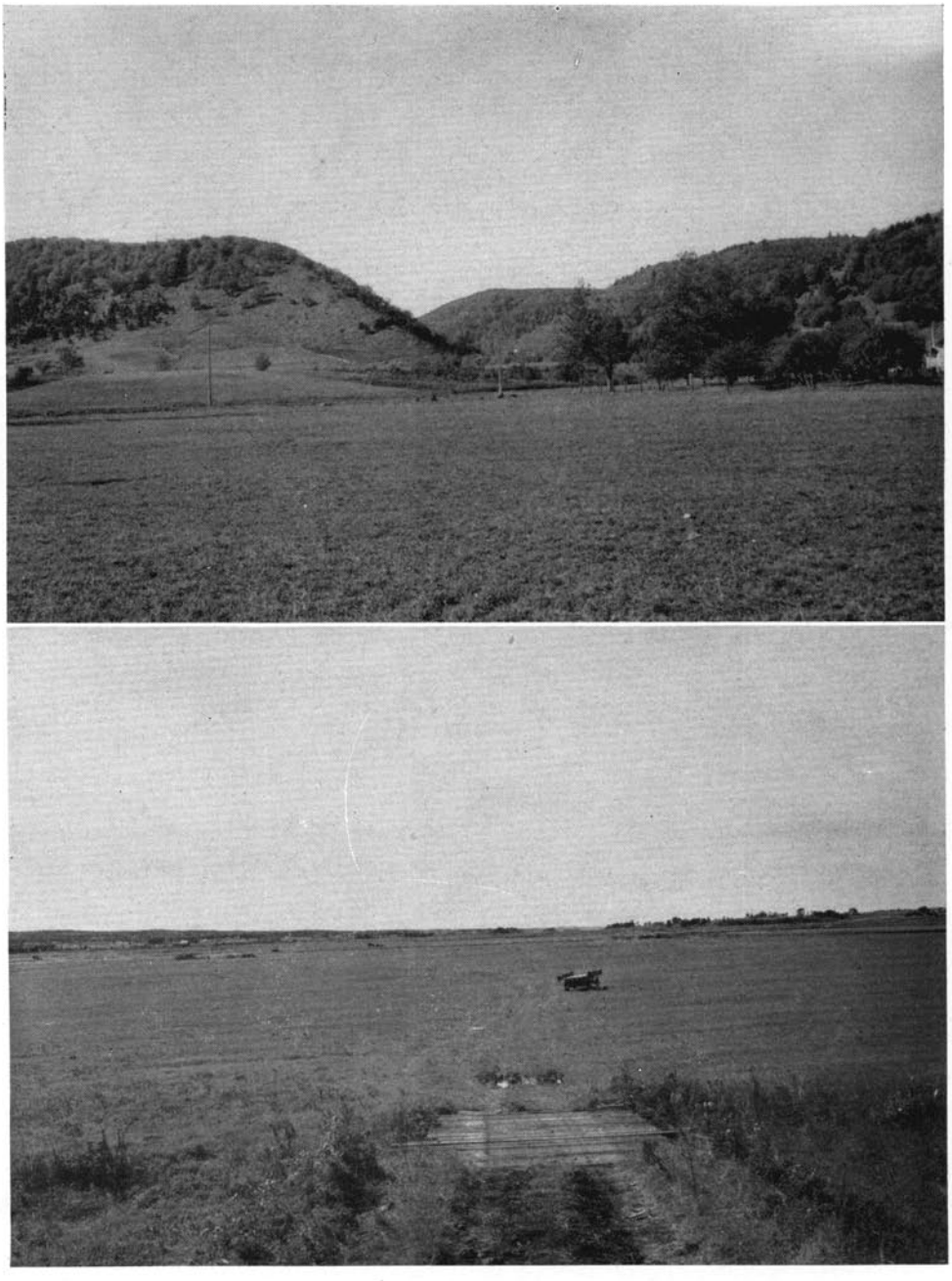
Grey sandstone. Rock material from which Shulie soils are developed.

Plate III

Black spruce and tamarack swamp. These areas occur in upland depressions and possess a sparse and stunted vegetation.

Tatamagouche Creamery. Dairying is the major farm enterprise in the northern part of the county and the product is sold as cream to this modern plant.

PLATE IV



Upper: Cobequid Mountain landscape. Hilly to mountainous topography.
Lower: Truro dykeland. These areas of heavy textured soils are highly fertile and produce excellent crops of hay.

Surface textures do not vary greatly in these soils, being either clay loam or clay. A description of an uncultivated Diligence clay loam is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Moss and leaf mat, merges gradually with the lower horizon, pH 4·0.
A_2	2"– 4"	Light yellowish brown clay, weak platy structure, mottled with yellow and orange stains, cohesive, pH 4·0.
B_1	4"– 9"	Yellowish brown clay, mottled, tendency to blocky structure, cohesive, relatively impervious, pH 4·2.
B_2	9"–15"	Olive grey brown clay; massive and impervious, highly mottled, contains grey shale fragments, pH 4·2.
C	15"+	Olive grey clay till, compact, impervious, contains grey shale in varying quantity.

Utilization of Soils

Most of the Diligence soils have at some time been cleared and although not always cultivated they have been used for pasture. At the present time most of these areas are reverting to forest vegetation. The condition of the cultivated land is poor and it is doubtful whether much can be done to improve the condition of this soil. The largest areas of cultivated land occur in the vicinity of Manganese Mines, Upper Brookside, East Mountain and north of Onslow Mountain. Of the total area the most favourable soil occurs around Upper Brookside and East Mountain. The soil in this area is being cultivated to some extent, the crops grown being hay and grain. At the present time any further expansion on these soils is not advisable.

The chief problems connected with these soils are that of drainage and fertility. The condition of drainage will be difficult to improve because of the impermeability of the subsoil and parent material. These soils also have a characteristically low natural fertility. For the production of agricultural crops the liberal use of limestone, manures and commercial fertilizers will be necessary. They are suitable only for the production of hay and grain crops and where the land is reverting to forest this process should be allowed to continue.

Pugwash Association

The soils of the Pugwash Association occupy an important place in the agriculture of the county. They are medium textured soils consisting of sandy loam, loam and clay loam soils developed on reddish brown sandy loam and sandy clay loam till. These soils occur in association with Queens and Nappan soils and may possess the colour characteristics of either one. They differ from these soils in having a lighter texture and in having good drainage.

The Pugwash soils occupy an area of 45,747 acres or 5.0 per cent of the area. They are located chiefly along the north shore in the vicinity of Bayhead, Central New Annan, Balmoral Mills and Denmark. Two or more small areas occur west of Brookfield in the vicinity of Pleasant Valley. Their distribution within the province is as widespread as any other Association. They occur in Cumberland and Pictou and probably adjacent counties. The topography is moderately undulating, many of the undulations being in the form of short narrow ridges that lie fairly close together. The drainage conditions are good in most cases, the only exceptions being where the topography is level. Small streams have developed between the ridges and provide a network of drainage channels. It is this feature of the topography that detracts from its value as agricultural land.

Stone is nearly always present and occurs in variable quantity. The ridges contain the greatest amounts but the stones are usually small and therefore laborious to remove from cultivated fields. On the whole, stone content in these soils is not a serious factor and to some extent may be advantageous, in giving porosity to the soil.

In a cultivated condition these soils are characterized by a light brown sandy loam surface, a friable consistency and a granular or crumb-like structure. The "B" horizon consists of a reddish brown loam or sandy loam that possesses a crumb or granular structure. When dry this horizon is somewhat hard and brittle and contains variable amounts of gravel and sandstone fragments. The parent material is a reddish brown clay loam to sandy clay loam till which in the dry condition is characteristically hard and indurated. It also contains a considerable number of sandstone fragments.

The Pugwash poorly drained Associate occurs on level topography and in the numerous depressions that occur with an undulating topography. The profiles of these soils are strongly mottled and possess a glei horizon in the subsoil, that is hard and indurated when dry but which softens up when wet.

In a more detailed survey a number of textural variations could be separated out in this Association. The following surface textures will be found to occur, sandy loam, loam, sandy clay loam and in extreme cases, clay loam. The textures within the profile are also variable having approximately the same range as the surface textures. A detailed description of an uncultivated Pugwash soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown organic layer consisting of spruce needles and sphagnum moss, partially decomposed, pH 3·7.
A_2	2"– 8"	Light brownish grey loam, platy structure, fairly loose and porous, good root development, pH 4·5.
B_1	8"–11"	Greyish brown sandy loam, coarse platy structure, firm but brittle, moderately compact and slightly indurated, pH 5·0.
B_2	11"–17"	Light reddish brown loam, hard, brittle, very firm when dry, no definite structure, contains sandstone fragments, pH 5·1.
C	17"+	Reddish brown sandy clay loam till, hard and compacted when dry, contains sandstone fragments.

Utilization of Soils

The Pugwash soils located along the north shore and in the vicinity of Tatamagouche have been cleared and cultivated since the earliest days of settlement. At the present time there is a greater concentration of settlement on this soil than on any other soil in the district and the cultivated areas are probably expanding. The best agricultural section lies east of the Tatamagouche River and it is here that the majority of the farms are located.

A mixed type of farming is practised with the principal crops grown being hay, barley and oats. Dairying forms a large part of the farm enterprise but poultry and hogs are raised in increasing quantities.

These are probably the most productive soils in the area and require less caution and less expense in handling than adjacent clay soils. The first object of soil management should be the shortening of crop rotations. This will permit more frequent applications of limestone and fertilizers, thus improving the soil as well as giving better hay crops and better pastures. In the present long rotation program, pasture herbage is thin and weedy showing the deteriorated condition of the soil. The more frequent use of limestone would seem to be essential in maintaining the permanent productivity of the soil. The application of limestone should be made after the land has been ploughed at the rate of two tons per acre and harrowed in. A second and equal application may then be made in the second round of the rotation and subsequent applications may be spaced at intervals of eight or ten years.

Where available, barnyard manure is to be preferred to commercial fertilizers but on the majority of farms some fertilizer will have to be purchased. For the present it is recommended that an application of 300 to 500 pounds per acre of

2-12-6 fertilizer be applied for grain; 400 to 600 pounds per acre for field roots, and for potato and garden crops 1200 to 2000 pounds per acre of a 4-8-10 fertilizer.

Although these soils are used at the present time for the production of hay and grain crops, the lighter textures should be well suited for potato production or market gardens. Some diversification is possible with these soils.

Truro Association

The Truro Association is one of the most important agricultural upland soils in the county. It is light textured and consists of sandy loam soil developed on red sandy loam till. The red colour of the parent material is a noticeable characteristic and has an intensity that is not found in any other soil in the county.

These soils occupy an area of 66,522 acres or 7.5 per cent of the county area. They occur as a narrow belt bordering Cobequid Bay and extend inland to a distance of not more than six miles. The largest area occurs on the north side of the Bay and extends from Manganese Mines in the east to Economy River in the west. The distribution of these soils within the province is limited as the till is derived from red Triassic sandstone which is confined to the Cobequid Bay region. The soils of this Association have been established only in Colchester county.

The topography varies from level to rolling. Most of the area is level to gently undulating while the rolling topography is associated with the many stream and river channels. The drainage of these soils is governed by the topography. Although the normal soil is well drained there are many poorly drained areas. These latter soils are found on level or nearly level land and under forest vegetation have resulted in the formation of bog-like soils. Clearing and cultivation result in an improvement in the surface drainage and in time the soil takes on the appearance of a well drained condition.

The cultivated surface of the well drained Truro soil consists of a light brown sandy loam to loam which is friable and porous and is therefore easy to cultivate. The "B" horizon is an orange brown or orange red sandy loam that becomes redder with depth. This horizon has some cohesive properties but is always porous and contains no evidence of mottling or restricted drainage. The parent material is a bright red sandy loam till that is fairly firm but not indurated. There is a uniformity of texture and consistency throughout the profile that is somewhat similar to water-laid deposits. As a rule very little foreign rock material is mixed with the till.

The poorly drained Associate occupies a fairly large area. Under forest vegetation it is almost permanently saturated with water due to its flat topography and few well defined drainage channels. The profile possesses a thick leached horizon with a textural range from loamy sand to sandy loam. An iron pan layer is usually present at a depth of 12 inches which is soft when wet but becomes cemented when the soil dries out.

A description of an uncultivated Truro soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown organic layer consisting of pine and spruce needles and sphagnum moss, pH 4·2.
A_2	2"– 4"	Light ashy grey sandy loam, tendency to platy structure, friable, porous, pH 4·6.
B_1	4"–12"	Orange brown sandy loam, pulverulent structure, soft, slight cohesion, good root distribution, pH 4·6.
B_2	12"–18"	Brownish red sandy clay loam, coarse crumb structure, firm, moderately cohesive, pH 5·0.
C	18"+	Bright red sandy loam till, moderately hard and firm but not indurated, pH 4·6.

Utilization of Soils

The soils of the Truro Association occupy an area which witnessed some of the first settlements in the province. Some land in the vicinity of Masstown,

Onslow, Truro, and Clifton has been cultivated since 1755. The type of agriculture that is practised in these areas at the present time is the most intensive that is found on this soil type. Practically all the land directly adjacent to the shore is cleared and cultivated but half a mile inland much of the forest still remains. Much of this forest area is poorly drained but the continued utilization of the well drained land for woodlots is difficult to explain.

A more intensive type of agriculture is practised on these soils than on any other upland soil in the county. Their friable, open textures make them suitable for market gardening, commercial potato growing and the growing of small fruits such as strawberries. The principal field crops grown are timothy hay, clover and the cereal grains, oats, and barley. Large quantities of hay are also obtained from the adjacent dykelands which help to support the large population and the concentrated dairy industry. The purchase of mill feeds is a common practice which tends to reduce diversification in the farm crop program.

The condition of the cultivated land is on the whole better than can be found on any other soil type in the county. Such methods as the use of legumes, manures and fertilizers have improved the condition of the soil and increased its productivity. These soils are very acid however and more attention needs to be given to remedying this condition. Where potatoes are grown commercially the limestone application should follow the potato crop to avoid the incidence of scab.

It is improbable that any further expansion of cultivated land will take place on these soils There are still areas of potentially good agricultural land which are accessible but are covered with forest. Where suitable virgin land is being considered for future agricultural settlement these soils probably rank first in the county.

Kirkhill Association

The Kirkhill soil Association is of little agricultural value and yet it covers a considerable area of land. These soils are light textured, consisting of shaly loam soils developed on shaly loam till. The bluish grey colour of the shale gives the entire profile a characteristically grey colour but with the different horizon colours well developed.

These soils occupy an area of 47,290 acres or 5.2 per cent of the county area. A small section occurs in the vicinity of Lower Five Islands which is part of a large area of these soils occuring in Cumberland county. The principal location of these soils is along the southern boundary of the county where they constitute the Gay River ridge. They extend continuously from Gay River to the Pictou county boundary. These soils are widespread within the province occurring in a number of other counties.

The topography of these soils is extremely variable ranging from gently undulating areas on the crest of the ridge to hilly topography on the flanks of the ridge. The soil is well drained both externally and internally. Stones are plentiful, while shale and slate fragments make up a large percentage of the soil constituents. Rock outcrops occur frequently.

In a cultivated condition the surface soil consists of a brownish grey shaly loam that is relatively high in organic-matter content and possesses a mass of small slate fragments. The "B" horizon consists of an orange brown shaly loam that is loose, friable and porous and contains a large percentage of shale fragments. The parent material is a dark bluish grey shaly till. It is firm but crumbles readily to a shale-like mass. The depth of the profile is entirely dependent on the depth of the till overlying the bedrock. This is variable but in the majority of cases is not more than 20 inches.

A detailed description of an uncultivated Kirkhill soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown organic layer consisting of fir, spruce and moss debris, pH 4·6.
A_2	2"– 4"	Light grey shaly loam, no definite structure, soft, loose, slaty, good root development, pH 4·5.
B_1	4"–10"	Orange brown shaly loam, no definite structure, loose, porous, slaty, good root development, pH 4·6.
B_2	10"–19"	Bluish grey shaly loam, firm and slightly compact, porous, slaty, pH 4·8.
C	19"+	Bluish grey shaly till, hard and moderately compact, permeable.

Utilization of Soils

On the Gay River ridge large areas of land have been cleared and cultivated. The indications are that at some time the area was rather extensively settled. At the present time scarcely any settlers remain but the cleared areas are still being used as grazing land. The remainder of the area is covered with forest vegetation.

In the virgin state these soils are probably highly productive but they will not withstand continuous cultivation. The wholesale abandonment of the area attests the poor staying power of the soil. They are however excellent timber soils and some good timber stands still exist. Every effort should be made to aid reforestation. This area is part of the watershed of the Stewiacke River and consequently reforestation is one of the answers to the flooding problem in the Stewiacke valley.

The continued use of the cleared areas for grazing purposes is of doubtful value. Successful permanent pastures require fertilization and this soil does not justify such an expenditure. The pasture vegetation at the present time is thin and weedy and would probably need reseeding if good permanent grasses are to be established. This area should be maintained for woodlots which can in the future help to supplement the farmers' income.

Westbrook Association

The soils of the Westbrook Association occur on the northern slopes of the Cobequid Mountains. They consist of sandy loam soils developed on gravelly sandy loam to gravelly clay loam till. The till material is derived from a purplish brown conglomerate rock which gives the entire soil its gravelly characteristic.

These soils occupy an area of 15,091 acres or 1.6 per cent of the county area. They occur in two separate sections, one bordering Cumberland county, the other bordering Pictou county. The latter area is fairly large and includes the areas around North Earltown, East Earltown and land adjacent to Balmoral Mills. Their occurrence is more extensive in the adjacent counties of Cumberland and Pictou and there the cultivated acreages are considerably greater.

The topography of the Westbrook soils varies from moderately undulating to hilly. This feature combined with the gravelly nature of the soil results in good to excessive drainage conditions. Small stones are usually present but not in amounts sufficient to prevent cultivation. Outcrops of the conglomerate rock occur frequently indicating that the till deposit is shallow.

The cultivated surface soil consists of a gravelly sandy loam that is loose, porous and contains a relatively high content of organic matter. The "B" horizon is a brown gravelly sandy loam, loose and porous and possesses a characteristic crumb structure. Root development is usually good in this layer. The parent material is somewhat variable in texture and consistency. In general it consists of a purplish brown gravelly sandy loam that is hard and compact but not impervious. In the virgin condition the organic-matter content of these soils is high

and often carries down well into the profile. A description of an uncultivated soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 4"	Dark brown organic layer consisting of evergreen needles and sphagnum moss, pH 4·0.
A_2	4"– 7"	Purplish grey sandy loam, weak platy structure, soft, loose, porous, pH 4·2.
B_1	7"–12"	Orange brown gravelly sandy loam, coarse crumb structure, soft, moderately loose, porous, pH 4·4.
B_2	12"–20"	Brown gravelly sandy loam, no definite structure, moderately cohesive but breaks readily to a gravelly mass, pH 5·2.
C	20" +	Purplish brown gravelly sandy loam till, compact, hard but not impervious, pH 5·0.

Utilization of Soils

The area in which the Westbrook soils occur has been settled for a considerable length of time. Trails and some good secondary roads occur in abundance and farm clearings are scattered over the entire area. Farming has been carried on rather extensively on this soil and in the past it has probably been one of the major agricultural soils in this as well as other counties in the province. It is not a soil that will stand up to continuous cultivation and as a result farm abandonment is rapidly taking place. At the present time many clearings still exist and are being used as pasture.

The natural pasture is fairly good and some regeneration of the soil is taking place in this way. Where grazing is light the areas are reverting to white spruce and other forest vegetation.

Although these soils possess the features of good drainage and a fair natural content of organic matter, they are not good agricultural soils. They are droughty in some seasons and fertility is difficult to maintain because of their gravelly nature.

Harmony Association

The soils of the Harmony Association make up the major portion of the forest area lying east and south of Truro. They are gravelly and stony and consist of gravelly sandy loam soils developed on dark brown gravelly clay loam till. The colour of the till is similar to that of the Londonderry soils but is derived from a coarse textured dark brown sandstone.

These soils cover an area of 64,237 acres of 7.4 per cent of the county area. They occur as a large block of land between Greenfield, Camden and Smithfield and as two small sections, one southwest of Truro, the other north of Kemptown. These soils appear to have a limited distribution within the province and up to the present have been identified only in Colchester county.

The topography of the Harmony soils is moderately to roughly undulating. The area is badly cut up and as a result possesses a comprehensive network of stream and river channels. The soils are well drained both externally and internally except on flat or depressional areas. As a rule the stream channels are narrow and the water flows rapidly so that few alluvial deposits are formed.

The stone content of these soils is usually so great as to make them unsuitable as agricultural soils. The stone occurs not only at the surface but is distributed through the soil mass and thus makes clearing of the land practically impossible.

In the cultivated condition these soils possess a brown gravelly sandy loam surface that is friable and porous. It is low in organic matter and strongly acid. The subsoil consists of a light brown gravelly sandy clay loam, the gravel made up of angular particles of brown sandstone. The parent material which is a dark brown gravelly clay loam till is somewhat compacted but not sufficient to prevent free

percolation of water. In contrast with many other till deposits in the county, the till from which these soils are developed appears to be relatively deep. Although boulders and stones are plentiful there are few outcrops of solid rock.

The poorly drained Associate occurs only in depressional areas and is never very large in any one place. It possesses a deep leached A_2 horizon and a mottled profile but glei-like horizons do not seem to develop in this soil.

A detailed description of an uncultivated or virgin soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown organic layer consisting of semi-decomposed forest debris, pH 4·6.
A_2	2"– 6"	Light purplish brown gravelly sandy loam, coarse platy structure, slightly cohesive, porous, pH 4·4.
B_1	6"–14"	Brown gravelly sandy clay loam, crumb structure, slightly compacted, porous, pH 4·5.
B_2	14"–21"	Dark brown gravelly sandy loam, crumb-like structure, compact, pH 4·6.
C	21"+	Dark brown gravelly clay loam till, moderately compact, porous, contains some large sandstone fragments, pH 4·6.

Utilization of Soils

The area in which the Harmony soils occur has had a more concentrated settlement than exists at the present time. Evidence of old clearings still exists but most of the abandoned land has reverted to forest vegetation. The return of forest vegetation takes place fairly rapidly, the growth consisting chiefly of white spruce. The present farming areas are located around Greenfield and Camden with a few scattered farms northeast of Brookfield. Most of the cleared land is adjacent to the roads and on each farm the cultivated acreage is small.

These soils are continuously being abandoned as the income from forest products decreases. As agricultural soils their chief drawbacks are excessive stoniness and rough topography. In favourable areas where the stone can be removed profitably they are productive soils. Such areas are isolated, small in extent and hardly justify separating out for agricultural land. The cultivated land around Camden is an example of one of these better soil areas.

Most of the land is in forest vegetation consisting of mixed hardwoods and conifers. Lumbering operations are being carried on extensively in this region and some good stands of timber still remain. In some sections forest fires have destroyed large tracts of timber but such areas do not remain barren for any length of time.

The use of the Harmony soils for any other purpose than forestry is doubtful. The natural abandonment of the cultivated land attests to its unsuitability as an agricultural soil.

Portapique Association

The Portapique Association consists of light textured soils developed on gravelly sandy loam till. The till is derived from an arkosic conglomerate rock which accounts for the gravelly nature of the soil. In many respects these soils resemble the Westbrook soils which are also derived from conglomerate rocks, the distinction being that the Portapique soils have a gravelly sandy loam texture throughout the profile whereas the texture of the Westbrook soils are usually heavier. This light texture has resulted in the development of a light coloured well drained soil. Many of the soil areas in this Association are residual but yet have deeply developed profiles as the conglomerate rock decomposes fairly readily.

These soils occupy an area of 14,221 acres or 1.5 per cent of the county area. They occur as small isolated blocks of land extending from Lower Economy to Londonderry Station. The largest single area lies north of Great Village, and this area also possesses the greatest number of farms.

The topography of the Portapique soils is gently to moderately undulating, a type of topography which is most satisfactory from the standpoint of drainage and ease of cultivation. The soils are well drained both internally and externally and few poorly drained soils can be found. They are practically free of stone except near their boundary with the Shulie soils where considerable grey sandstone boulders occur at the surface.

The cultivated surface of these soils consists of a brown gravelly sandy loam that is loose and porous. Where surface erosion takes place the gravel content is correspondingly increased. The "B" horizon consists of a yellowish brown gravelly sandy loam, possesses a weak crumb structure and is loose and porous. The parent material is a greyish brown gravelly sandy loam till that is high in gravel content.

The textures of the surface soils are fairly consistent, the range being from gravelly sandy loam to gravelly loam. A description of an uncultivated soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 1"	Organic layer, brown to black in colour, coniferous tree and sphagnum moss debris, pH 3·9.
A_2	1"– 4"	Light greyish brown gravelly sandy loam, weak crumb structure, soft and loose, pH 4·7.
B_1	4"–14"	Yellowish brown gravelly sandy loam, crumb structure, soft and porous, pH 4·9.
B_2	14"–20"	Greyish brown gravelly sandy loam, weak crumb structure, firm but porous, pH 5·1.
C	20"+	Greyish brown gravelly sandy loam till, slightly compacted but porous, pH 5·2.

Utilization of Soils

Most of the area in which the Portapique soils occur is covered with forest vegetation. The farming section is confined chiefly to an area south of Londonderry station. As compared with many other soils in the county these soils have not been cleared and subsequently abandoned to any great extent. Most of the cleared land is being cultivated and used for farming at the present time.

These soils have certain desirable features as agricultural soils. They are deep, well drained and stone free and possess a topography that is suitable for the use of farm implements.

The principal crops grown are hay and grain in connection with a mixed type of farming. These soils are suitable for a wide variety of crops adaptable to the region.

Shulie Association

The soils of the Shulie Association constitute the third largest Association in the county. They are stony and light textured soils consisting of gravelly sandy loam soil developed on stony or gravelly sandy loam till. The stones are predominantly coarse textured grey sandstones that are hard and resistant to weathering. The soil profile has a bright yellow and orange colouring which is very characteristic and in this respect bears a resemblance to the Diligence soils.

These soils occupy an area of 115,868 acres or 12.8 per cent of the county area. They occur on the southern base of the Cobequid Mountains and extend as a narrow unbroken strip from Five Islands to Folly River. The largest areas occur in the eastern part of the county where they constitute practically all the upland soils extending from Central North River through Kemptown and Riversdale to the Pictou county boundary. As well as occupying a large area in Colchester county they are commonly occurring soils in many other counties of the province and in all cases the area which they cover is extensive.

The topography of the Shulie soils varies from gently undulating to hilly. In general the roughest topography occurs at the base of the Cobequid Mountains carrying through from Five Islands to the Pictou county boundary. The area lying south of the Salmon and Black rivers has in general a gently undulating to moderately undulating topography. It is only in this latter area that drainage is restricted and is due to the nature of the relief and not to the impermeability of the soil. Consequently although the majority of these soils are well drained there are some local areas of poor drainage.

These soils are very stony with boulders of grey sandstone occurring through the soil as well as at the surface. There are no areas in which stone is not present in considerable quantity, and the quantity is sufficient to interfere with if not prevent cultivation.

In a cultivated condition these soils possess a gravelly loam or gravelly sandy loam surface that is loose, porous and with a pulverulent or often single grained structure. Large quantities of grey sandstone fragments are always present. The "B" horizon is a yellowish brown gravelly loam, also very loose and porous and containing large quantities of grey sandstone fragments. The parent material is a brownish grey gravelly loam till, often compacted but permeable due to its high content of sandstone fragments.

The Shulie poorly drained Associate lacks the bright coloured profile of the well drained soil and possesses instead a grey surface, a mottled "B" horizon in which a glei-like layer may or may not be present. The poorly drained soils have no agricultural value.

There are no great variations in surface textures in these soils, the only textures noted have been gravelly loam and gravelly sandy loam. A description of an uncultivated Shulie soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– ½"	Dark brown organic layer, conifer, hardwood and moss litter, pH 3·8.
A_2	½"– 5"	Light ashy grey gravelly loam, tendency to platy structure, loose, porous, good root development, stony, pH 4·0.
B_1	5"–12"	Yellowish brown gravelly loam, finely granular structure, fluffy and loose, pH 4·4.
B_2	12"–20"	Greyish brown gravelly sandy loam, fine crumb structure, firm but porous, good root development, pH 4·8.
C	20"+	Brownish grey gravelly loam till, compacted, hard and brittle but not impervious, stony, pH 4·9.

Utilization of Soils

The Shulie soils are not used to any great extent as agricultural land. The few farms that occur on these soils are scattered through the narrow strip that runs along the southern base of the Cobequids, in which a relatively concentrated settlement occurs in the vicinity of Londonderry. In most of the area the stony nature of the soil has discouraged clearing and cultivation. Since this soil is relatively widespread and covers large acreages it is to be expected that some of the most favourable areas will be settled to some extent.

It is unlikely that there will be any further expansion of farming on these soils, and their use for this purpose should not be encouraged. They are excellent forest soils and at the present time are covered with second-growth hardwoods and conifers. Some fire barrens occur in the large area south of Riversdale where logging operations have been severe. Regeneration of the forest should take place fairly rapidly on these soils provided seed trees are still present.

Where these soils have been cleared and cultivated they are producing fair crops of hay and grain. They are however the most acid soils occurring in the county, an acidity which is too strong for cultivated crops. Any application of limestone made to these soils should prove beneficial. It is possible that with a consistent lime and fertilizer program these soils could be made relatively productive but they have little use other than for hay and grain crops.

Wyvern Association

The soils of the Wyvern Association occur in the Cobequid Mountain landscape area. They consist of a brown sandy loam soil developed on a greyish brown gravelly sandy loam till. The till is derived from igneous rock material such as granite, diorite and felsite and is therefore relatively coarse textured and porous.

These soils occupy an area of 15,686 acres or 1.7 per cent of the county area. They occur in the northwest corner of the county, north of Five Islands and Economy and occupy rather the northern slope of the Cobequid Mountains. Their occurrence within the province is limited to Cumberland and Colchester counties.

The topography of the Wyvern soils is moderately undulating and drainage in most cases is good. Some areas do occur in which the topography is level and the bedrock lies close to the surface, and in these locations the soils are poorly drained. These areas are small in extent. Stone is everywhere present, throughout the soil profile as well as at the surface.

A detailed description of an uncultivated soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown organic layer consisting mainly of deciduous leaves, pH 4·0.
A_2	2"– 4"	Ashy grey sandy loam, tendency to platy structure, loose and porous, pH 4·0.
B_1	4"–11"	Dark yellowish brown gravelly sandy loam, weak crumb structure, loose, porous, pH 4·4.
B_2	11"–20"	Brown gravelly sandy loam, firm but not compact, porous, pH 4·6.
C	20"+	Greyish brown gravelly sandy loam till, firm to compact, stony, pH 4·6.

Utilization of Soils

The area in which the Wyvern soils occur is largely covered with forest vegetation which consists of mixed stands of hardwood and conifer. Some clearing was done in the past for use as farm land but these have all been abandoned and have reverted to a natural grass vegetation with an encroachment of forest vegetation. These areas are still being used by farmers outside of the area as summer grazing land for their livestock.

The physical characteristics of these soils are good and in a different location they might have some use as an agricultural soil. Their inaccessibility however prohibits their use for this purpose. They are excellent forest soils and should produce a fairly rapid tree growth. Fire barrens are conspicuously absent in this area but the removal of the forest in lumbering operations has been very severe. Its return to forest vegetation should be encouraged as much as possible.

Cobequid Association

The soils of the Cobequid Association comprise practically all the land area of the Cobequid Mountains. They consist of a friable brown gravelly loam soil developed on a brownish grey gravelly sandy loam till. The area is characterized by a shallow till deposit over bedrock and by frequent rock outcrops in which the till occurs in depressions between them. The till is derived almost wholly from igneous rock material consisting of granite, syenite, diorite and felsite which imparts a gravelly and stony character to the soil mass.

These soils occupy an area of 200,454 acres or 22.5 per cent of the county area. This is the largest area of land occupied by any Association in the county. They occur on the Cobequid Mountains which extend across the central part of the northern half of the county. Their occurrence within the province is confined to the Cobequid Mountains and therefore constitute a large area in Cumberland and to some extent in Pictou counties.

The topography of the Cobequid soils is extremely variable being rolling to hilly along the flanks and gently to roughly undulating on the summits. Drainage is good both externally and internally and few poorly drained or swampy areas exist.

Stone is always present in large quantities, being distributed throughout the soil profile as well as at the surface. It is this characteristic which makes the soil unsuitable for agricultural use.

The cultivated soils are characterized by a dark brown gravelly loam surface soil which is very friable and possesses a relatively high content of organic matter. The "B" horizon is a dark brown gravelly loam, friable and porous and containing a high content of organic matter. The parent material consists of a brownish grey gravelly sandy loam till that is slightly compacted but porous. The almost complete absence of a grey leached layer and the high content of organic matter in the "B" horizon of these soils suggests that they have had a somewhat different soil development than other upland soils in the county. The present indication seems to be that the dominant vegetation under which these soils developed has been deciduous rather than evergreen forest.

A description of an uncultivated Cobequid soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"- 3"	Black well decomposed organic layer consisting of deciduous leaves and decayed wood, pH 4·1.
A_2	3"- 5"	Pinkish grey gravelly loam, fine granular structure, soft, loose, good root development, pH 4·3.
B_1	5"-10"	Dark brown gravelly loam, pulverulent structure, loose, porous, good root development, pH 4·8.
B_2	10"-22"	Light brown gravelly sandy loam, moderately cohesive, porous, stony, pH 5·1.
C	22"+	Brownish grey gravelly sandy loam, slight compaction but pervious, pH 5·3.

Utilization of Soils

The largest part of the area in which the Cobequid soils occur is covered with forest vegetation. This is second-growth vegetation and at the present time consists of mixed stands of hardwood and conifer. Some fairly large tracts of land have been cleared and cultivated particularly around Castlereigh, Nutthy, East New Annan and Earltown. The original settlements in these areas began at an early date and became established probably in conjunction with the lumbering industry. The partial survival of these settlements up to the present time is due to income derived from forest products. Some attempt is made to produce grain crops but most of the cultivated land is devoted to hay and pasture.

The Cobequid soils are poor agricultural soils. Except in local small areas the soils are too stony and shallow over bedrock to be satisfactory for cultivation. They are however excellent forest soils and the area as a whole appears to have some natural forest fire protection. Fire barrens are non existent so that the depleted forest condition has been brought about by severe logging operations. The use of these soils for forestry should be encouraged.

Folly Association

The soils of the Folly Association are not important agricultural soils in the county. They consist of a light brown gravelly loam soil developed on a light brown gravelly sandy loam till. The till is very stony and appears to be derived from mixed rock material consisting of a hard grey conglomerate and brown and grey sandstone. The influence exerted on the soil by the sandstone and the conglomerate is about equal.

These soils occupy an area of 16,032 acres or 1.7 per cent of the county area. They occur at the southern base of the Cobequid Mountains extending in a narrow strip from Londonderry station in the west to Central North River in the east. Up to the present these soils have been identified only in Colchester county.

The general topography is moderately undulating and drainage is good both externally and internally. Stones and boulders are plentiful throughout the soil profile and at the surface which prohibits the use of the soil for agricultural purposes.

A description of an uncultivated Folly soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 3"	Dark brown organic layer consisting of sphagnum moss, spruce and fir needles, pH 3·7.
A_2	3"– 6"	Light purplish grey loam, platy structure, usually tongued, loose, stony, pH 4·0.
B_1	6"–12"	Orange brown gravelly sandy loam, fine granular structure, loose, porous, stony, pH 4·8.
B_2	12"–22"	Greyish brown gravelly sandy loam, large crumb structure, soft, loose, porous, stony, pH 5·6.
C	22"+	Light greyish brown gravelly sandy loam till, compact but not impervious, stony, pH 5·5.

Utilization of Soils

The Folly soils are at the present time almost entirely covered with forest vegetation. Some settlements as the Delanay and McCallum settlements were established in this area and some attempt was made at cultivating the land. The former settlement has been abandoned and only a few scattered farms exist within the entire area. They are good forest soils and should be used only for that purpose.

Thom Association

The soils of the Thom Association occur in the Cobequid Mountain landscape area. They consist of a gravelly sandy loam soil developed on a grey gravelly till. The small rock fragments that make up the gravel content of the till and of the soil are in the form of small cubes but with irregular cleavage faces, and are probably a form of breccia. Several farms are located on these soils and appear relatively prosperous.

These soils occupy an area of 6,144 acres or 0.6 per cent of the county area. They occur as a narrow strip of land extending from Central North River in the west to the Pictou county boundary in the east. Their occurrence within the province is probably confined to Colchester and Pictou counties.

The topography is moderately undulating and drainage is good both internally and externally. Few stones are present and on the cultivated land are easily removed.

A detailed description of an uncultivated Thom soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown organic layer consisting of sphagnum moss.
A_2	2"– 4"	Purplish grey gravelly sandy loam, structureless, porous.
B_1	4"–11"	Orange brown gravelly sandy loam, structureless, loose, porous.
B_2	11"–16"	Greyish brown gravelly sandy loam, slight compaction but porous.
C	16"+	Grey gravelly till, loose and unconsolidated.

Utilization of Soils

Although the Thom soils do not cover a very large area of land there is a relatively large acreage under cultivation. The choice of this soil as farm land has probably resulted from its well drained characteristic and its relative freedom from stone. Any further expansion on these soils for agricultural purposes should not be attempted. It is not a soil that will stand up under continuous cultivation.

Gibraltar Association

The Gibraltar Association comprises a small area of soils occurring in the southeast corner of the county. They are light textured, gravelly sandy loam soils developed on grey gravelly sandy loam till. The till from which these soils are developed is made up largely of biotite granite some of which is well decomposed but much of it occurring as stones and boulders. The soil is strongly leached and shows the characteristics of mature podzol development.

These soils occupy an area of 3,546 acres or 0.3 per cent of the county area. They occur in the extreme southeast corner of the county where the county boundaries of Colchester, Pictou and Halifax meet. Their occurrence within the province is probably fairly widespread since they form a part of the Atlantic Upland.

The topography is moderately undulating. Drainage is good both externally and internally. They are excessively stony and are therefore not agricultural soils.

A description of an uncultivated soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 1"	Dark brown organic layer consisting of deciduous leaf accumulation and decayed wood, pH 3·7.
A_2	1"– 3"	Grey gravelly sandy loam, no definite structure, soft, loose, pH 3·9.
B_1	3"–15"	Orange brown gravelly sandy loam, structureless, friable, loose, pH 5·3.
B_2	15"–25"	Greyish brown gravelly sandy loam, structureless, loose, good root development, pH 5·1.
C	25"+	Grey gravelly sandy loam till, unconsolidated, pH 5·4.

Utilization of Soils

The Gibraltar soils occur in an inaccessible part of the county and consequently are unlikely to be for agricultural purposes. The area in which they occur is covered with forest vegetation but heavy logging operations have removed the merchantable timber. The present tree growth consists of red spruce, fir, maple, yellow birch and poplar.

IMMATURE SOILS ON ALLUVIAL DEPOSITS

Among the most important agricultural soils that occur in Colchester county are those developed on Alluvial deposits. They are locally referred to as Interval soils and include all the soils occurring in the beds of stream and river channels that owe their origin to material deposited by running water. The degree of sorting which has taken place is dependent on the rate at which the water flows, but the texture of the deposits has also been influenced to a large extent by the source of the material carried by the streams.

The textures of these deposits range from gravel to clay. The lighter textured deposits of sand and gravel although not totalling the greatest combined acreage are the most widespread and make up the soils of the Cumberland Association. The heavy textured deposits occur chiefly where the streams flow through areas in which the upland is composed of clay till. These comprise the soils of the Stewiacke Association. The latter are not very widespread but their total acreage is greater than that of the Cumberland soils.

Stewiacke Association

The soils of Stewiacke Association include the heavy textured alluvial deposits which occur in Colchester county. The texture of these deposits ranges from silty clay loam to clay and the soils are relatively uniform throughout their depth. These soils are immature since flooding still occurs during seasons of unusually high rainfall and at such times additional fine textured sediments are deposited on the surface.

These soils occupy an area of 19,283 acres or 2.1 per cent of the county area. The largest area of these soils occurs in the Stewiacke valley with smaller areas in the vicinity of Brookfield, Hilden and at the mouths of the Salmon and North rivers. Similar soils may be expected to occur in adjacent counties.

The topography of these soils is level to gently undulating and to some extent depressional. The drainage varies from good to poor, the area of poorly drained soils being 5,222 acres. These latter soils occur chiefly along the South Branch of the Stewiacke river where the river channel has practically been obliterated due to silting. Some of the areas in the vicinity of Otter Brook are probably depressional since water at certain times flows back into them from the main river channel.

In the better drained positions these soils are characterized by a brown, friable silty clay or clay loam surface underlain by a brown friable clay that extends beyond the depth of 30 inches. The organic-matter content shows little variation to a depth of 30 inches which together with a relatively high content of silt and very fine sand produces a deep friable soil.

The poorly drained Associate may or may not have a muck surface underlain by clay, is highly mottled and usually possesses a permanently high water-table. These areas are covered with a luxuriant growth of grass but are too wet to be used as hay land.

A detailed description of a cultivated soil described at arbitrary depths is as follows:

Depth	*Description*
0"– 6"	Cultivated layer. Brown silty clay, fine granular structure, slight mottling, pH 4·9.
6"–12"	Brown clay, large blocky structure which crushes to fine granular, cohesive but not compact, very permeable, pH 4·9.
12"–18"	Brown clay, blocky structure, cohesive but not compact, porous, pH 5·2.
18"–24"	Brown clay loam, no definite structure, cohesive but not compact, porous, pH 5·2.
24"–30"	Brown clay, cohesive but moderately friable, porous, pH 5·2.
30"–36"	Brown clay, no definite structure, moderately cohesive, porous, pH 5·5.

Utilization of Soils

The Stewiacke soils are highly productive and are used at the present time in the production of hay and to a lesser extent grain crops. The better drained areas where flooding does not occur should be adaptable to a wide variety of crops including field roots, vegetable crops and commercial potato growing but as yet little use is being made of these soils for that purpose.

The principal limiting factor in the use of these soils is drainage. The poorly drained soils cover a fairly large area and in many cases represent good agricultural land. This is particularly true of areas in the Stewiacke valley. In the depressional areas no system of drainage can be installed that will remedy the condition but in other areas the possibility of artificial drainage may well be investigated. Such a scheme would seem to involve the deepening and straightening of the river channel and the building of lateral drains leading into it. The areas chosen for drainage should be selected having regard to the soil and only those having a good mineral soil from the surface should be drained. The areas consisting of organic ooze and muck should not be considered. With the establishment of proper drainage these soils should be as productive as the better drained soils.

Flooding occurs frequently and to such an extent that large areas of the normally well drained soils may be covered with water. This occurrence in periods of excessive rainfall limits the amount of land that can be exposed by bare cultivation and consequently, the variety of crops that can be grown is also limited.

The prevention and control of flooding are problems that are becoming increasingly severe. The excessive removal of the forest on the watershed of the

rivers and their tributaries is the chief contributing factor. This removal through lumbering operations is still continuing so that no lessening in flooding may be expected.

Cumberland Association

The soils of the Cumberland Association include light textured alluvial deposits in which the soil material is made up of a predominance of sand and gravel. Stratification occurs regularly with coarse and fine sediments alternating or with more or less well sorted deposits of sand or gravel occurring alone.

These soils occur in the valleys of the various rivers and streams, the largest areas being formed in the valleys of the Salmon River, North River and Tatamagouche River. The streams dispersed through the county possess small areas of alluvial soils often not more than a few acres in extent and are too small to show on a reconnaissance map. These are the cultivated soils however and are generally preferred to most of the upland soils.

The Cumberland soils have been divided into two textural classes, namely, Cumberland sandy loam and Cumberland gravelly sandy loam. The gravelly soils are characterized by gravelly sandy loam surfaces and gravel subsoils. The sandy soils consist of sandy loam surfaces and sand or sandy loam subsoils. This distinction is necessary since increasing quantities of gravel in these soils decreases their agricultural importance.

The total area occupied by these soils is 10,951 acres or 1.1 per cent of the county area. Of this total the gravelly soils occupy 5,946 acres and the sandy soils 5,005 acres. Their occurrence within the province is widespread and in practically all cases they possess the same characteristics. They are immature soils in which flooding may occur at any time and additional sediments may be deposited on the surface.

A representative profile of Cumberland sandy loam is described below:

Horizon	*Depth*	*Description*
Surface Soil	0"– 8"	Dark brown sandy loam to loam, granular to fine crumb structure, soft, mellow, pH 5·0.
Subsoil	8"–28"	Light brown sandy loam to loam, finely granular structure, may be laminated due to mode of deposition, soft, mellow, pH 5·2.
Below 28"		Light brown sandy loam, usually laminated, slightly mottled, porous, pH 5·0.

Utilization of Soils

The Cumberland soils are the first soils in the county to have been cleared and cultivated. In the virgin condition they were covered by low bush and grass vegetation so that clearing has not been difficult. In many cases therefore they constitute most of the arable land on a farm.

These soils are fertile but due to frequent flooding their use is limited to certain crops. Most of the land is devoted to the production of hay and grain crops and only occasionally to vegetable crops. Where flooding does not occur the sandy soils particularly are excellent market gardening soils, as they are fertile, friable and easy to work.

The chemical analysis of these soils shows that they are well supplied with calcium and magnesium. The use of limestone is therefore questionable. Commercial fertilizer gives good results and together with barnyard manure is used extensively in the farm lands of the Salmon and North rivers. These are the most intensively cultivated areas of these soils in the county.

SOILS DEVELOPED ON KAMES, ESKERS, OUTWASH AND FLUVIATILE DEPOSITS

These different land forms and deposits may be included in the same heading since they consist principally of gravel and the type of soil development which has taken place is similar in all cases. The Kames and Eskers which occur in the

county possess the typical characteristics of these land forms, but their occurrence is very limited. They occur almost exclusively in the vicinity of West St. Andrews and at a point west of South Branch.

The Outwash and Fluviatile deposits make up the largest acreage and have a wide distribution within the county. They may be present as gravel plains or may possess a rough hilly topography. The majority of these deposits are undoubtedly of glacial origin since the depth of the deposits and the well rounded characteristic of the gravel is not complementary with the size of the present streams.

The rock material is chiefly granitic and where the deposits are associated with such rivers as Folly and Portapique they indicate the only direct evidence which has been noticed of rock material foreign to the province.

The soils occurring on these various deposits have all been mapped as Hebert. Because of the variation in texture and the consequent difference in land use suitability two Textural classes have been mapped namely, the Hebert sandy loam and the Hebert gravelly sandy loam. These differences are explained in the Association description.

Hebert Association

The soils of the Hebert Association are all well developed podzols. They consist of sorted gravels in which the size of the rock material varies from fine gravel to cobblestone. Lenses of these different sized particles occur throughout the deposit and are most prominent in the Kames, Eskers and Outwash. The Fluviatile deposits which occur in conjunction with the main rivers consist chiefly of the coarsest gravel and cobblestones.

These soils cover an area of 22,848 acres, of which the gravelly sandy loam occupies 12,179 acres and the sandy loam 10,669 acres. These combined acreages are equal to 2.4 per cent of the county area. Their occurrence within the county is widespread, being associated with most of the main rivers and occurring as gravel plain deposits on the upland. The largest Fluviatile deposits are associated with the Portapique, Folly and Debert rivers, while the largest outwash deposit occurs at Earltown. The distribution of these soils within the province is also widespread and they cover comparable acreages in adjacent counties.

The topography varies from level to hilly. The level plains are usually those occurring adjacent to the rivers while the rougher topography is typical of the Eskers, Kames and Outwash deposits. Drainage is in all cases good to excessive.

The Hebert soils are mature podzols and have developed under forest vegetation. In the cultivated condition they consist of a dark brown sandy loam surface that is loose and structureless. The grey leached layer has been destroyed by cultivation but is very prominent in the virgin condition. This layer is underlain by a yellowish brown "B" horizon, sandy loam to gravelly sandy loam texture, also loose and structureless. The parent material consists of sand, gravel or cobblestones and is always loose or unconsolidated.

The sandy soils consist of sands and gravels and may have a soil development to a depth of 30 inches. The gravelly soils which have a cobbly texture throughout the soil are generally not deeper than 12 inches. As a result the cultivated surfaces of these soils are cobbly and stony.

A detailed description of an uncultivated sandy loam soil is as follows:

Horizon	*Depth*	*Description*
A_0	0"– 2"	Dark brown well decomposed organic layer of deciduous leaves and evergreen needles, pH 3·8.
A_2	2"– 5"	Light grey sandy loam, no definite structure, loose, porous, pH 4·2.
B_1	5"–16"	Yellowish brown sandy loam, no definite structure, fluffy, loose, porous, pH 5·1.
B_2	16"–29"	Reddish brown sandy loam, slightly indurated, large fragmental structure, permeable, pH 5·3.
C	29"+	Gravel, consisting of granite and quartz pebbles chiefly, loose, pH 5·5.

Utilization of Soils

The Hebert soils are cultivated to some extent and are used for a wide variety of crops. This is particularly true of the soils occurring adjacent to the various rivers. In these locations the smooth topography and well drained condition are features that invite their use as cultivated soils. As a result they are used for grain and vegetable as well as hay crops.

The majority of these soils however are non-agricultural as they are droughty and infertile.

IMMATURE SOILS DEVELOPED ON DELTA AND MARINE DEPOSITS

The marine deposits which occur in Colchester county are confined to the Cobequid Bay region. They represent areas in which fine sediments have been deposited by recurring tides or in which alluvial material has been deposited in salt water at the mouths of the principal rivers. There is therefore a considerable variation in the texture of these deposits. Those of alluvial origin tend to be sandy while those deposited by recurring tides consist of clay and silty clay.

These deposits are red coloured since the tidal waters move back and forth in the Triassic sandstone region, the rock material of which has a characteristically red colour. The dispersed clays carried by the tidal waters coat the banks of the rivers with a shiny red deposit which to the uninitiated appears as the product of erosion from the upland soils.

Practically the whole area has been dyked against overflow and is provided with open drainage systems and aboideaux. These are traps constructed to allow the water to run into the river channels but prevent the water at high tide from entering the drainage ditches. Flooding of large areas by fresh water occurs periodically and at any time of the year.

Acadia Association

The soils of the Acadia Association include those which are above high tide level and those which have been dyked and are therefore not affected by daily tides. These soils occupy an area of 5,466 acres or 0.6 per cent of the county area. They occur as small areas along the shores of the Cobequid Bay and at the mouths of the Gay River, Stewiacke River, Salmon River and North River. All of these areas are heavy textured with the exception of the Truro dykelands, a large part of which consists of medium textured soils overlying deposits of fine sand.

The topography is flat and drainage in all cases is imperfect. Open drains are maintained to carry off the surface water which collects after every rain, and the flood waters that occur after periods of high precipitation.

The Acadia soils are immature and no profile development is visible. The process of podzolization is taking place as some of these soils are acid to a considerable depth. This is particularly true of the lighter textured deposits of the Truro dykelands which have a uniform pH of 5.4 to a depth of 30 inches. In a cultivated condition the surface soil consists of a light brown silt loam or silty clay loam. When dry these soils are friable but when wet they are amorphous and sticky.

A detailed description of an Acadia soil which is free from the influence of tidal waters is as follows. The depths given are arbitrary.

Depth	*Description*
0″– 6″	Light brown silt loam, friable, porous, slight mottling, pH 5·4.
6″–12″	Brown silt loam, cohesive but not sticky, porous, slight mottling, pH 6·4.
12″–18″	Reddish brown silty clay, cohesive, firm but not impervious, moderately porous, pH 6·7.
18″–24″	Reddish brown silty clay loam, some tendency to blocky structure, cohesive, porous, pH 7·0.
24″–30″	Reddish brown silty clay loam, cheesy consistency, cohesive, porous, pH 7·1.

Utilization of Soils

The Acadia soils in Colchester county were among the first soils in the county to have been used for farming. The early history of the province indicates that the French settlers initiated the practice of dyking, a laborious operation since at that time the work was done entirely by hand. These excellent dykes withstood the action of the tides for a considerable length of time and it is probable that at that time the dykelands achieved their maximum efficiency. The indifferent maintenance of the dykes by subsequent settlers resulted in a reduction of the productive acreage, a process that has continued unabated to the present time.

These soils are used almost exclusively for the production of hay crops and for pasture. Some small acreages are seeded to grain but the practice is not common. The concentration of dairying in the vicinity of Truro and Onslow places considerable dependence on these soils for live-stock feed. The usual practice is to seed the land down to a mixture of timothy and red clover but in some areas no seeding is done and the natural grass vegetation is cut for hay.

The management of dykeland soils may be considered more specialized than for other soils and it should perhaps be emphasized that dyking alone is not the only operation required. Open drainage ditches are everywhere necessary and it is chiefly the failure to maintain this drainage system that results in reduced productivity. Somewhat similar treatment must be given these soils as is given to the upland soils. The use of fertilizers, manures and limestone is necessary to obtain satisfactory yields.

The natural grass vegetation consists chiefly of broad leaf, fox grass, salt marsh grass and black grass. In the cultivated areas where fertilization and shorter rotations are not followed up the vegetation quickly reverts to these natural grass species.

Although the Acadia soils are naturally suited to grass some of the better drained areas are suited to most general farm crops.

MISCELLANEOUS SOILS

Muck

Muck soils are organic soils consisting of black fairly well decomposed organic matter that is 12 inches or more in depth. This material is usually mixed with variable quantities of silt and clay and has a smeary consistency when wet. The origin and constitution of muck soils have not been investigated but it would appear that they consist chiefly of the remains of minute animal and plant forms mixed with some mineral matter.

They are distributed throughout the county in small areas that are too small to map out. The areas mapped occupy 128 acres. None of these soils are being used as agricultural soils but are covered with tamarack, black spruce and birch vegetation.

Their use as an organic addition to mineral soils is often questioned. Although they contain an abundant supply of organic matter and nitrogen they are usually low in phosphorus and potash. In addition they are extremely acid so that applications of limestone would be necessary to correct this condition.

Peat

Peat soils are organic soils consisting of brown non-decomposed organic matter that is 12 inches or more in depth. They occur in low lying wet areas where water remains for most of the year, and are composed chiefly of sphagnum moss. This organic material is so poorly decomposed that the original plant structure can still be seen. In addition to sphagnum moss the native vegetation may consist of Labrador tea and sedges.

The areas mapped cover 614 acres but their distribution and occurrence is somewhat wider than this figure indicates. They occur often as small areas less than an acre in extent and are therefore too small to map out. These soils are not suitable for agricultural use.

Swamp

The areas mapped as swamp consist of low lying mineral soils which are continually saturated with water and which usually possess a shallow muck or peat-like surface. For the greater part of the year the surface is covered with water.

In the mineral portion of the soil some profile development may be present but is not consistent.

These soils are covered with a dense growth of scrubby black spruce, wire birch, tamarack, fir and red maple and often sedges, reeds and other semi-aquatic plants. They have no value as agricultural soils.

Salt Marsh

The salt marsh areas are associated with the Acadia soils and consist of recent marine deposits which are constantly being reworked by tides. The areas occurring in the county cover 2,150 acres and are distributed everywhere along the Cobequid shore.

They are usually covered with a saline vegetation consisting of marsh grass, glasswort, sea-blite and spurrey. The marsh grass is sometimes cut for hay and produces poor quality feed.

Eroded Land

The steep eroded slopes along stream and river channels in which no profile development has taken place have been mapped as eroded land. These areas cover 5,452 acres and occur chiefly along the steep river channels adjacent to the Cobequid Mountains. Some of the areas are bare of vegetation while others are covered with second-growth mixed woods.

RATING OF THE SOILS FOR CULTIVATED CROPS

The use and suitability of the various soils for cultivated crops have been discussed in the preceding pages. The use which is made of a soil varies somewhat in different parts of the county depending upon such economic factors as accessibility, distance from market and the kind of market available. Consequently a certain soil may be used for general farming in one section of the county and in another section the emphasis may be on dairying. An estimate of suitability of any particular soil is not so variable since it is contingent upon the characteristics of the soil which produce their effects upon a given crop regardless of the section in which they occur.

The rating of soils is most reliable when based on actual crop yields as they may then be lined up according to their productivity. Such information is not available at the present time, the general yield figures given by farmers usually not being applicable to definite types of soil. In the absence of yield data the suitability of the soils for various crops may be estimated from the physical and chemical characteristics of the soil together with observations of the crops growing on a particular soil. This information was collected during the course of the survey and the estimated soil rating given in Table (4) was arrived at. This rating serves as a means of comparison between the various soils and is a temporary estimate which may be useful until more accurate data can be obtained.

The suitability of the different soils for hay and pasture is not as selective as it is for any of the other principal crops occurring in the county consequently their ratings for these crops are higher. In many cases this represents its only use as an agricultural soil. It should be recognized, however, that soils which show such

TABLE 4—*ESTIMATED SOIL RATING FOR THE PRINCIPAL CROPS GROWN IN THE COUNTY

Soil Associations phase, miscellaneous soils	Soil Rating For					
	Hay	Potatoes	Oats	Turnips	Vegetable Crops	Pasture
Nappan	E	F	G	F	F	E
Queens	E	F	G	F	P	E
Londonderry	G	P	F	P	P	E
Diligence	F	VP	F	VP	VP	G
Pugwash	E	G	G	G	G	E
Truro	E	E	G	G	E	G
Kirkhill	F	VP	F	VP	VP	G
Westbrook	G	P	F	F	P	G
Harmony	G	F	G	P	P	G
Portapique	G	F	G	F	F	G
Shulie	F	VP	F	VP	VP	F
Wyvern	F	VP	F	VP	VP	G
Cobequid	F	VP	F	VP	VP	G
Folly	P	U	P	U	U	F
Thorn	F	VP	F	VP	VP	F
Gibraltar	P	U	U	U	U	P
Stewiacke	E	G	E	G	G	E
Cumberland sandy phase	E	E	G	G	E	E
Cumberland gravelly phase	E	G	G	G	G	E
Hebert gravelly phase	F	P	F	VP	VP	P
Hebert cobbly phase	F	VP	P	VP	VP	P
Acadia	E	P	G	P	F	E
Muck	F	U	U	U	U	F
Peat	U	U	U	U	U	U
Swamp	U	U	U	U	U	U
Salt Marsh	P	U	U	U	U	P
Eroded Land	U	U	U	U	U	U

Symbols: E—Excellent. P—Poor.
G—Good. VP—Very Poor.
F—Fair. U—Unsuitable.

* These ratings are based on average general farm practice, and apply only within the province.

a limited suitability are very inferior soils. This selectivity of crops for particular soils may be of increasing importance in the future following a trend to a more diversified type of agriculture.

In making comparisons between soils from the standpoint of use and suitability certain characteristics must be considered, or an ideal soil may be set up with which comparisons may be made. Such characteristics include good drainage, high fertility, medium to light textures, good depth, gently undulating topography and freedom from stone.

From the soil ratings which are given in Table (4) a certain grouping of similarly productive soils is possible.

1. Stewiacke, Cumberland sandy loam, Cumberland gravelly sandy loam, Acadia, Truro. All of these soils except Truro, are Interval and Dykeland soils and are the most productive soils in the county. With the exception of Acadia they are suited to most crops in the region.

2. Pugwash, Nappan, Queens. These soils differ in texture and drainage but they are all important upland agricultural soils in the county. Pugwash soils are light textured and well drained whereas Nappan and Queens soils are heavy

textured and imperfectly drained. These differences to some extent affect their adaptability to certain crops.

3. Portapique, Londonderry, Westbrook. These soils are less suitable for agriculture than those of group 2. Their adaptability for many crops is reduced by undesirable texture, topography, and content of stone.

4. Diligence, Harmony. Only limited areas of these soils are suitable for farming. The soils are shallow and stony and possess low fertility.

5. Cobequid, Wyvern, Kirkhill, Shulie, Thom, Hebert sandy loam, Hebert gravelly sandy loam, Folly, Gibraltar. These are essentially non-agricultural soils possessing such limitations as stoniness, poor texture, rough topography and low fertility.

6. Muck, Salt Marsh, Peat, Swamp, Eroded Slopes. Unsuitable for agricultural purposes.

The above grouping of the soils is necessarily arbitrary so that the soils within each group should not be considered as being identical in their productive capacities. For specialized types of farming the soils will need to be considered individually.

SUMMARY

Colchester county lies in the north central part of Nova Scotia and covers an area of 903,799 acres or approximately 1,412 square miles. Its boundaries extend from the Atlantic Upland on the south to the Northumberland Strait on the north. The Cobequid Bay which is an inland extension of the Bay of Fundy forms much of its western boundary. The county possesses three fairly well defined landscape areas consisting of the Atlantic Upland, the Carboniferous Lowlands and the Cobequid Mountains. The relief is variable ranging from gently undulating to hilly and mountainous. Elevations range from the dykelands, which are a few feet above sea level, to 1150 feet in the Cobequids. Drainage is effected through numerous short rivers which extend throughout all parts of the county.

The climax vegetation in the area is forest and although few if any virgin stands of timber remain most of the county area is covered with second growth stands of hardwoods and conifers. Agricultural land that has been abandoned for any length of time quickly reverts to forests.

The population according to the 1941 Census is 30,124 of which 11,233 is urban and 18,891 is rural. Truro, with a population of 10,272 is the largest town and the principal market in the county for agricultural products. Transportation facilities consist of railways and a good system of highways radiating to all parts of the province.

The climate is humid and temperate with rarely any extreme temperatures between winter and summer. The average annual rainfall is 42.2 inches, an average annual snowfall of 78.9 inches, and a mean annual temperature of 42°F.

The early agriculture in the county centered around the Cobequid Bay region and along the Northumberland Strait in the vicinity of Tatamagouche. Most of the settlement was in the river valleys and the uplands adjacent to the marshland areas. Subsequent expansion of the agricultural land took place to a large extent in conjunction with the lumbering industry.

The present agriculture consists chiefly of mixed farming in which the raising of dairy and other livestock products are of chief importance. Poultry raising, potato growing, market gardening and fruit growing are important in certain areas. Hay and forage crops occupy the largest acreage and are produced mainly in support of dairying. The sale of lumber and other forest products makes up a large part of the farm income.

The entire surface of Colchester county has been glaciated and the material from which the soils have developed has accumulated partly through the effect of glacial action and partly by sediments laid down by existing streams and sea water. The principal glacial material is till which covers by far the greatest area. The alluvial and marine soils although not of large extent are the most important agricultural soils in the county and are generally preferred to the upland till soils.

The till soils are extremely variable in composition and in their adaptability for agricultural use. The deposits are shallow and the glacial material has been transported only a short distance. Consequently the underlying rock material has affected the composition of the till of the various soil Associations.

The soils of the county occur within the podzol zone and all the upland soils possess the characteristic podzol profile consisting of a surface layer of organic debris from deciduous and coniferous trees, underlain in order, by a grey leached layer, a yellowish brown and a reddish brown layer of accumulation. The soils are strongly acid in reaction at the surface and in many cases in the parent material. The low-lime status of the soil would appear to be due to continued leaching and to a low-lime content of the rock materials from which the soils have been derived. Upland soils are therefore particularly deficient in essential plant nutrients and a marked response is given by all cultivated crops to applied fertilizers.

The alluvial soils include the Cumberland and Stewiacke Associations. They are stone-free soils and range in texture from gravelly sandy loam to clay. Flooding of these soils occurs frequently and therefore their use for many agricultural crops is adversely affected. Where this does not occur these soils have the widest agricultural adaptation of any soils in the county. The nutrient status of these soils is somewhat better than the upland soils but manures and fertilizers must be used for successful crop production.

The marine or dykeland soils constitute the Acadia Association. In Colchester county these deposits are to a large extent alluvial in origin, consisting of material carried down by the Salmon and North rivers and deposited at their mouths in the form of a delta. The texture of these deposits ranges from fine sandy loam to silty clay. These soils are extremely fertile and are used chiefly in the production of hay. The maintenance of dykes and adequate drainage systems is essential if they are to continue producing satisfactorily.

The chief limitations in the use of the upland soils are drainage, stoniness and rough topography. The most desirable soils in this respect are the Truro, Pugwash, Nappan and Queens Associations. The light textured Truro soils are adaptable to potato growing, vegetables and small fruits, as well as to general farming. Their possibilities as orchard soils merit some investigation. The medium textured Pugwash and heavy textured Nappan and Queens are most satisfactory for general farming.

The remainder of the till soils are limited in their agricultural use because of poor texture, stoniness and rough topography.

The soils of the Kames, Eskers, Outwash and Fluviatile deposits are included in the Hebert Association. They are generally shallow, gravelly and droughty and although they are cultivated to some extent they are poor agricultural soils.

Miscellaneous soils include muck, peat, swamp, salt marsh and eroded land, all of which have no agricultural use.

Approximately 70 to 75 per cent of the county area is covered with forest vegetation. Forest growth becomes established on abandoned farm lands with little difficulty and should perhaps be encouraged on the poorer types of soil. The high cost of improving and maintaining the fertility of the land indicates that in continued agricultural use, there is need for a rigid selection of the soil.

APPENDIX

TABLE 5—AVAILABLE NUTRIENTS IN POUNDS PER ACRE

Soil Association	Horizon	Available			
		CaO[1]	MgO[1]	K_2O[1]	P_2O_5
Nappan	A_0[2]	150	76	162	172
	A_2	224	256	311	25
	B_1	123	176	433	23
	B_2	325	144	481	21
	C	112	112	415	25
Queens	A_0[2]	799	83	317	114
	A_2	140	112	415	25
	B_1	414	128	104	18
	B_2	706	192	490	23
	C	4648	384	443	303
Diligence	A	672	32	302	62
	B_1	392	20	302	41
	B_2	784	40	500	64
	C	3192	144	471	91
Pugwash	A_0[2]	65	3	411	213
	A_2	146	176	292	30
	B_1	123	80	471	30
	B_2	146	80	509	27
	C	202	96	556	34
Kirkhill	A_0[2]	253	13	188	218
	A_2	112	32	453	55
	B_1	90	32	453	25
	B_2	95	32	94	23
	C	134	160	405	87
Westbrook	A_0[2]	170	28	241	144
	A_2	616	112	471	32
	B_1	582	32	575	128
	B_2	537	64	444	46
	C	257	12	453	87
Harmony	A_0[2]	599	162	50	114
	A_2	258	64	415	27
	B_1	179	48	575	23
	B_2	106	64	189	23
	C	202	112	471	181
Cobequid	A_0[2]	405	154	264	183
	A_2	1836	304	547	39
	B_1	974	192	594	18
	B_2	728	48	553	30
	C	380	8	405	34
Folly	A_0[2]	156	4	327	229
	A_2	780	12	217	39
	B_1	437	20	547	14
	B_2	468	12	141	23
	C	499	8	245	62
Gibraltar	A_0	448	42	84	220
	A_2	117	48	867	30
	B_1	319	32	509	21
	B_2	224	32	415	18
	C	95	32	112	197
Hebert	A_0[2]	240	37	105	96
	A_2	78	16	387	18
	B_1	101	48	415	23
	B_2	112	48	406	27
	C	106	32	490	64

[1] Calculations for CaO, MgO and K_2O derived from exchangeable bases by conversion from milligram equivalent to percentage weight.

[2] Calculated on the basis of 193,000 lb. soil per acre.

TABLE 5—AVAILABLE NUTRIENTS IN POUNDS PER ACRE—*Continued*

Soil Association	Horizon	Available			
		CaO[1]	MgO[1]	K_2O[1]	P_2O_5
Stewiacke	0″– 6″	1870	80	321	41
	6″–12″	1266	80	462	30
	12″–18″	772	64	462	30
	18″–24″	554	64	481	25
	24″–30″	487	48	434	32
Acadia	0″– 6″	1680	76	575	46
	6″–12″	1176	140	265	87
	12″–18″	1792	224	603	268
	18″–24″	1512	216	575	330
	24″–30″	1400	212	858	364
Cumberland	0″– 6″	2016	60	236	46
	6″–12″	1232	96	264	32
	12″–18″	616	116	228	37
	18″–24″	728	88	434	80
	24″–30″	672	92	217	110

[1] Calculations for CaO, MgO and K_2O derived from exchangeable bases by conversion from milligram equivalent to percentage weight.

[2] Calculated on the basis of 103,000 lb. soil per acre.

TABLE 6—PHYSICAL AND CHEMICAL ANALYSES OF REPRESENTATIVE SOIL PROFILES

Horizon of Profile	Depth in inches	Gravel %	Sand %	Silt %	Clay %	Loss on Ignition %	pH	Lime req. T/Ac.	Total P_2O_5 %	Total N. %	Org. C. %	M.E. Exch. H.	M.E. Exch. Ca.	M.E. Exch. Mg.	M.E. Exch. K.	Base Saturation %	Total SiO_2 %	Total Fe_2O_3 %	Total Al_2O_3 %
NAPPAN LOAM																			
A_0	0″– 2″	0	0	0	0	47·1	3·2	50·5	·14	·82	31·65		2·78	1·96	1·78	7·2	44·0	1·0	1·0
A_2	2″– 6″	0	51	38	11	2·1	4·1	5·3	·05	·10	·53		·40	·64	·33	22·8	72·4	5·1	2·0
B_1	6″–11″	5	38	43	19	2·7	4·2	7·4	·07	·09	·24		·22	·44	·46	15·5	71·1	5·2	6·5
B_2	11″–16″	11	33	41	26	3·5	4·5	5·3	·04	·06	·38		·58	·36	·51	18·3	73·7	5·2	14·8
C	16″+	19	31	41	27	3·1	4·8	6·7	·05	·07	·04		·20	·28	·43	14·1	72·9	5·4	13·1
QUEENS CLAY LOAM																			
A_0	0″– 2″	0	0	0	0	63·7	4·5		·25	1·07		50·1	14·80	2·16	3·48	40·2	61·0	1·9	5·5
A_2	2″– 7″	11	39	39	21	4·0	4·5	6·3	·04	·05	1·00	8·7	·25	·28	·44	11·5	85·8	1·5	9·1
B_1	7″–11″	0	39	38	23	3·3	5·1	2·1	·03	·02	·16	3·2	·74	·32	·11	25·0	78·5	4·3	11·0
B_2	11″–16″	0	40	29	30	4·3	5·0	4·2	·04	·03	·18	6·4	1·26	·48	·52	27·7			
C	16″+	0	26	43	31	4·3	6·2	1·0	·08	·02	·18	4·0	8·30	·96	·47		75·2	5·9	14·7
LONDONDERRY CLAY																			
A	0″– 2″	3	18	43	39	9·7	4·6	10·6	·10	·22	5·30						66·7	4·7	15·2
B_1	2″– 8″	2	14	39	47	6·5	4·7	7·9	·08	·14	1·90						66·4	7·3	17·7
B_2	8″–13″	8	20	51	29	3·6	4·8	6·0	·06	·05	·40						69·5	5·9	16·6
B_3	13″–17″	30	24	43	33	3·9	4·9	5·6	·06	·05	·20						75·5	5·1	11·8
C	17″+		24	36	40	4·4	4·8	6·3	·06	·06	·33						58·8	6·7	25·2
DILIGENCE CLAY LOAM																			
A	0″– 2″		32	42	26	6·0	5·0	8·8	·09	·18	1·55	14·0	1·20	·08	·32	10·2	69·1	4·4	14·6
B_1	2″– 4″	5	37	33	30	4·4	4·6	6·0	·06	·13	·65	9·3	·70	·05	·32	9·7	71·1	5·5	14·8
B_2	4″– 9″	7	37	27	36	3·5	4·8	6·3	·05	·11	·23	10·1	1·40	·10	·53	16·9	67·9	5·7	16·6
C	9″+	13	16	45	39	5·0	5·4	5·6	·12	·18	·24	10·5	5·70	·36	·50	35·0	60·8	6·6	22·1
PUGWASH LOAM																			
A_0	0″– 2″					56·9	3·7	54·7	·24	·85	42·10		2·09	2·21	4·52	10·7	25·1	1·7	3·7
A_2	2″– 8″	3	43	41	16	4·0	4·5	3·9	·05	·11	·89		·26	·44	·31	9·5	83·4	3·2	9·0
B_1	8″–11″	6	53	32	15	2·6	4·8	4·2	·04	·10	·41		·22	·20	·50	19·1	77·7	3·8	9·7
B_2	11″–17″	11	47	36	17	2·8	5·1	3·9	·04	·07	·33		·26	·20	·54	22·8	71·4	4·9	15·0
C	17″+	15	42	38	20	2·6	5·1	3·1	·03	·07	·10		·36	·24	·59	24·2	73·7	5·4	11·4
TRURO SANDY LOAM																			
A_0	0″– 2″					36·7	4·2	39·7	·11	·50	20·40								
A_2	2″– 4″	9	64	29	7	1·5	4·6	3·1	·02	·03	1·06						92·7	·9	3·8
B_1	4″–12″	14	59	30	11	7·2	4·6	5·6	·10	·11	3·09						70·1	5·9	10·2
B_2	12″–18″	8	53	30	17	3·1	5·0	6·7	·04	·01	·56						74·9	3·5	19·3
C	18″+	5	55	37	8	1·5	4·6	4·6	·06	·02	·08						85·0	4·1	8·8

TABLE 6—PHYSICAL AND CHEMICAL ANALYSES OF REPRESENTATIVE SOIL PROFILES—*Continued*

Horizon of Profile	Depth in inches	Gravel %	Sand %	Silt %	Clay %	Loss on Ignition %	pH	Lime req. T/Ac.	Total P_2O_5 %	Total N. %	Org. C. %	M.E. Exch. H.	M.E. Exch. Ca.	M.E. Exch. Mg.	M.E. Exch. K.	Base Saturation %	Total SiO_2 %	Total Fe_2O_3 %	Total Al_2O_3 %
KIRKHILL GRAVELLY LOAM																			
A_0	0″– 2″					63·0	3·8	29·8	·25	1·10	3·0	53·4	4·69	·36	2·07	15·6	61·2	2·2	5·3
A_2	2″– 4″	48	38	48	14	13·9	3·8	8·1	·08	·28	3·0	12·0	·20	·08	·48	10·0	72·8	3·4	16·0
B_1	4″–10″	49	43	44	13	16·5	4·6	7·1	·09	·28	4·9	12·9	·16	·08	·48	4·9	64·3	10·7	19·9
B_2	10″–19″	44	41	45	14	5·9	5·2	1·7	·08	·07	·91	1·2	·17	·08	·10	12·9	68·2	7·3	19·8
C	19″+	45	46	38	16	3·2	5·2	1·0	·08	·03	·28	2·0	·24	·40	·43	58·4	64·8	7·9	14·2
WESTBROOK GRAVELLY LOAM																			
A_0	0″– 4″					67·7	3·8	81·7	·15	1·10	36·5		3·15	·73	2·65	32·0	12·0	1·0	·5
A_2	4″– 7″	21	44	42	14	3·0	3·8	5·6	·03	·15	1·3		1·10	·28	·50	8·6	66·7		
B_1	7″–12″	56	65	23	12	12·0	4·8	14·2	·50	·17	3·75		1·04	·08	·61	31·1	60·6	9·5	16·3
B_2	12″–20″	50	59	30	11	5·2	5·4	3·9	·10	·10	1·62		·96	·16	·47	33·1	72·9	6·9	15·1
C	20″+	57	57	30	13	3·6	5·1	2·8	·09	·08	·46		·46	·03	·48	16·8	88·4	7·1	13·7
HARMONY GRAVELLY LOAM																			
A_0	0″– 2″					55·7	3·8	33·0	·14	·90		63·9	11·1	4·2	·55	23·4	30·7	2·7	4·6
A_2	2″– 6″	39	39	33	28	3·7	3·8	9·2	·03	·04	·76	9·8	·46	·16	·44	12·5	50·7	3·8	6·3
B_1	6″–14″	39	55	27	18	25·0	4·5	8·8	·10	·20	1·50	23·4	·32	·12	·61	4·1	70·6	10·7	14·2
B_2	14″–21″	61	67	23	10	5·3	4·8	2·1	·06	·02	·43	3·2	·19	·16	·20	10·1	74·0	7·7	13·2
C	21″+	60	49	34	17	4·3	4·8	3·5	·08	·02	·11	3·3	·36	·28	·50	23·2	68·8	7·5	13·4
PORTAPIQUE GRAVELLY SANDY LOAM																			
A_0	0″– 1″					50·7	3·9	38·6	·20	·86	29·6								
A_1	1″– 4″	35	52	41	7	11·6	4·7	6·3	·21	·28	5·8						69·5	5·0	9·8
B_1	4″–14″	34	57	34	9	6·6	4·9	3·9	·24	·10							70·6	4·3	12·4
B_2	14″–20″	33	60	30	10	3·5	5·1	2·8	·19	·05	·8						75·3	4·7	10·0
C	20″+	50	74	17	9	1·7	5·2	2·1	·09	·03	·3						79·2	4·4	8·3
SHULIE GRAVELLY LOAM																			
A_0	0″– ½″					37·3	3·8	33·6	·16	·72	24·7								
A_2	½″– 5″	53	48	39	13	1·5	4·0	2·8	·05	·04	·63						91·6	2·2	4·8
B_1	5″–12″	36	46	41	13	7·5	4·4	7·7	·10	·14	3·6						74·8	2·3	10·3
B_2	12″–20″	43	50	38	12	6·3	4·8	8·8	·10	·09	1·9						75·0	4·4	9·2
C	20″+	43	47	37	16	2·3	4·9	8·4	·04	·03	·52						81·4	4·4	9·6
COBEQUID GRAVELLY LOAM																			
A_0	0″– 3″					52·1	4·1	63·9	·15	1·60	39·9		7·5	4·0	2·90	24·4	15·1	1·2	1·3
A_2	3″– 5″	20	37	48	15	8·1	4·3	13·8	·06	·25	3·2		3·2	·76	·58	22·7	74·6	6·1	10·0
B_1	5″–10″	37	48	40	12	23·9	5·0	25·4	·21	·56			1·7	·48	·63	19·4	49·3	9·14	15·6
B_2	10″–22″	52	65	29	6	10·1	5·0	10·2	·16	·25	3·4		1·3	·12	·48	36·8	69·4	6·9	12·3
C	22″+	43	68	28	4	3·3	5·3	4·2	·12	·18	·95		·68	·02	·43	19·8	42·9	6·1	12·0

TABLE 6—PHYSICAL AND CHEMICAL ANALYSES OF REPRESENTATIVE SOIL PROFILES—*Concluded*

Horizon of Profile	Depth in inches	Gravel %	Sand %	Silt %	Clay %	Loss on Ignition %	pH	Lime req. T/Ac.	Total P_2O_5 %	Total N. %	Org. C. %	M.E. Exch. H.	M.E. Exch. Ca.	M.E. Exch. Mg.	M.E. Exch. K.	Base Saturation %	Total SiO_2 %	Total Fe_2O_3 %	Total Al_2O_3 %
FOLLY GRAVELLY SANDY LOAM																			
A_0	0″– 3″					59·2	3·7	61·2	·20	1·4			2·9	·10	3·59	7·2	26·4	1·9	·70
A_2	3″– 6″	3	49	42	9	2·9	4·0	5·6	·03	·08	1·4		·50	·03	·23	10·6	88·4	2·4	3·7
B_1	6″–12″	37	66	28	6	21·0	4·8	20·0	·13	·36	8·9		·28	·05	·58	2·4	57·7	7·3	12·0
B_2	12″–22″	44	54	39	7	4·5	5·6	3·9	·06	·08	1·2		·30	·03	·15	7·8	73·2	4·1	9·0
C	22″+	36	59	33	8	2·3	5·4	1·7	·07	·05	·4		·32	·02	·26	17·4	71·6	4·5	10·2
GIBRALTAR GRAVELLY SANDY LOAM																			
A_0	0″– 1″					58·3	3·7	37·2	·14	·87		63·3	8·3	1·08	·92	16·9	34·5	1·05	5·0
A_2	1″– 3″	28	60	33	7	2·4	3·9	3·1	·01	·04	·90	5·2	·21	·12	·92	41·2	69·5	1·05	9·1
B_1	3″–15″	41	60	33	7	13·4	5·3	3·1	·05	·12	2·9	10·7	·57	·08	·54	11·8	72·6	4·8	17·0
B_2	15″–25″	41	52	38	10	9·5	5·1	2·8	·06	·08	1·8	9·5	·40	·08	·44	15·1	71·0	4·6	17·3
C	25″+	40	46	47	7	2·0	5·4	1·0	·11	·02	·26	2·0	·17	·08	·12	32·1	81·8	3·8	15·8
CUMBERLAND LOAM																			
	0″– 6″	3	47	41	12	6·0	5·4	5·6	·12	·18	1·9	7·1	3·6	·15	·25	36·3	69·7	4·7	12·0
	6″–12″	1	40	42	18	4·2	5·5	3·9	·08	·16	·78	6·1	2·2	·24	·28	26·9	71·8	4·9	13·6
	12″–18″		54	32	14	3·4	5·4	3·5	·07	·10	·34	4·4	1·1	·29	·24	20·3	74·9	4·9	12·6
	18″–24″		66	23	11	3·1	5·5	3·1	·08	·08	·30	5·3	1·3	·22	·46	27·6	76·6	4·7	11·2
	24″–30″		61	28	11	3·0	5·5	2·8	·08	·11	·21	4·1	1·2	·23	·23	25·1	74·4	4·6	12·1
HEBERT SANDY LOAM																			
A_0	0″– 2″					35·1	3·8	22·3	·13	·47		40·8	4·4	·96	1·15	23·4	30·7	2·7	4·6
A_2	2″– 5″	9	70	23	7	1·4	4·2	2·4	·01	·02	·40	1·9	·14	·04	·41	12·5	50·7	3·8	6·3
B_1	5″–16″	12	72	20	8	4·2	5·1	2·1	·04	·05	·87	2·3	·18	·12	·44	30·8	70·6	10·7	14·2
B_2	16″–20″	10	72	17	11	2·2	5·3	1·0	·04	·01	·14	1·9	·20	·12	·42	10·1	74·0	7·7	13·2
C	29″+	48	78	14	8	2·0	5·5	1·4	·06	·01	·11	1·2	·19	·08	·52	23·2	68·8	7·5	13·4
STEWIACKE SILTY CLAY LOAM																			
	0″– 6″		15	60	25	11·7	4·9	4·9	·21	·28	3·0	11·1	3·3	·20	·34	32·1	70·8	7·9	14·0
	6″–12″		19	51	30	10·1	4·8	6·0	·18	·22	2·0	11·7	2·2	·20	·49	25·1	74·2	7·8	18·1
	12″–18″		19	54	27	7·0	5·0	3·9	·13	·11	1·2	6·7	1·3	·16	·49	36·0	71·8	7·9	16·8
	18″–24″		29	51	20	5·6	5·1	2·8	·11	·08	·60	4·7	·99	·16	·51	41·1	73·2	6·5	13·6
	24″–30″		26	49	25	5·5	5·3	2·4	·13	·08	·73	3·9	·87	·12	·46	29·8	75·5	7·1	13·9
ACADIA SILT LOAM																			
	0″– 6″		19	70	11	6·1	5·4	4·9	·15	·26	3·2	7·3	3·0	·19	·61	34·5	71·9	5·9	13·0
	6″–12″		20	66	14	2·7	6·5	1·7	·10	·12	·35	3·3	2·1	·35	·28	31·0	71·8	4·4	13·3
	12″–18″		15	58	27	3·2	6·7	1·7	·10	·15	·27	2·7	3·2	·56	·64	33·8	67·2	6·3	16·0
	18″–24″		18	61	21	2·6	7·0	1·4	·10	·12	·17	2·4	2·7	·54	·61	33·7	70·4	4·8	14·9
	24″–30″		20	59	21	2·6	7·2	1·0	·10	·11	·16	2·5	2·5	·53	·91	34·2	70·3	5·3	14·4

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