Soil Survey of the Gander-Gambo Area, Newfoundland

Report No.1 Newfoundland Soil Survey 1972

Agriculture Canada

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INTRODUCTION

The soil survey of the Gander–Gambo area was started in the spring of 1964 under the Agricultural and Rural Development Act (ARDA) to determine the nature of the soils, their extent and location in the area, and their capability for agriculture. The survey required examination, description, and mapping of the soils in the field together with a vegetation survey, and observations of bedrock, climate, streams, and ponds. The survey was conducted in close liaison with the ARDA forest capability mapping for the Canada Land Inventory and where possible identical boundaries were drawn.

The first part of the report gives a brief description of the area and the factors affecting the development, classification, and use of the soils. The main body of the report describes the soils in detail, and outlines their capability for agriculture and forestry. Data on chemical and physical analyses as well as on readily available nutrients support this section.

A soil map showing the distribution of various kinds of soils and a capability map for agriculture accompany the report.

GENERAL DESCRIPTION OF THE AREA

Location and Extent

The surveyed area covers 513,700 acres, or 802.7 sq miles, and is located in the northeastern part of the island of Newfoundland (Fig. 1). It lies between lat 48° 45′ and 49° N and long 55° and 54° W and includes the Gander and Gambo National Topographic map sheet areas 2 D/15 and 2 D/16 respectively, on a scale of 1:50,000. Gander Lake in the west and center of the mapped area and Freshwater Bay in the southeast mark the general location (Fig. 2).

Population and Industry

The Gander–Gambo area has two concentrations of population: the town of Gander, and the coastal communities of Gambo, Dark Cove, Middle Brook South, and Hare Bay. These concentrations of population reflect two separate histories of settlement and growth.

The growth of the town of Gander was closely linked with the development and operation of the international airport. The importance of the site as a refueling stop during the era of transatlantic flights with propellor-driven aircraft was mainly responsible for its growth into a community of about 6,000 persons. With the advent of jet aircraft Gander declined in importance as a refueling stop, but an increase in air cargo operations and charter flights has reversed the decline. The present population of 8,000 persons attests to the continuing importance of Gander as a transportation and communications center.

Population growth of the coastal communities compares closely with the natural rate of 2.5% per year for Newfoundland (Hunting Survey Corp., 1964). An emigration that is typical of many other rural parts of Canada has been prominent. At present less than half the population of these centers is in the productive age range, 15 to 64 years.

Pulpwood cutting for Bowaters and Price Companies is the main occupation in these communities; cutting of timber for small sawmills, carpentry, and other activities associated with the forest industry are also important.

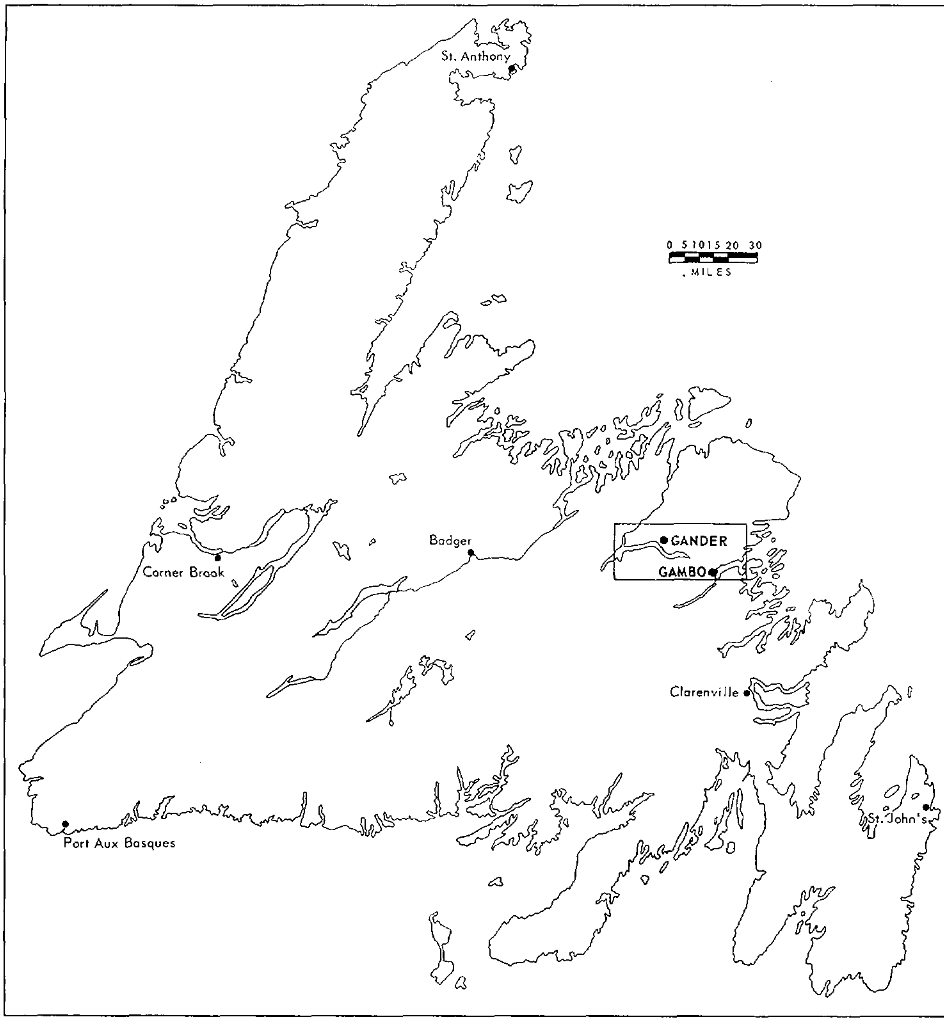

Fig. 1. Outline map of Newfoundland showing the area surveyed.

Few employment opportunities exist in the coastal communities of northeastern Newfoundland. Fishing, once a mainstay of livelihood, is of decreasing importance and the salt cod fishery that now exists in these coastal communities remains a cottage industry as in the past. Hare Bay was formerly one of several centers for the Labrador fishery. The small village of Benton is the only population center between Gander and the coast to the east. Benton functions mainly as a loading place for railway transshipment of pulpwood. The remainder of this portion is largely uninhabited.

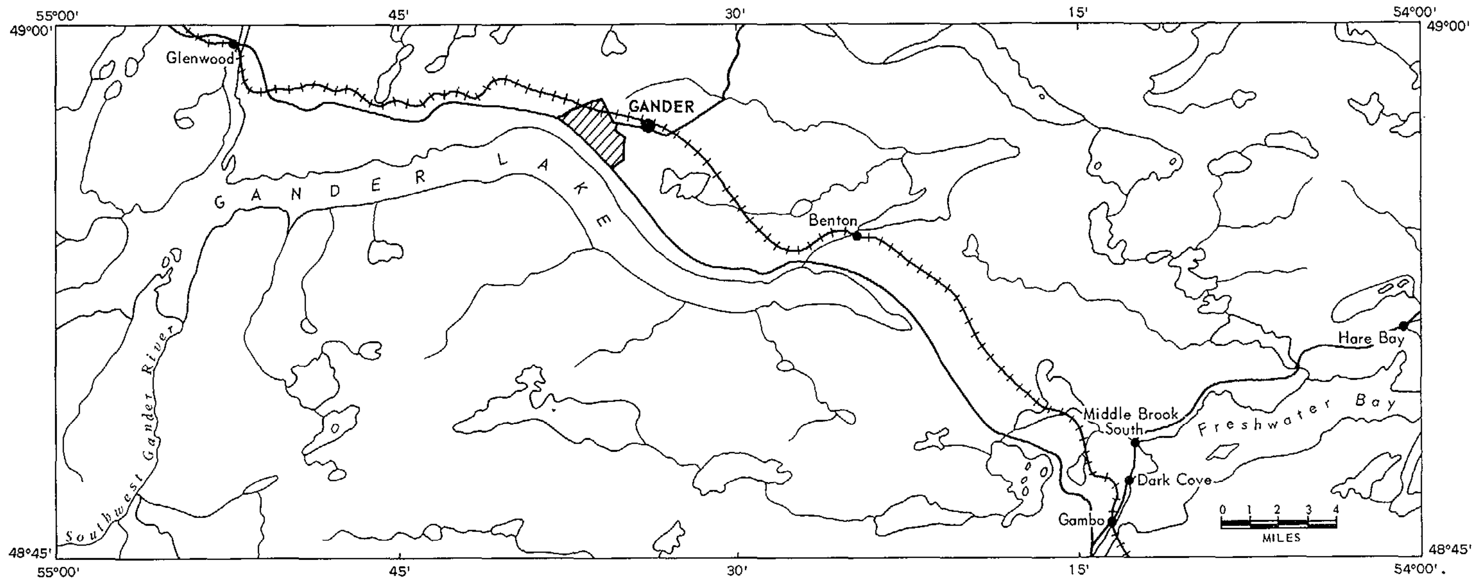

Fig. 2. Outline map of the Gander-Gambo area.

Transportation

The Trans Canada Highway and the Canadian National Railways cross the mapped area from the southeast to the northwest. There is a road from Gander north to Gander Bay, and a road from Gambo in a northeasterly direction linking the coastal communities (Fig. 2). Some logging trails were used in the survey, but much of the traveling had to be done on foot, by canoe, and occasionally by floatplane.

Recreation

Much of the area is a fishing, hunting, boating, and camping paradise. In countless nonscheduled lakes, ponds, and rivers, trout fishermen can take brook trout, and brown and rainbow trout. In many scheduled streams, fighting Atlantic salmon and sea-run squaretails present an exciting challenge to the angler's skill with a fly rod.

Woodland caribou roam the area, and a prolific moose population leave but few hunters without an impressive trophy. Other game that can add variety to a hunting trip include black bears, ducks, and ptarmigan. Licensed caterers provide fly-in trips to many comfortable camps from which the wilderness sections can be hunted, with special provisions made for bow hunting.

FACTORS IN SOIL FORMATION

Climate

The annual cycle of air temperature in Newfoundland is similar to that in other parts of the Atlantic region of Canada, but the presence of the sea reduces the observed extremes. Newfoundland's reputation for bleak cold at all seasons is far from justified; in winter the whole Island is milder, for example, than the Montreal plain, and in summer much of it compares well with Edmonton. Long-term climatic data for the mapped area were obtained from the weather station at Gander. The annual average of daily mean temperatures is 38.9 F (Dominion Bureau of Statistics, 1960). February is usually the coldest month with the mean minimum temperature of -7 F; the mean maximum temperature for July and August, the two warmest months, is about 85 F (D.B.S., 1960; Hare, 1952). The vegetative season in central Newfoundland begins rather late (May 15) because of the influence of the cold Labrador current and the arctic ice pack, which often surrounds the Island in early spring; the season ends around the last week of October. The frost-free period is about 120 days, with local variations due to topography, drainage, and coastline.

The mapped area, located in the northeastern part of the Island, is somewhat drier than most other parts of the Island. The total mean annual precipitation at Gander is about 39.5 inches (D.B.S., 1960). Although the autumn months tend to be the wettest, with November as the month of greatest precipitation (Hare, 1952), the precipitation is well distributed throughout the year. Snowfall is high in the interior and averages 119.2 inches at Gander (D.B.S., 1960). Table 1 (Hare, 1952) shows observations on air temperature, precipitation, and cloudiness.

Fig. 3 indicates that on the average there is no moisture deficiency in the area and that moisture storage is reduced by only 2.24 inches at Gander, assuming that soil moisture storage capacity is 4 inches (Thornthwaite, 1948). Moisture deficiencies probably occur in certain years in the rapidly drained soils of the area, because

Table 1. Temperature, Precipitation, and Cloudiness at Gander,* 1937–48 (Hare, 1952)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual	Years of Observation
Air temperature, F, at station level														
Mean daily	19	19	24	33	44	52	62	61	55	44	34	25	39	10
Mean of daily maximum	26	27	32	40	53	62	72	70	63	51	40	31		10
Mean of daily minimum	12	11	17	26	35	43	52	52	47	37	28	19		10
Mean of daily range	14	16	15	14	18	19	20	18	16	14	12	12		10
Mean of monthly maximum	40	42	43	54	71	82	84	86	79	70	57	44		5
Mean of monthly minimum	-6	-10	-3	12	24	34	41	39	38	24	13	3		5
Absolute maximum	50	53	53	71	77	87	91	89	83	76	67	50	91	11
Absolute minimum	-14	-15	-14	4	22	28	36	38	32	23	6	-5	-15	11
Precipitation, inches														
Mean of monthly total	2.8	3.5	2.5	2.3	2.4	3.1	3.7	3.6	3.3	4.3	4.5	3.8	39.7	11
Mean of monthly rainfall	0.6	0.8	0.8	1.0	1.9	3.0	3.7	3.5	3.2	3.9	3.4	1.3	27.1	11
Mean of monthly snowfall	22	27	17	13	5	1	-	-	0.5	4	11	25	127	11
Total days	17	18	20	14	15	13	16	16	18	20	20	204	5	
Rain, days	16	18	17	12	4	1	-	-	-	4	11	14	97	5
Cloudiness, mean, days														
0130 hr	7.3			7.3			6.5			6.1				7-9
0730 hr	7.9			7.9			7.6			7.3				7-9
1330 hr	8.2			8.1			7.5			7.8				7-9
1930 hr	6.9			7.6			7.3			6.4				7-9

*Lat 48° 57′ N, long 54° 34′ W. Height above sea level, 482 ft.

their moisture storage capacity is much lower than the 4 inches assumed for average soils.

Parent Materials and Deposition

Parent materials are mainly glacial drift deposits derived to a large extent from sedimentary and metamorphic rock, such as shale, slate, sandstone, and schists, which underlie most in the area (Fig. 4). Granitic outcrops are common. Small outcrops of basic intrusives occur, but are too small to influence the composition of the parent materials significantly.

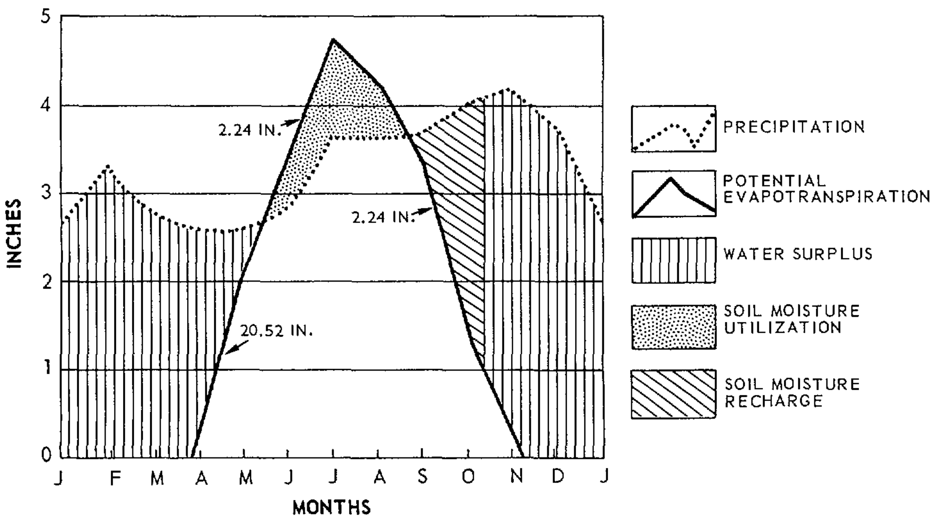

Fig. 3. Precipitation and potential evapotranspiration at Gander, Newfoundland.

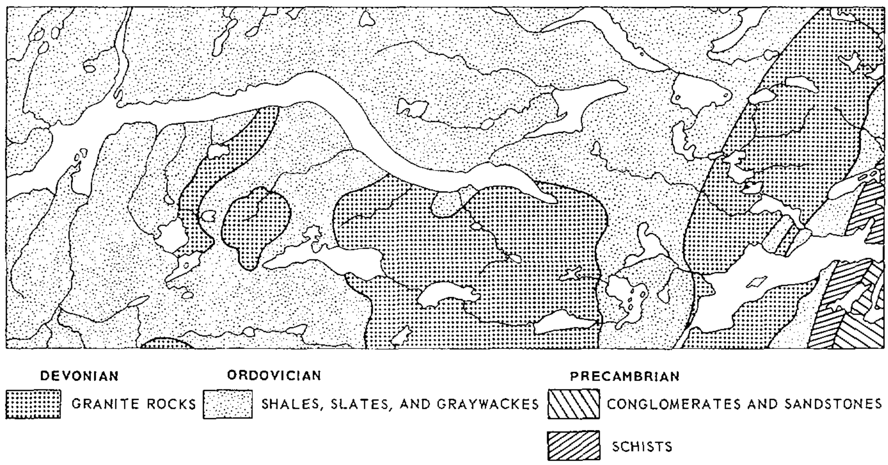

Fig. 4. Geological formations of the Gander–Gambo area.

Practically all the soils in the mapped area have developed from glacial till deposits (Fig. 5). These include mainly ground moraine deposits from a few inches to over 20 ft thick and composed largely of materials derived from locally underlying bedrock. Because the mapped area lies within a large north–south belt of granite intrusions, the till is generally composed of varying amounts of granite mixed with materials from other sources. Only in a portion of the mapped area, largely north of Gander Lake, is the till composed predominantly of materials derived from underlying shale and sandstone. A few sections occupied by soils developed on till derived mainly from shale occur in the west half of the Gander map sheet area. These sections were much scoured during glaciation and as a result the soils are very shallow.

Parts of a large end moraine (Jenness, 1963) can be recognized in the southern portion of the Gambo map sheet area. The till in this deposit is composed mainly of unsorted granitic materials.

A significant portion of the mapped area has been affected by the action of glacial meltwater. Kame terraces, eskers, and other outwash deposits occur at several locations. These deposits commonly consist of well-stratified sands and gravels, sometimes partly overlain by shallow till. A deposit described as a kame terrace occurs along the southeast-facing slope just behind the village of Gambo. Moderately well sorted sands and gravels are exposed in some of the gravel pits in the locality. An isolated remnant of outwash sand and gravel occurs along the valley leading from the southeast end of Gander Lake to Freshwater Bay at the village of Middle Brook South. This deposit consists of well-stratified sand and gravel partly overlain by till. Another deposit of well-stratified sands and gravels occurs along the valley of the Southwest Gander River. Here, however, the remnants are of minor extent and most of this portion is occupied by fluvial deposits at lower levels.

Soils developed on till parent materials of granite composition have coarse sandy textures and are grayish brown in color. Till deposits are often shallow and surface boulders are numerous. Water percolation is rapid and these soils tend to be

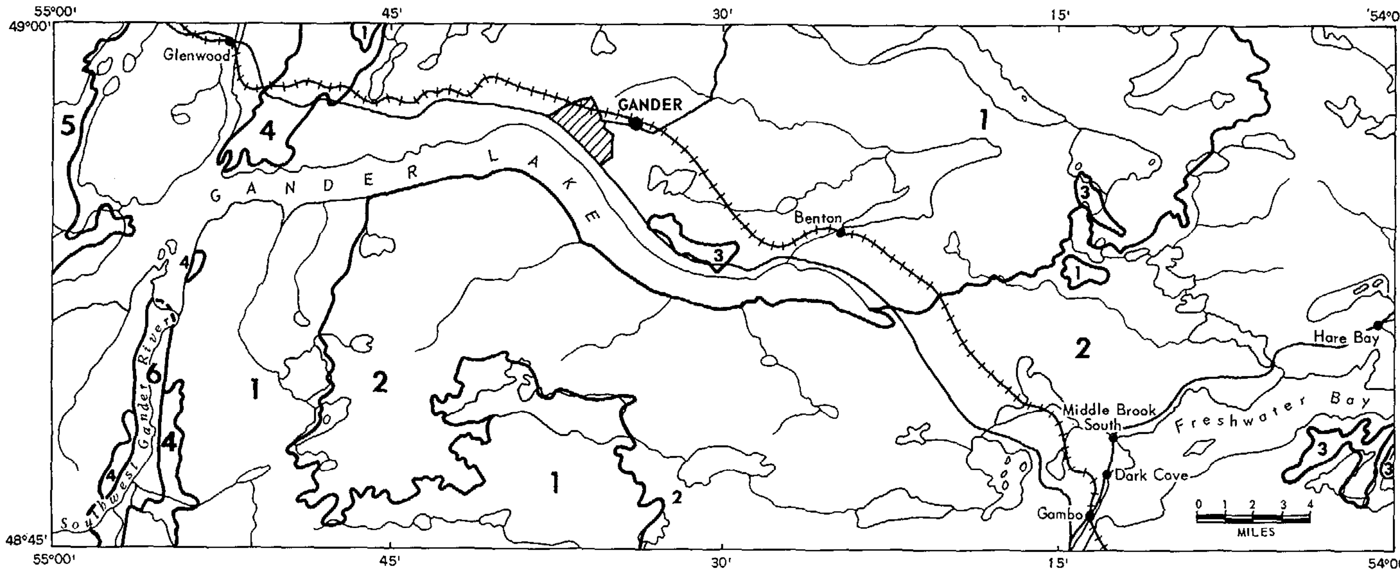

Fig. 5. Map of soil parent material.
1. Till predominantly derived from material of the Gander lake group, shale, graywacke, argillaceous sandstone, siltstone, chloritic rocks.
2. Till predominantly derived from granitic rocks.
3. Bedrock; undifferentiated.
4. Shale and till derived from shale.
5. Mixed till derived from acid and basic igneous rocks.
6. Alluvial deposits.

rather droughty. Soils developed on till composed of sedimentary and rock materials are generally olive gray and have textures from loam to silt loam or clay loam. They are often shallow, but have better moisture-holding capacities than those derived from granite.

In the Gander and Gambo map sheet areas the soils and land types are estimated to occupy the following acreages:

Soils developed from glacial till	348,000 acres or 68%
Soils developed from glacial outwash	4,000 acres or 0.8%
Shallow soils over shale	10,000 acres or 1.9%
Organic soils	44,000 acres or 8.5%
Lakes, ponds, and the main rivers	80,100 acres or 15.6%
Rocks and extremely stony land	15,900 acres or 3%
Gander town and airport	11,700 acres or 22%
Total	513,700 acres

Vegetation

Large sections of the Gander–Gambo area are covered with coniferous forests, but heath barrens and also organic soils that support almost no trees are widespread. The severe fires of 1961 drastically reduced the forested portion, burning 64,640 acres of productive forest in the Gambo map sheet area and 23,045 acres in the Gander map sheet area. The best-drained soils, those of the Podzolic Order, are generally covered with balsam fir, trembling aspen, and black spruce, and scattered white birch. A history of repeated fires has favored the development of extensive black spruce forests. The dense to open black spruce stands have an understory of sheep-laurel, lowbush blueberry, mountain cranberry, Labrador tea, with some bunchberry and plume moss. The podzolic soils that have slight mottling in the lower B and the C horizons are generally covered with balsam fir, black spruce, and scattered stands of white birch, with occasional white spruce. These soils are among the best forest sites with an understory of green alder, pin cherry, twinflower, dwarf raspberry, and feather moss.

The Gleyed Podzols are largely covered with black spruce, balsam fir, tamarack, speckled alder, and Bartram's serviceberry, with a ground vegetation of sheep-laurel and the mosses *Hypnum crista-castrensis* Hedw., *Hylocomium splendens* (Hedw.) BSG., *Dicranum undulatum* Schrad., and *Cladonia* species.

Some of the gleysolic soils on slopes with seepage conditions support a thriving stand of dense balsam fir with scattered white birch and occasional white spruce, and an understory of twinflower, bunchberry, blueberry, and the mosses *Hylocomium splendens* (Hedw.) BSG., and *Dicranum scoparium* Hedw.

On poorly drained sites the gleysolic soils generally support black spruce, tamarack, speckled alder, Labrador tea, sheep-laurel, lowbush blueberry, and mountain cranberry.

Heath barrens support an abundance of sheep-laurel, lowbush blueberry, mountain cranberry, Labrador tea, and reindeer lichen, and also some bunchberry and feather moss.

Many of the organic soils show an abundance of sheep-laurel, Labrador tea, cloudberry, and sphagnum mosses with increasing sedge, scattered bunchberry, and some grass near the edges under stunted scattered black spruce, tamarack, and speckled alder.

Topography and Drainage

The Gander–Gambo area lies largely within the eastern part of the Central Lowland of Newfoundland. The overall topography is that of a rather flat to gently rolling plain sloping to the northeast. Local relief is generally less than 200 ft except along the sides of the Gander River and Gander Lake, where elevations range from 300 to 600 ft above sea level.

Gander Lake marks an abrupt increase in elevation from about the 350-ft level on the north to the 700-ft level on the south. The valley occupied by Gander Lake is considered to be a fault valley, which was deepened by glacial action (Jenness, 1963). Glacial action is responsible for the generally rounded appearance of much of the land surface.

The gently undulating to rolling topography of the area becomes generally steep and hilly on the eastern side. Increased local relief accompanied by steep valley sides and rock ridges becomes common near the coast.

High precipitation and limited evaporation on a peneplain, with low relief practically unaltered by glaciation, have caused much ponding and a deranged drainage pattern with extensive sections of poor drainage.

On many lower slopes and even on hills with moderately flat and undulating crowns, peat has formed over imperfectly or poorly drained soils.

Drainage in the western half of the area is mainly toward the Gander River; drainage in the eastern half is to Freshwater Bay (Fig. 2). Spring runoff in the Gander River is regulated to a large extent by Gander Lake and the many ponds. Spring runoff to the east into Freshwater Bay is also modified by many large and small ponds, reducing spring flooding to a minimum.

Age

The best estimate of the length of time since deglaciation is between 7,000 and 8,000 years (Jenness, 1963). The rather unweathered nature of the till found throughout the island of Newfoundland (MacClintock and Twenhofel, 1940) indicates that the soils of the Gander–Gambo area are relatively young and contain a significant proportion of readily altered minerals.

SOIL DEVELOPMENT AND PHYSIOGRAPHY

Soil development depends mainly on parent material, texture, and climate, but landform and position on the slope are also important. Abundant precipitation and rather low evaporation cause the necessary humid conditions that encourage the formation of organic soils. Organic soils develop not only in the low-lying depressions, but some can be found on the lower parts and sometimes over extensive parts of sloping terrain with gradients of 8% and over. The development of organic soils on slopes is especially encouraged where a depression exists near the top of the slope (Fig. 6).

Another development on slopes affects the Ae or leached horizon in podzolic soils. Tree growth and subsequent churning of the soil when trees are blown over appears to be one reason for an often thin and irregular Ae horizon; churning of the soil due to frost also appears to take place. The very high moisture content of many soils in spring appears to be another reason. Many soils are saturated with water and have the consistency of porridge. Road travel on unmetalled roads is impossible for a few weeks in the spring and it is not uncommon to see a car or truck bogged down to over the axles in a soil with a stone and gravel content of

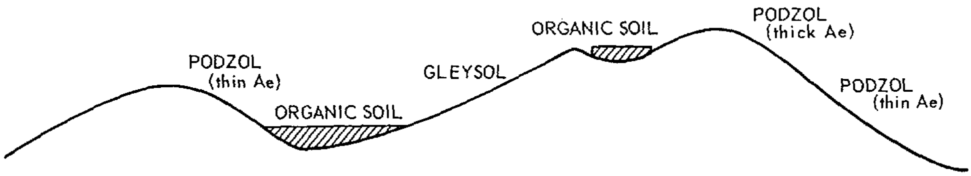

Fig. 6. Sketch showing relation of soil development and physiography.

more than 50%. The stones appear to be floating in the mud and the saturated soil creeps down the slope. These phenomena help to explain the presence of a thin Ae horizon on slopes, and a pronounced thick Ae on hilltops and in some very well drained localities.

CLASSIFICATION OF THE SOILS

Methods of Soil Survey

Available roads and trails were used to make a preliminary field examination of the area. The lack of roads greatly hindered extensive field operations. Access was somewhat aided by boat travel on the main lakes, but most of the field work was done by traverses on foot. Spot checks of the least accessible areas were made near lakes suitable for the operation of a float-equipped airplane. Because transportation of personnel and field and camping equipment was often carried out by a combination of truck, plane, canoe, and on foot, preparation of actual field surveys required much attention. It was necessary to examine the weather forecast and pay attention to the weather because a light floatplane is not equipped to land under adverse conditions on water often unfamiliar to the pilot. Thus trips often had to be postponed or canceled.

Inspections of aerial photographs of the area supplemented the ground surveys to provide information on possible access routes.

Stereoscopic examination of aerial photos was used to delineate soil areas, vegetational cover, bedrock, streams, and drainage. Obvious landform boundaries were the basis for most soil delineations. However, forest vegetation boundaries were often used to delineate soil areas within main landform divisions. Although these boundaries conformed well to the large topographic divisions of the landscape, they did not always coincide with the present guidelines for the classification of topography laid down by the Canada Soil Survey Committee.

Initial photo interpretation made use of older aerial photographs at scales of 1 inch to 2,640 ft and 1 inch to 3,333 ft. Recent photographs at 1 inch to 1,320 ft were used for later interpretation and compilation. Base maps were National Topographic Series maps at a scale of 1:50,000. A Map-O-Graph was used to facilitate transfer of lines from air photos to base maps. These lines showing soil areas were then traced on autopositive copies of the base map in order to facilitate reproduction of the completed soil maps.

Soil sampling and soil analyses in the laboratory provided the necessary data for proper characterization and classification of the soils and for estimating their usefulness for agriculture and forestry.

Soil areas on the maps are designated by composite symbols that use abbreviations of soil series names in the numerator and Canada Soil Survey Committee symbols for topography, stoniness, and rockiness in the denominator. A soil area designated by a single soil series symbol is considered to be 80% or more occupied by soils of that series. A soil area designated as a complex by two soil series symbols is considered to be occupied by 80% or more of a combination of soils of both series shown in decreasing order of dominance. Miscellaneous land types and various types of organic deposits are similarly designated where they occur in combination with recognized soil series.

Agricultural soil capability assessment was made simultaneously with the soil survey at a scale of 1:50,000.

Kinds of Soil Profiles

Mineral Soils

In Table 2 the mineral soils of the mapped area are grouped into two Orders: Podzolic and Gleysolic. Podzolic soils display light-colored eluviated (Ae) horizons underlain by illuvial (B) horizons in which Fe and Al oxides and organic matter are the main accumulation products.

Podzolic soils are the main soils in the area. They are subdivided into Orthic Humo-Ferric, Orthic Ferro-Humic, and Gleyed Podzols. Orthic Humo-Ferric and Ferro-Humic Podzols have characteristics typically developed in well-drained slope positions. Some of the Orthic Humo-Ferric Podzols possess indurated or cemented B horizons known as ortstein. Orthic Ferro-Humic Podzols are usually found under heath vegetation. Gleyed Podzols include podzolic soils with general characteristics of any of the above subdivisions, but modified by periodic wetness in some or all of the profile.

Soils classified as Orthic Gleysols on the basis of their profile and morphology occur throughout the area, although less extensively than Podzols. In these soils the development of podzolic characteristics has been restricted by lack of aeration and by poor drainage. Soil horizons are mottled with gray and yellowish brown because

Table 2. Key to the Soil Series

Parent material		Podzolic soils		Brunisolic soils	Gleysolic soils
Texture	Lithology	Well drained	Imperfectly drained	Imperfectly drained	Poorly drained
Moderately stony, medium textured glacial till	Gray to black shale	Benton		Soulis Pond	Boot Pond
Stony, medium-textured glacial till	Gray to black shale siltstone, and sandstone	Gander	Wing Pond		Home Pond
Slaty, shallow medium-textured glacial till	Gray to black shale	Glenwood			
Stony, moderately coarse-textured glacial till	Medium-grained gray to pink granite plus shale, siltstone, and sandstone	Gambo	Butts Pond		
Stony, coarse-textured glacial till	Medium-grained gray to pink granite	Terra Nova	Square Pond		
Stony, coarse-textured glacial till	Medium-grained granite, granodiorite, and diorite	Peyton	Fox Brook		
Medium sands over gravel	Mixed	Southwest Gander River			
Coarse, well-stratified sands and gravel	Mixed	Eastport			

of the reduction of Fe compounds under such conditions. In very wet sites the colors may be much subdued and horizons may be dull gray.

Organic Soils

Sections of organic soils are not extensive in the mapped area. They are considered to be organic deposits and are broadly divided according to type of vegetation and degree of decomposition. Sphagnum peat is the predominant type of organic deposit. The material beneath the surface is slightly to moderately well decomposed. Grass and sedge peat occur to a minor extent and are usually found at the edges of larger expanses of sphagnum peat or in small sections often along streams.

The term *muck* is used here to designate any well-decomposed organic deposit. Muck deposits are usually found only on depressional sites, but some shallow mucks occur on lower slopes under mixed forest and alder vegetation.

The name *ericaceous peat* is used here to designate L–H layers that have accumulated under heath vegetation on upland sites. Accumulated thickness of these layers varies because of a hummocky microrelief, but is often about 18 inches.

A key to the mineral soils of the area is given in Table 2. Horizontally, the soils have developed from similar parent material; they have similar texture but differ in morphological features that are related to differences in drainage. Vertically, the soils have similar drainage but differ in texture. Rocky land, boulder terrain, and organic soils are discussed after the mineral soil descriptions.

Table 3 shows the acreages and percentages of the mapped soil series, organic soils, water, and land.

DESCRIPTIONS OF THE SOILS

The soils are classified according to the taxonomic system of classification outlined by the National Soil Survey Committee of Canada in 1968. The basic unit in the field classification is the soil series. A soil series is a group of soils having soil horizons that are similar in physical and chemical characteristics within the soil profile and developed from a particular parent material. They may occupy large continuous land areas, but more often occur in association with other soil series in a landscape pattern. The soil profile as viewed in vertical cross section is a succession

Table 3. Acreages of Soil Series, Organic Soils, Water, and Other Land

	Acreage	%		Acreage	%
Benton	30,370	5.91	Square Pond	66,122	12.87
Boot Pond	9,479	1.85	Terra Nova	55,307	10.77
Butts Pond	12,211	2.38	Wing Pond	34,935	6.80
Eastport	616	0.12	Ericaceous peat	866	0.17
Fox Brook	783	0.15	Grass and sedge peat	4,080	0.79
Gambo	32,630	6.35	Muck	4,250	0.83
Gander	65,573	12.76	Sphagnum peat	34,804	6.78
Glenwood	10,129	1.97	Boulders and rock	14,900	2.90
Home Pond	8,346	1.63	Gander town and airport	11,700	2.27
Peyton	4,098	0.80	Water	80,100	15.59
Soulis Pond	14,260	2.78			
Southwest Gander River	3,531	0.69	Total	513,700	100.00

of layers or horizons extending from the surface down into the underlying geological material. The layers or horizons are described here in their moist condition with colors given in Munsell values.

Benton Catena

The soils of the Benton catena occur in both the Gambo and Gander map sheet areas. The glacial till parent material of these soils is composed mainly of regionally metamorphosed Ordovician shale. The ground moraine deposit on which they have developed is generally more than 3 ft deep. Single-slope topography is characteristic of sections occupied by this catena. Soils of different drainage occur in the same section, and development depends on slope position, steepness, and length of slope. Where these soils are intricately associated, variations in microrelief and in depth of till over the shale bedrock appear to be additional factors influencing their occurrence. Differences in drainage and in associated morphological features led to recognition of three series: Benton, Soulis Pond, and Boot Pond.

Benton Series

The Benton soils are moderately well drained, of silt loam texture, and of low base status. They have been classified as Orthic Humo-Ferric Podzols (tending toward Degraded Dystric Brunisol), and cover 30,370 acres. The profile displays a thin but distinctly developed Ae horizon and often fine rust-colored mottles in the lower transitional BC horizon. The solum is usually about 20 inches thick and is moderately stony. The C horizon is usually of fragipan character.

The profile of a Benton silt loam soil is described as follows:

Horizon	*Depth inches*	
L-F	2 - 0.5	Fibrous, slightly decomposed moss, needles, and twigs.
H	0.5 - 0	Dark, decomposed, granular organic matter.
Ae	0 - 2	Light gray (7.5YR 7/1) silt loam; structureless or weak, fine platy; friable; few fine roots; abrupt, wavy boundary; pH 4.5.
Bfh1	2 - 6	Yellowish red (5YR 4/6) silt loam; moderate, fine granular; loose; plentiful to abundant fine roots; clear, wavy boundary; pH 4.7.
Bfh2	6 - 13	Strong brown (7.5YR 5/6) silt loam; weak, fine granular; friable; fine roots plentiful; clear, wavy boundary; pH 4.9.
BC	13 - 19	Olive (5Y 5/3) loam; common, fine, faint mottles; weak, fine subangular blocky; few roots; gradual, wavy boundary; pH 5.2.
Cx	19+	Olive gray (5Y 5/2) loam; few, medium, distinct, yellowish brown (10YR 5/6) mottles; weak, coarse platy; compact or weakly cemented; pH 5.2.

Range in characteristics. These soils often have very thin leached or Ae horizons, with Bf horizons between 12 and 20 inches thick. They are more fertile than any other soils examined in the mapped area. The stoniness varies from place to place and ranges from slight to moderate.

Use. The agricultural capability of these lands is the best encountered. The drainage in the lower part of the profile varies and this appears to have an important bearing on the forest productivity, which is generally good. Soil capability for agriculture is rated Classes 3 and 4 and the subclass limitations are adverse climate (C), stoniness (P), low fertility (F), and topography (T).

Soulis Pond Series

The Soulis Pond soils are moderately poorly drained, dominantly of loam to silt loam texture, and of low base status. They have been classified as Gleyed Dystric Brunisols, and cover 14,260 acres. The profile is characterized by a distinctly mottled, grayish-colored BC horizon underlain by a strongly mottled Cg horizon of darker appearance. Weakly developed Ae and Bf horizons often occur in the upper part of the BC and give the profile an appearance of being slightly podzolized. The

Fig. 7. A soil pit in the Soulis Pond series.

combined thickness of the Ae and Bm is usually about 3 inches, but may be as much as 6 inches as in the sample profile described here. The C horizon is a fragipan. The Soulis Pond soils generally occur in association with the Boot Pond soils on long, gentle to moderate slopes, and with the Benton soils on strong to steep slopes.

The profile of a Soulis Pond silty clay loam is described as follows:

Horizon	*Depth inches*	
L–F	3 - 0.5	Fibrous, partly decomposed moss with some needles.
H	0.5 - 0	Dark, granular, well-decomposed organic matter.
Aegj	0 - 3	Light gray (10YR 7/2) silty clay loam; brownish yellow (10YR 5/6) mottles sometimes present; weak, fine granular; friable; clear, wavy boundary; horizon not always present; pH 4.6.
Bm	3 - 6	Brown to reddish brown (10YR to 5YR 5/3) loam; no mottling evident; weak, fine granular; friable to firm; clear, wavy boundary; horizon not always present; pH 4.9.
BC	6 - 14	Light olive gray (5Y 6/2) loam; few, medium, distinct mottles; weak, fine subangular blocky; friable to firm; small concretions occasionally present; gradual, wavy boundary; pH 5.5.

Fig. 8. A soil pit in the Boot Pond series.

Cg	14 - 20	Light olive gray (5Y 6/2) loam; many, medium, brown (10YR 5/3) mottles; weakly cemented or somewhat concretionary; pH 5.6.
Cx	20+	Light olive gray (5Y 6/2) loam; rough bands of dark brown to reddish brown (10YR to 5YR 4/3) mottles often present; weak, coarse platy; weakly cemented; pH 5.5.

Range in characteristics. These soils are often intimately mixed with Benton and Boot Pond soils under a fairly wide range of drainage conditions. Also, the cementation in the lower horizon varies considerably in depth and consistence, and the stoniness varies from slight to moderate.

Use. These soils are capable of fair to good forest production. The agricultural value is judged only fair because of generally impeded drainage, but excellent grass crops may be possible with some additional drainage. Soil capability for agriculture is Class 4 and the subclass limitations are adverse climate (C), excess water (W), stoniness (P), and low fertility (F).

Fig. 9. A soil pit in the Gander series.

Boot Pond Series

The Boot Pond soils are poorly drained, are of loam to silt loam texture, and have been classified as Orthic Gleysols. They are of low base status, but have much higher percentage base saturation values than the other soils of the Benton catena. They cover 9,479 acres. The profile is characterized by weakly developed, friable Ah and Ahe horizons, a firm Bg horizon with many yellowish red mottles throughout, a compact BC horizon that shows decreased mottling with increased depth, and a compact, noncemented C horizon with very few mottles. The Boot Pond soils may have many stones near the surface, but are usually moderately stony throughout. These soils occur dominantly on gentle to moderate slopes, but may occur at lower slope positions on strong- or steep-sloping topography.

The profile of a Boot Pond silt loam is described as follows:

Horizon	*Depth inches*	
F-H	5 - 3	Partly decomposed roots with some granular decomposed organic matter.
H	3 - 0	Black greasy decomposed organic matter.
Ah	0 - 2	Dark grayish brown (10YR 4/2) silt loam; weak, fine granular; friable; roots plentiful; clear, smooth boundary; pH 5.3.
Ahe	2 - 7	Grayish brown (2.5Y 5/2) loam; weak, fine granular; few roots; clear, smooth boundary; pH 5.6.
Bg	7 - 16	Gray (5Y 6/1) loam to silt loam; many, coarse, prominent, yellowish red (5YR 5/8) mottles throughout; moderate, coarse blocky; firm; very few roots; clear, smooth boundary; pH 6.6.
BC	16 - 26	Olive gray (5Y 5/2) loam; few mottles; moderate, medium blocky; firm; very few roots; gradual, wavy boundary; pH 6.9.
Cg	26+	Olive (5Y 5/3) loam to clay loam; compact moderately stony and slaty till; few mottles; pH 6.9.

Range in characteristics. The organic cover of these soils ranges from 1 to 16 inches in thickness and consists mainly of sphagnum moss, feather moss, or sedge, grass, and weed remains. The Ah horizon is 0 to 3 inches thick, and the Ahe horizon is thin or absent in many places.

Use. The Boot Pond soils are moderately stony and poorly drained and their forest productivity ranges from poor to fair. These soils could be used for pasture if cleared of stones and drained. The soil capability for agriculture is Class 5. The subclass limitations are wetness (W), stoniness (P), and topography (T).

Eastport Catena

The soils of the Eastport catena are found in the east half of the Gambo map sheet area. They have developed from sands and gravels of the Gander Lake - Middle Brook South outwash deposit. These soils are similar to those that have developed from the Gambo Pond - Alexander Bay and Terra Nova River - Traytown outwash deposits. Only one series, Eastport, has been segregated within the catena.

Eastport Series

The Eastport soils are rapidly drained, of sandy loam to loamy sand texture, and of very low base status. They have been classified as Orthic Humo-Ferric Podzols, and cover 616 acres. Textural variations within the profile occur as a result of the well-stratified nature of the outwash deposits.

The profile of an Eastport sandy loam is described as follows:

Horizon	*Depth inches*	
L-F	2 - 0	Loose, fibrous covering of partly decomposed roots, twigs, and needles.
Ae	0 - 3	Pinkish gray (7.5YR 6/2) sandy loam; weak, coarse granular; loose; roots plentiful; abrupt, wavy boundary; pH 3.7.
Bfhc	3 - 5	Dark red to dark reddish brown (2.5YR 3/6 to 3/4) sandy loam; weak, coarse platy; firm to weakly cemented; roots plentiful; clear, wavy boundary; pH 5.1.
Bfc	5 - 9	Yellowish red (5YR 5/8) gravelly sandy loam; amorphous; strongly cemented; no or few roots; clear, wavy boundary; pH 5.5.
BC1	9 - 15	Strong brown (7.5YR 5/6) gravelly sandy loam; amorphous; weakly cemented; no or few roots; clear, smooth boundary; pH 5.4.
BC2	15 - 21	Grayish brown (2.5Y 5/2) sand; amorphous; firm; no or very few roots; gradual, wavy boundary; pH 5.3.
C	21 +	Light brownish gray (2.5Y 6/2) loose sand and fine gravel; pH 5.0.

Range in characteristics. The texture varies greatly from place to place, with sandy patches and some loamy soil. The cementation in the B horizon ranges from weak to strong and often extends to the C horizon. The fertility is very low.

Use. Eastport sandy loam soils are often dry and have very poor to poor forest capability; they are unsuitable for agriculture. Soil capability for agriculture is Class 7, with subclasses of moisture deficiency (M), restricted rooting zone (D), and stoniness (P).

Gambo Catena

The soils of the Gambo catena are found in the southern and eastern portions of the mapped area. They occupy large expanses of sloping land and are derived from a ground moraine deposit that has till composed of roughly equal parts granite and regionally metamorphosed, fine-grained sedimentary rocks. The soils of this catena may be found intermixed with the soils of the Terra Nova catena, but the main occurrence is as a drainage sequence on simple slopes. Two series, Gambo and Butts Pond, are recognized within this catena.

Gambo Series

The Gambo soils are moderately well drained, of sandy loam texture, and of low base status. They have been classified as Orthic Humo-Ferric Podzols, and cover 32,630 acres. The profile displays a thin but distinct Ae horizon, distinct Bfh and Bf horizons, a thick BC transitional horizon that may be slightly mottled, and a C horizon that is compact and usually not mottled. Structure is granular throughout the solum. Gambo soils occur intermixed with Square Pond soils on slopes where variable thickness of till over bedrock restricts drainage across the slopes. Gambo soils also occur intermixed with Square Pond soils in a few sections south and east of Gander Lake, where a deposit of coarse-textured end moraine was apparently laid down on top of the existing finer-textured cover of ground moraine.

The profile of a Gambo sandy loam to loam is described as follows:

Horizon	*Depth inches*	
F–H	2 - 0	Partly decomposed roots plus dark granular decomposed organic matter and some needles.
Ae	0 - 2.5	Light brownish gray (10YR 6/2) sandy loam to loam; weak, coarse platy to fine granular; friable; roots plentiful; abrupt, wavy to irregular boundary; pH 4.3.
Bfh	2.5 - 6	Dark red (2.5YR 3/6) sandy loam to loam; moderate, fine granular; very friable; roots abundant; clear, wavy boundary; pH 5.1.
Bf	6 - 15	Strong brown (7.5YR 5/6) sandy loam; weak, coarse granular; friable; roots plentiful; granular, smooth boundary; pH 5.4.
BC	15 - 32	Brown (10YR 5/3) sandy loam; weak, fine granular; friable; roots few; gradual, smooth boundary; pH 5.4.
C	32+	Grayish brown (2.5Y 5/2) sandy loam; moderately compact till; pH 5.6.

Range in characteristics. The Ae or leached horizon of these soils is 0.5 to 6 inches thick, and the Bfh 3 to 6 inches thick; some mottling in the BC horizon is not uncommon.

Use. Trees generally grow fair to fairly well, but stoniness and topography make these soils unsuitable for agriculture. Soil capability for agriculture is Class 7 and subclass limitations are stoniness (P) and topography (T).

Butts Pond Series

The Butts Pond soils are moderately poorly drained, of sandy loam texture, and of low base status. They have been classified as Gleyed Humo-Ferric Podzols, and cover 12,211 acres. The profile is characterized by a gleyed BC horizon under the organic layers, and a dark brown, strongly mottled layer (tentatively designated Ccg) over a gleyed and compact or cemented C horizon. Weakly developed Ae and Bfh horizons are present in the upper part of the profile. The Butts Pond soils generally occur in association with the Gambo soils on steeply sloping land.

The profile of a Butts Pond sandy loam is described as follows:

Horizon	*Depth inches*	
F–H	3 - 0	Partly decomposed roots plus dark greasy decomposed organic matter; trace of needle litter.
Aeg	0 - 5	Light brownish gray (10YR 6/2) sandy loam; weak, coarse subangular blocky; friable; clear, wavy boundary; pH 5.2.
Bfh	5 - 9	Brown (10YR 4/3) sandy loam; weak, coarse subangular blocky; friable; clear, wavy boundary; pH 5.3.
BC	9 - 17	Olive (5Y 5/3) sandy loam; common, coarse, light olive brown (2.5Y 5/4) mottles throughout; weak, coarse subangular blocky; gradual, smooth boundary; pH 5.7.

Ccg	17 - 23	Light olive brown (2.5Y 5/4) sandy loam to loam; common, medium yellowish brown (10YR 5/6) mottles; moderate, coarse platy; friable to firm; gradual, smooth boundary; pH 5.7.
Cx	23+	Olive gray (5Y 5/2) sandy loam to loam; common, medium yellowish brown (10Y 5/6) mottles; compact or weakly cemented; pH 5.6.

Range in characteristics. Variations in these soils are thought to be caused by the lateral drainage on the steep slopes. The boundaries of the horizons are often not well defined, and the abundance and prominence of mottling vary greatly.

Use. The slopes occupied by these soils have a fair forest capability, but the stones, slopes, and poor drainage make the soils unsuitable for agriculture. Soil capability for agriculture is Class 7 and the subclass limitations are stoniness (P), topography (T), and excess water (W).

Gander Catena

The soils of the Gander catena are widely distributed in the north central portion of the mapped area. They are derived from stony glacial till predominantly composed of argillaceous sandstone, siltstone, and shale. The ground moraine deposit from which these soils have developed is generally 2 to 3 ft in depth. Bedrock exposure becomes extensive in places where the underlying surface is too irregular to be covered by this rather thin deposit. Complex topography and the presence of exposed bedrock characterize the sections occupied by these soils. Three series have been mapped within the catena: Gander, Wing Pond, and Home Pond.

Gander Series

The Gander soils are well drained and of loam to silt loam texture. They are of low base status and have been classified as Orthic Humo-Ferric Podzols. They cover 65,573 acres. The profile is stony or flaggy throughout, and an imbricate pattern of flaggy fragments is often found in the C horizon. On gently to moderately sloping topography, the Gander soils may occur alone or in association with Wing Pond and Home Pond soils; in well-drained positions on rolling to hilly land associated soils seldom occur.

The profile of a Gander silt loam soil sampled near the town of Gander is described as follows:

Horizon	*Depth inches*	
L-F	2 - 0	Fibrous moss with some needles and twigs; slightly decomposed.
Ae	0 - 3	Light gray (7.5YR 7/1) silt loam; amorphous or weak, fine platy; friable; common fine and medium roots; abrupt, wavy, occasionally irregular boundary; pH 4.1.
Bfh	3 - 7	Yellowish red (5YR 4/8) loam; strong, fine granular; loose; abundant fine roots; clear, wavy boundary; pH 5.5.
Bf	7 - 12	Strong brown (7.5YR 5/8) silt loam; moderate, fine subangular blocky to granular; slightly firm; fine roots plentiful; clear, wavy boundary; pH 5.7.
BC	12 - 20	Light olive brown (2.5Y 5/4) silt loam; amorphous; few fine roots; gradual boundary; pH 5.7.

C	20+	Olive (5Y 5/3) loam; flaggy and stony glacial till; pH 5.8.

Range in characteristics. Variations from the described profile are common with regard to thickness of individual horizons, stoniness, rockiness, and productivity for forestry or agriculture. The Ae or leached horizon ranges in thickness from a little over 0.5 inch on moderately well drained positions to 6 inches on very rapidly drained sites such as on top of a steep hill. Stony land is common, some land is nearly free from stones, and other sites, particularly at the foot of slopes, are very stony. Rock outcrops are fairly common and may be prominent at the tops of hills.

Use. Although these lands are mainly forested, with forest capability ratings of Classes 4 to 6, they could be used for unimproved grazing land and the limited stone-free sites could be converted into fair arable land. The soil capability for agriculture is rated Classes 5 and 6, with limitations of stoniness (P), consolidated bedrock (R), topography (T), and low fertility (F).

Wing Pond Series

The Wing Pond soils are imperfectly drained, of loam to silt loam texture, and of very low base status. They have been classified as Gleyed Humo-Ferric Podzols and cover 34,935 acres. The mineral profile is characterized by thin but distinct Ae, AB, Bfh, and Bg horizons, by a rather thick, gleyed BC horizon, and by a prominently mottled, compact, and often moderately cemented C horizon. Stoniness is similar to that of the Gander profile. The surface organic horizons of this profile are typically derived from the remains of ericaceous plants. Total unconsolidated depth of these organic horizons may vary widely from place to place, which reflects the past history of the region, but in general the depth appears to be related to gentleness of slope and smoothness of surface. Where the surface is sufficiently regular, gently sloping areas occupied by Wing Pond soils may sometimes have surface organic horizons that are 18 or more inches thick. Such areas are mapped as complexes of Wing Pond soils and ericaceous peat. Wing Pond soils are found associated with Gander soils when these gently sloping areas have somewhat irregular surfaces. Areas of moderate to strong slopes occupied by Gander soils often have minor occurrences of Wing Pond soils at the lower slope positions. Occasionally Wing Pond soils are dominant in areas that have numerous rock ledges. However, their main occurrence is restricted to an association with ericaceous peat and Gander soils on gently sloping land.

The profile of a Wing Pond silt loam soil is described as follows:

Horizon	*Depth inches*	
F–H	5 - 0	Partly decomposed roots and dark well-decomposed organic matter; sometimes up to 16 inches thick.
Ae	0 - 3	Light brownish gray (10YR 6/2) silt loam; weak, fine platy; friable; few roots; clear, wavy boundary; pH 3.6.
AB	3 - 5	Dark grayish brown (10YR 4/2) silt loam; weak, fine platy to granular; friable; few roots; clear, wavy boundary; pH 3.9.
Bfhc	5 - 7	Dark reddish brown (5YR 2/2) loam; moderate, medium platy; firm to weakly cemented; roots plentiful; clear, wavy boundary; pH 4.2.
Bg	7 - 10	Pale olive (5Y 6/3) loam; many, prominent, yellowish red (5YR 4/8) mottles throughout; structureless; firm; few roots; clear, wavy boundary; pH 4.9.

BC	10 - 18	Olive gray (5Y 5/2) loam; few, prominent mottles; structureless; firm; very few roots; gradual, wavy boundary; pH 5.2.
Cg1	18 - 24	Grayish brown (2.5Y 5/2) clay loam; many, dark brown (7.5YR 3/2) mottles throughout; structureless; firm; gradual, wavy boundary; pH 5.0.
Cg2	24+	Olive (5Y 5/3) loam to silt loam; compact till with prominent, dark brown (7.5YR 3/2) mottles common throughout; pH 5.0.

Range in characteristics. The sections mapped as Wing Pond are quite variable as to drainage and vegetation. The drainage may be intermittently impeded in some places, whereas lateral water movement in other places gives rise to excessive moisture. The tree growth is often fairly good.

Use. The agricultural value of these lands is fairly low because of stoniness, rock outcrops, and excessive moisture; some lands are used as unimproved pasture. Soil capability for agriculture is rated Classes 5 and 7; the limitations are low fertility (F), excess water (W), stoniness (P), and consolidated bedrock (R).

Fig. 10. A soil pit in the Wing Pond series.

Home Pond Series

The Home Pond soils are poorly drained, of loam to silt loam texture, and of moderately low base status. They have been tentatively classified as Orthic Gleysols, and occupy 8,346 acres. The profile characteristically has a greasy H layer, a gleyed Ae horizon, strongly mottled Bg and BCg horizons, and a compact or weakly cemented C horizon. Although the weakly cemented Cg horizon may have a roughly banded occurrence of mottles, few mottles occur when there is no cementation. The profile is often very stony, but is usually less flaggy than the Gander profile. Gently sloping topography with a minor associated occurrence of sphagnum peat and Wing Pond soils are characteristic of the few sections dominantly occupied by Home Pond soils. Moderate to strong slopes occupied by Gander soils often have minor occurrences of both Home Pond and Wing Pond soils on the lower slopes. Home Pond soils may also occur to a minor extent with Gander soils in sections that have steep slopes and frequent bedrock exposures.

Fig. 11. A soil pit in the Home Pond series.

The profile of a Home Pond silt loam is described as follows:

Horizon	*Depth inches*	
Sphagnum	8 - 5	Live sphagnum moss, discontinuous cover.
F + H	5 - 0	Very dark brown (10YR 2/2) partly decomposed moss and roots and greasy, decomposed organic matter.
Aeg	0 - 4	Gray (5Y 6/1) silt loam; few, small, distinct, yellowish brown (10YR 5/6) mottles throughout; weak, coarse platy; firm; few, fine roots; clear, wavy boundary; pH 5.0.
Bg	4 - 16	Light olive gray (5Y 6/2) silt loam; many, coarse, distinct, yellowish brown (10YR 5/8) mottles throughout; amorphous; firm; few roots; gradual, wavy boundary; pH 6.3.
BC1	16 - 24	Gray (5Y 6/1) silt loam; many, medium, faint, olive brown (2.5Y 5/4) mottles; amorphous; firm; no roots; gradual, smooth boundary; pH 6.7.

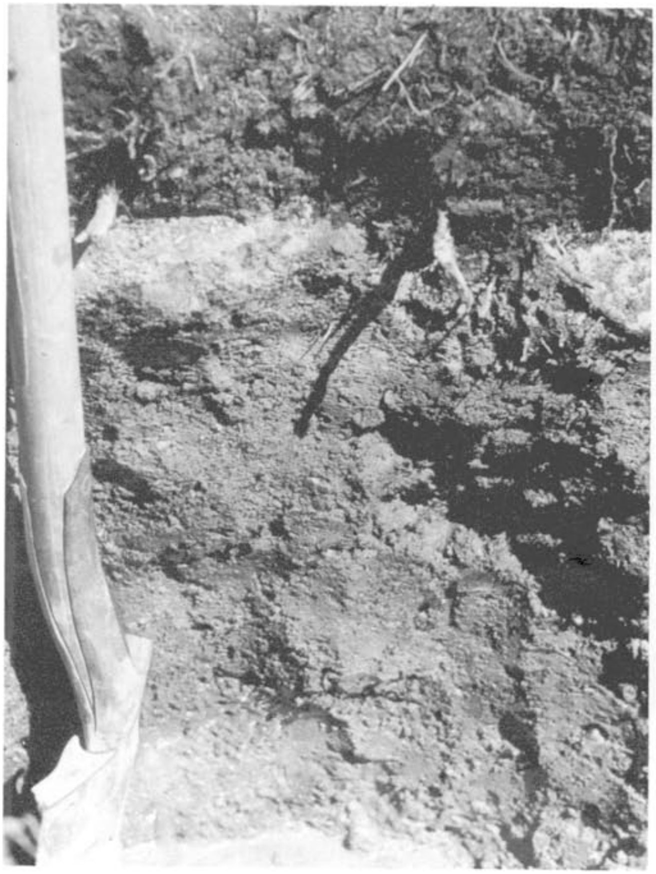

Fig. 12. A soil pit in the Fox Brook series.

BC2	24+	Olive (5Y 5/3) loam to clay loam; compact till with few, faint, light olive brown (2.5Y 5/4) mottles; pH 6.7.

Range in characteristics. Sections occupied by Home Pond soils appear to have variable thicknesses and qualities of organic matter. Sometimes sphagnum mosses form the main component; in other sections sedges, weeds, and some grass dominate. The sphagnum-covered soils show poor tree growth, but the sections covered with sedges, weeds, and grass often also support heath, alder shrubs, and fairly good or, at some locations, good tree growth. These sections are generally not very stony and some of the stones are weathered and soft.

Use. Because of the poor drainage and often depressional topography these soils have little agricultural value. Soil capability for agriculture is rated Class 7; the limitations are excess water (W), stoniness (P), and consolidated bedrock (R).

Glenwood Catena

The soils of the Glenwood catena are found in the west half of the Gander map sheet area. They have developed from shallow glacial till underlain by steeply folded Ordovician shale formations. These soils range as high as 12 inches in thickness, but are only a few inches thick where the shale structure is coherent and there is little accumulation of glacial till. A section occupied mainly by shallow soils of this catena can be seen where steep, northeast-southwest aligned ridges are crossed by the Trans Canada Highway a few miles east of the village of Glenwood. Other sections occupied mainly by deeper soils of this catena occur on dissected slopes along portions of the Southwest Gander Valley. Only one series is presently recognized in this catena.

Glenwood Series

The Glenwood soils are generally well drained, of silt loam to silty clay loam texture, and of low base status. They have been classified as Lithic Humo-Ferric Podzols, and cover 10,129 acres. The profile displays typical podzolic development.

The profile of a Glenwood silt loam is described as follows:

Horizon	*Depth inches*	
L-F	2 - 0	Moss, needles, twigs, and fibrous partly decomposed mixed plant remains.
Ae	0 - 2	Light gray (10YR 7/2) silt loam; moderate, fine platy; friable; roots plentiful; abrupt, wavy boundary; pH 4.0.
Bfh	2 - 6	Yellowish red (5YR 4/6) silt loam; moderate, fine granular; loose; roots abundant; clear, wavy boundary; pH 4.6.
Bf	6 - 10	Yellowish red (5YR 5/8) silt loam; weak, medium granular; firm; roots few to plentiful; horizon may be absent; clear, wavy boundary; pH 6.0.

R	10+	Dark shale bedrock.

Range in characteristics. The Glenwood soils are often found on rather steep slopes, and rock outcrops are common; variations to the described profile are common, with leached horizons 0.5 to 5 inches thick, Bfh horizons 2 to 5 inches, and Bf horizons 2 to 8 inches thick.

Use. Tree growth is poor to fair on these lands, but the soils have little value for agriculture. The soil capability for agriculture is Class 7. The subclass limitations are consolidated bedrock (R), and topography (T).

Peyton Catena

The soils of the Peyton catena are found in the northwest part of the Gander map sheet area, west half. These soils have developed from glacial till composed of a mixture of acidic and basic rock materials. These soils are very stony and occupy rolling to hilly upland sites. This catena includes well to imperfectly drained soils of the Podzolic Order. Two series, Peyton and Fox Brook, are recognized within this catena.

Peyton Series

The Peyton soils are well to moderately well drained, of sandy loam to loam texture, and of very low base status. They have been classified as Orthic Ferro-Humic Podzols, and cover 4,098 acres. The profile displays a fairly thin Ae horizon, a discontinuously cemented Bhfc horizon, a weakly cemented Bfc horizon, and a thick, often mottled BC horizon above a compact or weakly cemented C horizon. In the Peyton loam soils, ortstein development is often pronounced and some mottling is common.

The profile of a well-drained Peyton sandy loam is described as follows:

Horizon	*Depth inches*	
L-F	4 - 0	Moss, roots, and needles; loose, fibrous, and partly decomposed.
Ae	0 - 3	Light brownish gray (10YR 6/2) sandy loam; weak, fine granular; friable; few roots; abrupt, wavy boundary; pH 3.6.
Bhfc	3 - 5	Dark red (2.5YR 3/6) sandy loam; moderate, fine granular to amorphous; friable to weakly cemented; plentiful roots; abrupt, wavy boundary; pH 4.3.
Bfc	5 - 12	Yellowish red (5YR 4/8) loamy sand; amorphous; weakly cemented; few or no roots; clear, wavy boundary; pH 5.0.
BC	12 - 22	Brown (7.5YR 5/4) sandy loam to loamy sand; amorphous; firm; no roots; gradual, wavy boundary; pH 4.8.
C	22+	Light brown (7.5YR 6/4) loamy sand; compact stony till; pH 4.8.

Range in characteristics. Water percolates rather quickly through the upper horizons of these soils causing a wide range of moisture conditions along the slopes with fairly great changes throughout the season. The cementation found in the Bhfc and Bfc horizons is discontinuous. Stoniness is moderate to excessive.

Use. Forest productivity is fair. However, the stoniness is a serious limitation for agriculture. Soil capability for agriculture is Class 7 with subclass limitations of stoniness (P), topography (T), and undesirable soil structure (D).

Fox Brook Series

The Fox Brook soils are imperfectly to poorly drained, and of sandy loam to loam texture. They have been classified as Gleyed Ferro-Humic Podzols, and cover 783 acres. The profile characteristically has a fairly thick Ae horizon, thick Bhf and Bf horizons, and a thick, gleyed BC horizon over a compact C horizon.

The profile of a Fox Brook sandy loam is described as follows:

Horizon	*Depth inches*	
F-H	5 - 0	Loose, fibrous, partly decomposed roots plus dark granular decomposed organic matter.
Ae	0 - 5	Gray (10YR 5/1) sandy loam; weak, fine granular; friable; few roots; abrupt, wavy to irregular boundary; pH 3.7.
Bhf	5 - 14	Very dusky red (2.5YR 2/2) sandy loam; moderate, fine granular; friable; roots plentiful; clear, wavy boundary; pH 4.2.
Bf	14 - 20	Dark red (2.5YR 3/6) sandy loam; weak, coarse granular; friable; few roots; clear, wavy boundary; pH 4.8.
BC	20 - 28	Grayish brown (10YR 5/2) sandy loam; many, medium, distinct, brown (7.5YR 4/4) mottles; structureless; compact; no roots; gradual, smooth boundary; pH 4.9.
Cg	28+	Brown (10YR 5/3) sandy loam; compact till with few, medium, distinct, yellowish red (5YR 4/8) mottles; pH 5.0.

Range in characteristics. Variation in the expression of gley characteristics (mottles and neutral colors) is related mainly to changes in microrelief over the compact and rather impermeable C horizons. The high density of the C horizons appears to be a feature of the coarse-textured basal till deposit rather than of fragipan origin.

Use. Due partly to the stoniness but especially to poor drainage these soils rate low in forest productivity. They are unsuitable for agriculture, and are rated Class 7, with capability subclasses of excess water (W), and stoniness (P).

Southwest Gander River Catena

The soils of the Southwest Gander River catena occur on outwash remnants and fluvial terraces along the Southwest Gander River. The outwash remnants at the upper level and the higher terrace levels are usually gravelly or have less than a foot of fine sand over gravel. Lower terrace levels commonly have 2 to 3 ft of fine sand overlying gravel. Muck or peat deposits may occur in depressional sites on the lower terrace levels. Only one series, Southwest Gander River, has been segregated within the catena.

Southwest Gander River Series

The Southwest Gander River soils are moderately well drained, of fine sandy loam to silt loam texture, and of low base status. They have been classified as Orthic Humo-Ferric Podzols, and occupy 3,531 acres. The profile typically has a thin Ae horizon, thick Bfh and Bf horizons, and a faded or indistinctly mottled BC horizon. The Southwest Gander River fine sandy loam to silt loam soils predominate on the lower terrace levels.

The profile description of a Southwest Gander River silt loam is as follows:

Horizon	Depth inches	
F-H	2 - 0	Live roots and dark granular decomposed organic matter.
Ae	0 - 2	Pinkish gray (7.5YR 7/2) silt loam; weak, fine granular; friable; roots plentiful; abrupt, wavy boundary; pH 4.0.
Bfh	2 - 8	Yellowish red (5YR 4/6) silt loam; moderate, fine granular; very friable; roots abundant; clear, wavy boundary; pH 4.8.
Bf	8 - 14	Strong brown (7.5YR 5/6) loam; weak, fine granular; friable; roots plentiful; clear, wavy boundary; pH 4.8.
BC	14 - 24	Light yellowish brown (2.5Y 6/3) loam; few, fine, faint mottles; weak, fine granular; very friable; clear, smooth boundary; pH 5.3.
IIC	24+	Gravel of mixed lithology.

Range in characteristics. These soils are mainly fine sandy loam, but silt loams and loams are found in the area. The accumulation of organic matter in the B horizon also varies considerably from place to place; the higher amounts generally coincide with fine-textured horizons. The depth to gravel ranges from 10 to 26 inches.

Use. Southwest Gander River fine sandy loam soils tend to be dry in summer and very low in available nutrients, especially P and Ca. They have poor to fairly good forest capability depending on their depth to gravel, and many sites could be converted into grazing land. Capability for agriculture is rated Class 4, with subclass limitations of cumulative minor adverse characteristics (X), and moisture limitation (M). The X subclass includes locally adverse climate, and inundation by streams or lakes.

Terra Nova Catena

The soils of the Terra Nova catena occur extensively in the southern portion of the mapped area. These soils range from coarse to moderately coarse in texture. They are derived from very stony glacial till that is predominantly composed of medium-grained granite. Gently undulating to hilly upland topography is characteristic of sections occupied by these soils. Boulder terrain and bedrock exposure are common in rolling to hilly parts. Two series, Terra Nova and Square Pond, have been segregated within this catena.

Terra Nova Series

The Terra Nova soils are well drained, of sandy loam to loamy sand texture, and of very low base status. They have been classified as Orthic Ferro-Humic Podzols, and cover 55,307 acres. The profile is characterized by a deeply developed Ae horizon, a weakly cemented Bhf horizon, and a strongly cemented Bf horizon. These soils predominate where topography and sufficient depth of coarse-textured till permit adequate drainage, and occur under heath vegetation as well as under black spruce forest.

The profile of a Terra Nova sandy loam is described as follows:

Horizon	Depth inches	
L-H	3 - 0	Needle litter plus dark, felty, partly decomposed root mat.
Ae	0 - 8	Gray (10YR 5/1) sandy loam; amorphous; loose; roots few to plentiful; abrupt, wavy boundary; pH 3.9.

Bhfc	8 - 11	Dark reddish brown (2.5YR 2/4) sandy loam; weak, coarse platy; friable to very firm; weakly cemented; roots plentiful to abundant; abrupt, irregular boundary; pH 5.2.
Bfhc	11 - 16	Yellowish red (5YR 4/6) sandy loam; weak, coarse platy; strongly cemented; roots plentiful along ped surfaces; clear, wavy boundary; pH 5.5.
BC	16 - 24	Olive (5Y 5/3) sandy loam; single grain; very friable; few roots; gradual, smooth boundary; pH 5.5.
C	24+	Grayish brown (2.5Y 5/2) sandy loam; single grain; very friable; pH 5.3.

Range in characteristics. The degree of development of these soils varies according to their slope position. For example, the Ae horizons are sometimes up to 12 inches thick near the top of a hill, whereas they are often only 4 to 6 inches thick on lower slope positions. In addition, the cementation encountered in the Bhf in the lower positions occurs in the BC near the top of a slope, and thus lower in the profile.

Use. These soils rate only fair in forest capability and are generally rated unsuitable for agriculture. Soil capability for agriculture is Class 7 and the subclass limitations are stoniness (P), topography (T), moisture limitation (M), and undesirable soil structure (D).

Square Pond Series

The Square Pond soils are imperfectly to poorly drained, of sandy loam to loamy sand texture, and of very low base status. They have been classified as Gleyed Ferro-Humic Podzols, and cover 66,122 acres. The profile usually has an L–H layer less than 6 inches thick derived from moss vegetation under black spruce forest. Profiles of these soils with thick peaty L–H layers developed under heath vegetation are included as a heath land phase. The mineral horizons characteristically include a deeply developed Ae horizon, a thin but distinct AB horizon, a dark Bhf horizon underlain by a distinctly mottled Bgj horizon, and a deep BC transitional horizon to a more or less cemented C horizon. The Square Pond soils have some inclusions of Orthic Gleysols and weakly developed Gleyed Ferro-Humic Podzols, both found in very wet locations such as on slopes receiving drainage moisture from sphagnum peat bogs at higher positions.

The profile of a Square Pond sandy loam is described as follows:

Horizon	*Depth inches*	
L-H	5.5 - 0	Fibrous layer of moss with some dark decomposed organic matter.
Ae	0 - 5	Gray (10YR 6/1) sandy loam; amorphous; friable; abrupt, smooth boundary; pH 4.2.
AB	5 - 7	Reddish gray (5YR 5/2) sandy loam; amorphous; friable; clear, smooth boundary; pH 4.3.
Bhfc	7 - 12	Dark reddish brown (2.5YR 2/4 to 2.5YR 3/4) sandy loam; moderate, medium granular; friable; sometimes weakly cemented; clear, wavy boundary; pH 4.9.
Bgj	12 - 15	Reddish brown (5YR 4/4) sandy loam; common, medium, distinct mottles; weak, medium granular; friable; few medium concretions; gradual, wavy boundary; pH 5.3.

BC	15 - 25	Light olive gray (5Y 6/2) sandy loam; common, medium, distinct, yellowish brown (10YR 5/4) mottles; weak, granular; friable; gradual, wavy boundary; pH 5.3.
Cx	25+	Light brownish gray (2.5Y 6/2) and brown (7.5YR 5/4) sandy loam; common, medium, distinct, reddish brown (5YR 5/4) mottles; amorphous; weakly cemented; pH 5.4.

Range in characteristics. Some variation is to be expected in the prevalence of gley characteristics in these soils since the relatively impermeable fragipan influences soil drainage under varying slope conditions. As a result of this influence, mottles and neutral colors are more apparent on level to gently undulating sites than on slopes.

Use. The surface stoniness of these soils is often excessive and they are of very little value for agriculture. Their excess moisture and low fertility make them unfavorable for forest production. Soil capability for agriculture is Class 7 and the subclass limitations are stoniness (P), and excess water (W).

Rocky Land

Rocky land consists of sections having very shallow soil and enough rock outcrop to submerge other soil characteristics; it occupies 14,610 acres. The rock may be in the form of shales and graywackes as occur southeast of Gander; or granites, south of the eastern part of Gander Lake; or conglomerates and sandstone, southeast of Freshwater Bay. In many places the rock outcrops are covered by shallow moss and tree vegetation. Forest fires may cause havoc in these sections, since destruction of the organic cover leaves the bare rock exposed.

Boulder Terrain

These lands include sections having enough stones and boulders to submerge other soil characteristics. Boulder terrain occupies 14,900 acres. The stones and boulders may cover 50% to 90% of the surface and can dominate the aspect as well as possible use of the land. In some sections the stones and boulders may form a rather even surface, or stone pavement; in other sections the soil is strewn with big boulders.

Ericaceous Peat

Most of the organic material developed from ericaceous plants is rather shallow and it is classed as mineral soil. But in a moist environment with impeded drainage the organic accumulation may exceed 18 inches. Root, twig, and leaf remnants and moss are the main components. The lower 2 or 3 inches of the organic deposits are rather dense and greasy. A subsoil low in nutrients, a widely varying moisture supply, and repeated fires apparently favor the formation of ericaceous peat. The soils are classed as Terric Mesisols and cover 866 acres.

Grass and Sedge Peat

Several of the organic soils in the northwestern part of the mapped area consist mainly of sedges, rushes, reeds, and grass with mainly sedges and grass on the surface. The sites occupied by these soils are generally fairly small. The soils appear to have more available nutrients than the sphagnum peats and are generally little decomposed. They are classified as Fenno-Fibrisols and occupy 4,080. These soils derive some of their nutrient supply from surface runoff from the surrounding area or from streams running through them. Small included sections of more decomposed organic soil materials are classed as Mesic Fibrisols.

Muck

The muck soils of the mapped area consist mainly of dark-colored, highly decomposed organic soil materials. In comparison with other organic soils they contain the least plant fiber and the most nutrients. Conditions favorable for their development are provided primarily by additions of dissolved mineral elements in percolating groundwater, but similar additions from the atmosphere may contribute to muck formation in seaside localities. The soils are classified as Terric and Typic Humisols, and cover 4,250 acres.

Sphagnum Peat

Sphagnum peat is a nutrient-poor peat consisting of slightly decomposed *Sphagnum* mosses, well preserved and often identifiable at depth. It is classified as Sphagno-Fibrisol and covers 34,804 acres. This peat can be found in two groups of organic terrain, the raised bogs and the blanket bogs.

The surfaces of the raised bogs grow higher than the surrounding parts. These bogs are generally smaller than the blanket bogs and often have characteristic pond developments. The ponds are grouped in concentric circles around the high center. The ponds are locally called flashets and appear to be a permanent and distinctive feature. Translocation of the flashets is not uncommon, the old flashets becoming filled in with newer and lighter-colored sphagnum. A cross section of these bogs shows lighter and darker layers of different, but generally little decomposed, peats. These bogs support a growth of *Sphagnum* species and occasionally sedge. Many heath shrubs, spruce, and larch grow on the drier sites.

Blanket bogs are rather uncommon within the mapped area. They apparently have developed from small expanding bogs in depressional sites. Elsewhere in Newfoundland these bogs are often large, have fairly uniform thickness, and cover the slopes as well as small hills. Because of the position on the slope and the movement of water along these bog-covered slopes, mineral nutrients may be more available. These bogs thus support a greater variety of plants, are generally richer in mineral nutrients, and may be more humified than the raised bogs. Elongated flashets may occur perpendicular to the slope and an admixture of sedge species is quite common. These bogs are often 5 to 7 ft deep. Some sections are a little shallower and are classed as Terric Fibrisols, the more decomposed stages being called Mesic Fibrisols.

SOIL CAPABILITY FOR AGRICULTURE

Most of the soils in the mapped area are too stony, too steep, too shallow, or too wet for cultivation. Any one or a combination of texture, structure, water-holding capacity, and natural fertility may also limit the use of the various soils. Table 4 summarizes the capability classes and subclasses of the various soil series.

The soils of the area are grouped according to their capability for agricultural purposes. The capability classification has seven classes based on the severity of the limitations that physical factors impose on the use of the soil for crops. These classes have subclasses based on the kinds of limitation for crop use.

Classes 1 and 2 have few or no limitations and are capable of sustained

Table 4. Soil Capability Classes for Agriculture and Subclass Limitations for the Soil Series

Soil capability class	Subclass: Limitations	Subclass: Texture	Soil series and specific limitations*
3	Possible frost pockets, moderate stoniness, low fertility, imperfect drainage	Moderately fine	Benton C, P, F
4	Frost hazard, moderate danger of flooding, moderate stoniness, low fertility, moderate droughtiness	Medium	Benton C, P, F, T *Soulis* Pond C, W, P, F Southwest Gander River X, M
5	Stoniness, shallowness, low fertility, poor drainage	Medium	Gander P, R, F Wing Pond F, W, P, R Boot Pond W, P, T
7	Stoniness, shallowness, steepness, poor drainage	Medium to coarse	Gander P, R, T, F Wing Pond F, W, P, R Home Pond W, P, R Glenwood R, T Gambo P, T Butts Pond P, T, W Terra Nova P, T, M, D Square Pond P, W Peyton P, T, D Fox Brook P, W Eastport M, D, P

*Abbreviations for limiting factors are those used in the Canada Land Inventory Report No. 2, Soil Capability Classification for Agriculture. 1965.

production of a wide variety of agricultural crops. No soils in the mapped area fall within these two classes.

Class 3 soils have moderately severe limitations for crop production. Only a few small sections of Class 3 soils occur in the mapped area. These sections have gently to moderately sloping topography and are occupied by moderately well drained and imperfectly drained soils of the Benton catena. Class 3 soils cover approximately 1,800 acres.

Class 4 soils are marginal for sustained production of cultivated crops. The small proportion of Class 4 soils in the mapped area includes some of the poorly drained soils of the Benton catena in sections having moderately sloping topography, and some soils of the Southwest Gander River catena. Class 4 soils cover approximately 11,200 acres.

Class 5 soils are capable of use only for permanent pasture. Poorly drained soils of the Benton catena and nonsteep, well to imperfectly drained soils of the Gander catena have been grouped in this class. Class 5 soils cover approximately 45,000 acres.

Class 6 soils are considered capable of use only for wild pasture, and Class 7 includes soils and land types considered incapable of use for arable culture or permanent pasture. However, in Newfoundland Class 6 has been dropped from the capability classification and all soils incapable of arable use are designated as Class 7. The remainder of the mapped area is occupied by soils and land types that fall within Class 7 for agricultural purposes. Class 7 soils cover approximately 364,000 acres, of which 44,000 acres are organic soils.

Table 5 gives the acreages of mapped soil capability classes for agriculture and the total acreage occupied by water.

Table 5. Areas of Mapped Soil Capability Classes for Agriculture

	Acreage	%
Class 3	1,800	0.3
Class 4	11,200	2.2
Class 5	45,000	8.8
Class 7	364,000	71.0
Water	80,000	15.5
Gander town and airport	11,700	2.2
Total	513,700	100.0

PRESENT LAND USE

Small cultivated plots of potatoes, cabbage, and turnips are maintained in or near the settlements. The total acreage is insignificant and no full-time commercial agriculture is found within the mapped area. There are no improved pastures and no livestock industry.

The forested lands are leased by the two paper mills, in Corner Brook and Grand Falls, for the production and cutting of pulpwood. Forest management practices are all but absent and only the most accessible parts are logged. Reforestation practices have not been developed and many lands are unproductive because of repeated past forest fires.

LAND CAPABILITY FOR FORESTRY

The mineral and organic soils in this area have been surveyed for their inherent ability to grow commercial wood or timber (Anon., 1968). The survey was carried out by Mr. K. Beanlands, formerly with ARDA and now with the Newfoundland Forest Service.

The national capability class descriptions of seven classes that have been modified in the various regions of Canada are based on local mapping experience (McCormack, 1967). This classification is comparable to the land capability for agriculture, wildlife, and recreation and is set up to provide data for land use planning, particularly where there is a requirement for the alternative use of agricultural and especially submarginal agricultural land. In this land capability classification for forestry the mineral and organic soils in the area have been rated according to their inherent ability to grow commercial wood or timber with the emphasis on natural conditions.

The capability class takes into account the total environment of soil, subsoil, climate, and topography as it applies to tree growth. The factors that show the kinds of limitations to tree growth are called subclasses. A knowledge of these limitations is important especially when they affect management, or if they can possibly be corrected at a future time. The degree of limitations discussed in the following subclasses determines the class designation.

C—Adverse climate. Newfoundland has a cool humid climate. On the island, there are no limitations caused by aridity or temperature. Excessive exposure to wind may limit productivity in certain locations such as high uplands, hilltops, and sites along the coast.

M—Moisture limitation. A deficiency or a surplus of soil moisture may affect the productivity adversely. Also, highly variable moisture conditions may exist in certain areas, with an excess of water at one time showing a much greater influence than moisture need at other times. Moisture deficiency may affect the tree growth only slightly in some locations, but can be a dominating influence in others. Highly leached soils are often deficient in nutrients and moisture. Moisture excess or deficiency may occur in combination with rockiness. Bedrock near the surface restricts root development and nutrient and water supply, limiting tree development. On the other hand, where moisture flows over the bedrock, especially on hillsides, the supply of water and nutrients is abundant.

W—Excess water. Excess soil water often plays a dominating role. This has to be recognized not only as a major influence between different soil series, but also within a soil series. A well-drained soil with some mottling in the lower B horizon appears much more productive than a soil without this mottling or a slightly drier phase.

Different types of excess water, namely, a high water table, a fluctuating water table, and seepage water, are recognized. Seepage water or water transported more or less laterally through the soil contains needed minerals and especially on hillsides contributes to favorable growing conditions even though the soil appears gleyed or mottled throughout the solum. A continuous water table causes poor growing conditions, especially when the water is stagnant. A fluctuating water table may also severely affect the growing conditions in this climatic region where moisture is seldom deficient. Soils with excess water have to be considered together with topography, underlying bedrock, position on the slope, and porosity.

X—An intimate pattern of excess water, W, and moisture limitation, M, where the two components cannot be mapped individually. It has been used only for soils on the barrens. These lands supported forests at one time, but have since been occupied by dwarf heath shrubs and hence do not regenerate trees naturally. These lands include sections on well-drained and moist sites that are covered with up to 1.5 ft of raw humus developed under dwarf heath vegetation and also poorly drained sites covered with peat moss.

D—Restrictions because of undesirable soil structure or low permeability or both. Strongly compacted basal till within 2 ft of the mineral soil surface, strong cementation, or pans may severely affect tree development. This limiting factor is typical of soil series characterized by ortstein or cemented horizons.

R—Consolidated bedrock. Bedrock within or near the solum may severely affect the productive capacity of the soils. This influence is greater in well to rapidly drained soils than in the more compact and finer-textured soils. In depressional sites rocks may severely impede drainage, but rock formations on hills may direct or keep water near the surface and so improve otherwise dry soils. Rock formations at the tops of slopes and in other places without lateral water movement, especially in porous soils, restrict the available water and cause dry sites with low productivity. Shallow soils over bedrock are rarely uniform in depth, and productivity is very variable.

F—Low fertility. Limitations caused by lack of available plant nutrients are naturally of great importance to the productivity of the soil, but the fertility for forest production does not appear to depend on readily available nutrients to the extent that it does for agriculture. Most of the soils have a low inherent fertility and low readily available nutrients and only in extreme conditions are local deficiencies recognizable.

P—Stoniness. Many soils in Newfoundland are more or less stony. The presence of stones in many of these soils appears to improve rather than impede growing conditions. Growing conditions are impaired only in extremely stony fields (stoniness 4 and over).

T—Topography. The presence of slopes is not a recognized limitation to forest productivity. Very steep slopes with excessive runoff may cause impaired growing conditions due to lack of moisture. In Newfoundland, however, slopes are often the cause of lateral movement of groundwater and thus aid in the transport of both oxygen and plant food. In addition, slopes can often be used to good advantage in logging operations. The absence of slopes and also the presence of depressions cause poor drainage, and excessive moisture is then often a serious problem causing very poor growing conditions.

I—Inundation by streams or lakes. Prolonged inundations limit tree growth severely. Intermittent inundations, especially along riverbanks and in alluvial terraces in river flats in the spring, can be very beneficial if the floodings are of short duration, but other factors such as lateral water movement and competition from unwanted alder vegetation may be of greater influence and severely limit the capability of these sites for growing good forests.

Soils and Capability Classes for Forestry

Class 1. No Class 1 land was recognized in Newfoundland.

Class 2. Class 2 lands are the best forest-producing lands encountered. These sites are restricted to ideally located Benton soils with fairly good to imperfect drainage and some mottling in the lower B horizon. These soils usually have a stoniness of 3 or less and the slopes are generally between 7% and 40%. Forest sites of Class 2 generally support stands of balsam fir, but regeneration of white birch usually occurs after fire.

Class 3. This class is generally the most productive in many parts of the Island. Limitations to tree growth are few. The soils are well to imperfectly drained loams and have adequate plant nutrients. The soil solum is fairly deep and the horizons are well developed. Many of the lands in this class occupy middle and sometimes lower slopes, with nutrient-rich seepage water available all through the growing season. This class may occur on Gander and Gambo soils where all other conditions are ideal, but the Benton soils provide the largest sites on the middle slopes and often Soulis Pond soils on the lower slopes. Many of these lands support stands of balsam fir with an admixture of white spruce and white birch. White birch generally occupies these lands after fire.

Class 4. Soils for forest productivity Class 4 are generally well to poorly drained with a varying depth of solum or restriction in permeability. Fairly extensive sections of the rather productive forest lands fall in this class. Single slopes of 10% and over are common, with parent material of low nutrient status and low base saturation. Included are some sections of rather poorly drained soils with groundwater movement along the slope. Podzols with ortstein, Lithic Podzols, and also Orthic Gleysols occur on these sites. Benton, Soulis Pond, Gander, Gambo, Terra Nova, Peyton, and some Glenwood soils are in this class if no other subclass limitations lower the productivity. Balsam fir and occasionally birch and white spruce grow on these lands, with black spruce regeneration after fire.

Class 5. The soils in this class are low in nutrients, and occur in sites with complex topography or occupy exposed positions as on hilltops, or are very porous.

Drainage may be poor or very poor, and shallow organic soils with lateral-flowing groundwater containing nutrients may be included in this class. Many soils mentioned in Classes 2, 3, and 4 may have to be included in this class because of subclass limitations such as stoniness, consolidated bedrock, adverse climate due to exposure, or excess water. Black spruce and balsam fir usually occupy these lands. Regeneration is often unsatisfactory because of ubiquitous dwarf heath shrubs on these lands and the organic layer developed under this vegetation on rather low nutrient soils. Soils in this class are Boot Pond, Butts Pond, Fox Brook, Eastport, and Southwest Gander River, provided that no other subclass limitations lower their usefulness.

Class 6. Single limitations such as severe wetness or rockiness are not unusual, but more often a combination of limitations exists. Excessive dryness can be a limiting factor, but very poor drainage occurs much more frequently. Fertility may be a limiting factor, but this is generally overshadowed by other much more severe subclass limitations. Soils in this class include Wing Pond, Home Pond, Square Pond, and muck and sedge peats exclusive of other subclass limitations. Forests occupying this class consist mainly of black spruce and larch, but larch is absent in sites exposed to wind. Regeneration is often limited by an extensive small shrub vegetation, especially dwarf heath shrubs. An organic layer of heath or moss peat also severely restricts regeneration after fire. Some areas exposed constantly to the wind are included in this class.

Class 7. Lands in this class are unsuitable for tree growth. Excess water, consolidated bedrock, stoniness, and flooding may singly or in combination impose severe limitations. This land is often covered with thick moss peat, ericaceous peat in exposed sites after burning, stone pavement, or rock.

Table 6 shows the soil series and their capability for forestry with the main subclass limitations.

ANALYSES OF SOIL SAMPLES

Physical and Chemical Analyses

The pH in water (1:1 ratio) and the pH in $CaCl_2$ (10 g soil in 20 ml 0.01 M $CaCl_2$) are shown in Table 7.

In the past it was general practice to determine the pH in water, but the values so obtained fluctuate with salt content, organic matter, moisture content, time of sampling, soil temperature, and microbiological activity. The pH in $CaCl_2$ appears to fluctuate less under varied conditions and is a more realistic indicator of the base status of the soil. The two values are given here to indicate the range and the different values obtained by the two methods. The pH in $CaCl_2$ was generally one-half to one unit lower than the pH in water except in the Southwest Gander River soils where the differences were slight. The difference between the two pH values was the least in the coarse, rapidly drained Orthic Humo-Ferric Podzols and the greatest in the Gleyed Dystric Brunisol.

The Orthic Humo-Ferric Podzols and the Orthic Ferro-Humic Podzols show a high ignition loss, high free Fe (oxalate-extractable Fe_2O_3), and an increase in clay in the B horizon. Destruction of organic matter and Fe, both binding agents, could show substantially higher values of clay in these horizons. It is interesting to note that all but the Orthic Gleysols showed a peak of free Fe in the B horizon, whereas this trend was least prominent in the poorly and imperfectly drained soils. Fox

Table 6. Soil Series and Their Capability for Forestry with Main Subclass Limitations

Series	Map symbol	Forest capability class					
		2	3	4	5	6	7
		Subclass					
Benton	BN	F	F	FM	-	-	-
Boot Pond	BO	-	-	-	W	WP	WP
Butts Pond	BU	-	-	W	W	-	-
Eastport	EP	-	-	-	MF	M	MDP
Fox Brook	FB	-	-	-	-	FWPD	WP
Gambo	GB	-	-	FM	MF	-	-
Gander	GA	-	-	FM	MF	RP	-
Glenwood	GW	-	-	FM	FD	DR	R
Home Pond	HO	-	-	-	W	WRP	WRP
Peyton	PY	-	-	FP	MFD	MDP	-
Soulis Pond	SU	-	-	W	W	-	-
Southwest Gander River	SW	-	-	F	M	I	-
Square Pond	SP	-	-	-	-	FWPR	WPR
Terra Nova	TN	-	-	-	MF	M	-
Wing Pond	WG	-	-	-	FW	FWP	WP

- Does not occur in this class
Subclasses
D, physical restriction to rooting caused by dense or consolidated layers, other than bedrock.
F, low fertility.
I, soils periodically inundated by streams or lakes.
M, soil moisture deficiency.
P, stoniness that affects forest density or growth.
R, restriction of rooting zone by bedrock.
W, excess soil moisture.

Brook, a Gleyed Ferro-Humic Podzol, was an exception with 5.7% extractable Fe in the Bhf horizon, which showed the highest (21%) ignition loss. All analyzed soils show a high ignition loss in the B horizon, indicating the importance of organic matter movement in the profile under existing conditions, whereas the exchangeable acidity appears closely related to the figure for loss on ignition.

Exchangeable bases are generally low, but show the highest values in the Home Pond and Boot Pond soils, all Orthic Gleysols.

The Gleysols and the gleyed soils all show an increase in clay with depth, and the rapidly drained Terra Nova and Eastport soils, Orthic Ferro-Humic Podzols and Orthic Humo-Ferric Podzols respectively, show a peak in the silt content in the BC horizon.

Available Nutrients

Table 8 gives the available nutrients in pounds per acre. All soils are apparently deficient in P, and have only small amounts of available N, K, and Ca.

The poorly drained Home Pond and imperfectly drained Fox Brook soils have the highest amounts of available nitrogen. In these soils the nitrogen apparently does not leach out and denitrification is slow. Also, the prevalence of alder shrubs on these soils stimulates the fixing of nitrogen.

Analytical Methods

Reaction (pH). Glass electrode. 10 g soil in 20 ml 0.01 M $CaCl_2$ (pH $CaCl_2$), and also 10 g soil in 10 ml water (pH water).

Particle size analyses. Hydrometer method. (Bouyoucos, 1936).

Table 7. Chemical and Physical Analyses of Representative Profiles

Horizon	Depth inches	Chemical analyses: Loss on ignition %	pH H_2	pH $CaCl_2$	Free Fe_2O_3 %	meq/100 g of soil: Exchangeable acidity	meq/100 g of soil: Exchangeable bases	Particle-size analyses: Gravel %	Sand 2-.05 mm %	Silt .05-.002 mm %	Clay below .002 mm %
						Benton					
Ae	0-2	3.1	4.5	3.9	0.16	7.3	2.0	11	17	67	16
Bfh1	2-6	13.0	4.7	4.4	2.88	10.3	tr.	33	26	58	16
Bfh2	6-13	7.2	4.9	4.7	1.96	6.6	0.7	31	26	57	17
BC	13-19	5.4	5.2	4.7	0.21	2.6	0.3	33	37	47	16
Cx	19+	1.4	5.2	4.7	0.16	2.4	0.3	36	36	45	19
						Boot Pond					
Ah	0-2	4.6	5.3	4.6	1.18	6.9	3.3	50	25	59	16
Ahe	2-7	2.2	5.6	4.7	0.22	3.3	1.4	35	39	46	15
Bg	7-16	0.9	6.6	5.6	0.22	1.3	3.4	23	33	49	18
BC	16-26	1.4	6.9	6.0	0.25	1.1	4.6	19	30	44	26
Cg	26+	2.0	6.9	6.1	0.27	2.0	4.6	31	29	43	28
						Butts Pond					
A20/ Aeg	0-5	1.4	5.2	4.0	0.28	2.3	0.1	19	58	34	8
Bfh	5-9	3.0	5.3	4.3	0.43	3.8	0.2	20	64	27	9
BC	9-17	1.8	5.7	4.5	0.41	2.2	0.1	24	54	33	13
Ccg	17-23	1.2	5.7	4.3	0.33	1.7	0.5	22	48	36	16
Cx	23+	1.2	5.6	4.3	0.34	1.9	0.9	20	42	38	20
						Eastport					
Ae	0-3	1.7	3.7	3.2	0.19	5.3	0.3	16	45	49	6
Bfhc	3-5	10.0	5.1	4.6	2.15	7.7	0.0	32	68	24	8
Bfc	5-9	2.9	5.5	5.2	0.83	2.6	0.0	20	69	27	4
BC1	9-15	1.2	5.4	5.2	0.63	1.8	0.1	27	61	35	4
BC2	15-21	0.6	5.3	5.1	0.29	0.9	0.0	6	81	14	5
C	21+	0.3	5.0	4.7	0.19	0.7	0.2	12	92	6	2
						Fox Brook					
Ae	0-5	2.0	3.7	3.2	0.10	4.4	0.3	7	56	37	7
Bhf	5-14	21.2	4.2	3.8	5.75	28.4	1.1	38	59	36	5
Bf	14-20	2.6	4.8	4.3	0.29	4.3	0.3	13	58	38	4
BC	20-28	1.4	4.9	4.4	0.49	2.3	0.3	28	55	37	8
Cg	28+	0.6	5.0	4.4	0.23	1.7	0.3	21	50	39	11

					Gambo						
Ae	0-2.5	0.7	4.3	3.3	0.05	1.8	0.2	8	47	46	7
Bfh	2.5-6	13.4	5.1	4.4	2.34	11.3	0.2	10	52	38	10
Bf	6-15	2.2	5.4	5.2	0.44	1.5	0.0	12	53	38	9
BC	15-32	1.0	5.4	4.9	0.32	1.5	0.1	18	54	37	9
C	32+	0.4	5.6	5.0	0.07	0.9	0.0	8	55	38	7
					Gander						
Ae	0-3	2.3	4.1	3.1	0.38	6.2	0.4	4	29	66	5
Bfh	3-7	12.3	5.5	4.6	2.57	8.0	0.2	40	43	48	9
Bf	7-12	4.6	5.7	5.2	1.06	2.7	0.1	40	42	51	7
BC	12-20	1.7	5.7	4.9	0.38	0.9	0.1	40	43	51	6
C	20+	1.5	5.8	4.9	0.39	1.4	0.1	48	46	45	9
					Glenwood						
					Not Sampled						
					Home Pond						
Aeg	0-4	0.9	5.0	4.5	0.10	2.0	1.0	10	39	51	10
Bg	4-16	1.4	6.3	5.6	0.31	0.9	3.7	14	36	52	12
BC1	16-24	0.9	6.7	6.0	0.52	0.7	5.4	21	30	46	24
BC2	24+	1.7	6.7	6.1	0.55	0.7	5.3	21	29	44	27
					Peyton						
Ae	0-3	1.7	3.6	3.1	0.05	4.3	0.3	20	62	36	2
Bhfc	3-5	14.9	4.3	4.0	3.75	15.6	0.5	15	54	42	4
Bfc	5-12	2.9	5.0	4.9	0.83	2.0	0.2	47	77	21	2
BC	12-22	1.2	4.8	4.8	0.49	1.1	0.1	18	72	28	0
C	22+	1.2	4.8	4.6	0.14	1.2	tr.	21	65	33	2
					Soulis Pond						
Aegj	0-3	4.1	4.6	3.6	0.49	10.6	0.2	11	12	58	30
Bm	3-6	4.0	4.9	3.9	0.85	5.7	0.2	32	39	45	16
BC	6-14	3.4	5.5	4.5	0.87	2.7	0.1	27	42	43	15
Cg	14-20	2.9	5.6	4.6	0.51	2.3	0.1	39	39	45	15
Cx	20+	1.6	5.5	4.2	0.31	2.3	0.2	30	28	46	26
					Southwest Gander River						
A20/ Ae	0-2	5.1	4.9	4.5	1.45	6.0	0.2	0	19	61	20
Bfh	2-8	9.0	4.7	4.6	3.81	7.3	0.1	4	35	51	14
Bf	8-14	6.3	4.5	4.7	1.98	5.7	tr.	4	41	46	13
BC	14-24	4.9	4.6	4.9	0.98	4.0	0.2	6	52	36	12
IID	24+	2.8	5.0	5.0	0.41	3.4	0.3	1	68	26	6

Table 7. Chemical and Physical Analyses of Representative Profiles

		Chemical analyses						Particle-size analyses			
						meq/100 g of soil					
Horizon	Depth inches	Loss on ignition %	pH H_2	pH $CaCl_2$	Free Fe_2O_3 %	Exchangeable acidity	Exchangeable bases	Gravel %	Sand 2-.05 mm %	Silt .05-.002 mm %	Clay below .002 mm %
						Square Pond					
Ae	0-5	0.9	4.2	3.3	0.04	2.8	0.0	25	60	35	5
AB	5-7	1.5	4.3	3.4	0.05	3.4	0.1	21	62	33	5
Bhfc	7-12	14.7	4.9	4.0	0.91	17.6	0.4	26	63	34	3
Bgj	12-15	4.4	5.3	4.3	0.25	5.3	0.1	23	64	33	3
BC	15-25	2.7	5.3	4.5	0.25	2.4	0.0	40	60	34	6
Cx	25+	1.2	5.4	4.5	0.35	1.9	0.0	37	58	37	5
						Terra Nova					
Ae	0-8	0.3	3.9	3.4	0.16	3.9	0.2	11	60	31	9
Bhfc	8-11	15.4	5.2	4.5	1.91	13.6	0.2	17	63	25	12
Bfhc	11-16	6.7	5.5	5.1	1.37	4.3	0.0	22	60	29	11
BC	16-24	0.3	5.5	5.3	0.14	1.7	0.3	23	58	34	8
C	24+	0.0	5.3	4.9	0.08	1.5	0.0	28	59	30	11
						Wing Pond					
Ae	0-3	2.0	3.6	3.3	0.05	1.8	1.1	29	19	63	18
AB	3-5	2.9	3.9	3.6	0.34	7.4	0.2	36	33	53	14
Bfhc	5-7	10.6	4.2	3.8	0.89	14.9	0.2	48	49	39	12
Bg	7-10	5.3	4.9	4.6	1.28	5.3	0.1	47	43	45	12
BC	10-18	2.0	5.2	4.7	0.57	2.3	0.1	45	35	40	25
Cg1	18-24	1.4	5.0	4.2	0.55	2.1	0.4	37	35	34	31
Cg2	24+	0.9	5.0	4.3	0.37	1.8	0.3	28	32	50	18

Table 8. Available Nutrients* in Representative Soil Profiles

Series	Horizon	Depth inches	Pounds per acre N	P	K	Ca
Benton	Ae	0– 2	1.3	0.3	9.2	47.5
	Bfh1	2– 6	7.9	vl	13.2	5.3
	Bfh2	6–13	4.7	vl	23.4	vl
	BC	13–19	4.0	vl	28.0	vl
	Cx	19+	4.0	vl	20.0	vl
Boot Pond	Ah	0– 2	4.0	0.7	9.2	110.9
	Ahe	2– 7	10.0	vl	23.2	265.6
	Bg	7–16	vl	vl	48.0	816.0
	BC	16–26	6.6	7.7	46.5	690.6
	Cg	26+	4.0	1.0	28.0	272.0
Butts Pond	Aeg	0– 5	6.6	vl	16.6	vl
	Bfh	5– 9	5.3	vl	18.5	vl
	BC	9–17	vl	vl	26.6	vl
	Ccgj	17–23	vl	vl	28.0	224.0
	Cx	23+	vl	1.0	28.0	256.0
Eastport	Ae	0– 3	10.0	1.0	16.0	8.0
	Bfhc	3– 5	4.0	0.3	13.2	5.3
	Bfc	5– 9	13.2	0.7	26.4	10.6
	BC1	9–15	20.0	2.0	32.0	16.0
	BC2	15–21	28.0	1.0	36.0	16.0
	C	21+	12.0	1.0	24.0	vl
Fox Brook	Ae	0– 5	19.9	1.7	46.5	13.3
	Bhf	5–14	24.0	1.5	102.0	24.0
	Bf	14–20	16.0	1.0	32.0	16.0
	BC	20–28	21.3	1.3	42.6	21.3
	Cg	28+	16.0	1.0	56.0	16.0
Gambo	Ae	0–2.5	1.7	0.4	8.4	vl
	Bfh	2.5– 6	7.0	vl	16.2	vl
	Bf	6–15	18.0	vl	42.0	48.0
	BC	15–32	11.3	2.8	79.2	vl
	C	32+	4.0	vl	20.0	vl
Gander	Ae	0– 3	2.0	1.0	10.0	vl
	Bfh	3– 7	5.3	vl	13.2	vl
	Bf	7–12	6.6	vl	16.6	vl
	BC	12–20	5.3	vl	37.2	vl
	C	20+	4.0	vl	20.0	vl
Glenwood		Not sampled				
Home Pond	Aeg	0– 4	5.3	0.7	15.8	10.6
	Bg	4–16	32.0	2.0	48.0	224.0
	BC1	16–24	16.0	1.3	42.6	319.2
	BC2	24+	20.0	1.0	32.0	256.0

Table 8. Available Nutrients* in Representative Soil Profiles (Concluded)

Series	Horizon	Depth inches	Pounds per acre			
			N	P	K	Ca
Peyton	Ae	0– 3	6.0	1.0	24.0	8.0
	Bhfc	3– 5	6.6	0.3	18.5	5.3
	Bfc	5–12	9.3	1.2	37.1	18.6
	BC	12–22	6.6	1.7	39.8	26.6
	C	22+	12.0	1.0	24.0	16.0
Soulis Pond	Aegj	0– 3	4.0	vl	14.0	vl
	Bm	3– 6	4.0	vl	14.0	vl
	BCgj	6–14	10.6	vl	42.6	vl
	Cg	14–20	4.0	2.0	28.0	vl
	Cx	20+	4.0	vl	28.0	vl
Southwest Gander River	Ae	0– 2	2.0	vl	14.0	vl
	Bfh	2– 8	10.0	vl	16.6	vl
	Bf	8–14	13.9	vl	37.1	vl
	BC	14–24	13.9	vl	37.1	vl
	IIC	24+	7.9	vl	31.7	42.2
Square Pond	Ae	0– 5	10.0	vl	26.6	vl
	AB	5– 7	1.3	0.3	9.2	vl
	Bhfc	7–12	3.3	0.8	23.2	vl
	Bgj	12–15	6.0	vl	14.0	vl
	BC	15–25	19.9	1.7	46.5	vl
	Ccgj	25+	8.0	1.0	20.0	vl
Terra Nova	Ae	0– 8	5.3	1.3	37.2	vl
	Bhfc	8–11	2.0	0.5	10.0	vl
	Bfhc	11–16	3.3	vl	16.6	vl
	BC	16–24	5.3	vl	37.2	21.3
	C	24+	4.0	vl	28.0	vl
Wing Pond	Ae	0– 3	8.0	0.5	8.0	8.0
	AB	3– 5	5.3	0.3	10.6	5.3
	Bfhc	5– 7	5.3	0.3	13.2	5.3
	Bg	7–10	6.0	0.5	16.0	8.0
	BC	10–18	10.6	1.3	42.6	21.3
	Cg1	18–24	8.0	1.0	56.0	128.0
	Cg2	24+	8.0	1.0	68.0	128.0

vl = very low, less than 0.1 lb per acre.
*Available nutrients in each horizon calculated on the basis of 2,000,000 lb of soil per acre 6 inches deep, gravel and stones not included.

Hygroscopic moisture. By heating at 105 C until the weight remained constant.

Loss on ignition at 450 C. (Atkinson, Giles, MacLean, and Wright, 1958).

Free Fe_2O_3. Extracted in ammonium oxalate as discussed by McKeague, J., and J. H. Day (1966).

Exchangeable acidity. Soil leached with 1 N ammonium acetate to pH 7.0, back-titrated to original pH. Chemical methods of soil analysis (Atkinson et al., 1958).

Exchangeable bases. Soil leached with 1 N ammonium acetate, leachate evaporated to dryness, ignited, dissolved in HCl, and back-titrated with NaOH (Jackson, 1958, p. 69).

Available nutrients. Soil shaken with 0.025 N acetic acid according to Spurway. Determinations done with the aid of spectrometer and atomic absorption spectrophotometer (Spurway, 1933).

GLOSSARY

catena A sequence of soils of about the same age, derived from similar parent materials, and occurring under similar climatic conditions, but having unlike characteristics because of variations in relief and in drainage.

consistence (i) The resistance of a material to deformation or rupture. (ii) The degree of cohesion or adhesion of the soil mass. Terms used for describing consistence at various soil moisture contents are:
wet soil—nonsticky, slightly sticky, sticky, and very sticky; nonplastic, slightly plastic, plastic, and very plastic.
moist soil—loose, very friable, friable, firm, and very firm; compact, very compact, and extremely compact.
dry soil—loose, soft, slightly hard, hard, very hard, and extremely hard.
cementation—weakly cemented, strongly cemented, and indurated.

cementation See *consistence.*

fragipan A natural subsurface horizon having a higher bulk density than the solum above; seemingly cemented when dry, but showing moderate to weak brittleness when moist. The layer is low in organic matter, mottled, slowly or very slowly permeable to water, and usually has some polygon-shaped bleached cracks. It is found in profiles of either cultivated or virgin soils but not in calcareous material.

friable A consistence term pertaining to the ease of crumbling of soils. See also *consistence.*

horizon, soil A layer of soil or soil material approximately parallel to the land surface; it differs from adjacent genetically related layers in properties such as color, structure, texture, consistence, and chemical, biological, and mineralogical composition. A list of the designations and some of the properties of soil horizons and layers follows. More detailed definition of some horizons and layers may be found in *The System of Soil Classification for Canada.* Organic layers contain more than 30% organic matter.
L-F-H—Organic layers developed under imperfectly to well-drained conditions, often forest litter.
L—The original structures of the organic material are easily recognizable.
F—The accumulated organic material is partly decomposed.
H—The original structures of the organic material are unrecognizable.
Master mineral horizons and layers contain less than 30% organic matter.
A—A mineral horizon formed at or near the surface in the zone of removal of materials in solution and suspension or maximum in situ accumulation of organic matter, or both.
B—A mineral horizon characterized by one or more of the following:
1) an enrichment in silicate clay, iron, aluminum, or humus;
2) a prismatic or columnar structure that exhibits pronounced coatings or stainings associated with significant amounts of exchangeable sodium;
3) an alteration by hydrolysis, reduction, or oxidation to give a change in color or structure from horizons above or below, or both.
C—A mineral horizon comparatively unaffected by the pedogenic processes operative in A and B, except gleying, and the accumulation of carbonates and more soluble salts.
R—Underlying consolidated bedrock.

Roman numerals are prefixed to horizon designations to indicate unconsolidated lithologic discontinuities in the profile. Roman numeral I is understood for the uppermost material and therefore is not written. Subsequent contrasting materials are numbered consecutively in the order in which they are encountered downward, that is, II, III, and so on.

Horizon subdivisions are shown with arabic numerals used as suffixes. Transition horizons need capitals only; if transition is gradual, use, for example, AB or BC.

Lowercase suffixes

c—A cemented (irreversible) pedogenic horizon.

e—A horizon characterized by removal of clay, iron, aluminum, or organic matter alone or in combination and higher in color value by one or more units when dry than an underlying B horizon. It is used with A (Ae).

f—A horizon enriched with hydrated iron. It usually has a chroma of 3 or more. The criteria for an f horizon except for Bgf are: the oxalate-extractable Fe + Al exceed that of the IC horizon by 0.8% or more, and the organic matter to oxalate-extractable Fe ratio is less than 20. These horizons are differentiated on the basis of organic matter content into:

Bf, less than 5% organic matter
Bfh, 5% to 10% organic matter
Bhf, greater than 10% organic matter.

g—A horizon characterized by gray colors, or prominent mottling indicative of permanent or periodic intense reduction, or both, for example, Aeg, Btg, Bg, and Cg.

h—A horizon enriched with organic matter.

Ah—An A horizon of organic matter accumulation. It contains less than 30% organic matter. It is one Munsell unit of color value darker than the layer immediately below, or it has at least 1% more organic matter than the IC, or both.

Ahe—This horizon has been degraded as evidenced by streaks and splotches of light and dark gray material and often by platy structure.

Bh—This horizon contains more than 2% organic matter, and the organic matter to oxalate-extractable Fe ratio is 20 or more.

j—This is used as a modifier of suffixes e, g, n, and t to denote an expression of, but failure to meet, the specified limits of the suffix it modifies, for example, Aej is an eluvial horizon that is thin, discontinuous, or faintly discernible.

m—A horizon slightly altered by hydrolysis, oxidation, or solution, or all three, to give a change in color or structure, or both.

x—A horizon of fragipan character.

parent material The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil has developed by pedogenic processes.

pH, soil The negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity or alkalinity of a soil as determined by means of a glass, quinhydrone, or other suitable electrode or indicator at a specified moisture content or soil-water ratio, and expressed in terms of the pH scale.

profile, soil A vertical section of the soil through all its horizons and extending into the parent material.

series, soil The second category (II) in the Canadian system of soil classification. This is the basic unit of soil classification, and consists of soils that are essentially alike in all major profile characteristics except the texture of the surface.

structure, soil The aggregation of primary soil particles into compound particles, which are separated from adjoining aggregates by surfaces of weakness. Aggregates differ in grade (distinctness) of development and grade is described as structureless (no observable aggregation or no definite orderly arrangement but amorphous if coherent or single grained if noncoherent), weak, moderate, and strong. The aggregates vary in class (size) and are described as fine, medium, coarse, or very coarse. The size classes vary according to the type (shape) of structure. The types of structure mentioned in the report are:

granular—having more or less rounded aggregates without smooth faces and edges, relatively nonporous.

platy—having thin, platelike aggregates with faces mostly horizontal.

subangular blocky—having blocklike aggregates with rounded and flattened faces and rounded corners.

texture, soil The percentages of sand, silt, and clay in a soil determine its texture. Size groups from 2 mm to 0.05 mm in diameter are called sand, those from 0.05 to 0.002 mm are called silt, and those less than 0.002 mm in diameter are called clay. Sands are coarse textured, loams are medium textured, and clays are fine textured.

till (i) Unstratified glacial drift deposited directly by the ice and consisting of clay, sand, gravel, and boulders intermingled in any proportion. (ii) To plow and prepare for seeding; to seed or cultivate the soil.

REFERENCES

Anon. 1965. Soil capability classification for agriculture. Report No. 2. Canada Land Inventory, ARDA, Can. Dep. Forest., Ottawa. 16 p.

Anon. 1966. The climates of Canada for agriculture. Report No. 3. Canada Land Inventory, ARDA, Can. Dep. Forest. Rural Develop., Ottawa. 24 p.

Anon. 1968. Forest capability maps (Sheets 2D 15 and 2D 16). Newfoundland Forest Service, Dep. Mines, Agr., and Resources, St. John's.

Atkinson, H. J., Giles, G. R., MacLean, A. J., and Wright, J. R. 1958. Chemical methods of soil analysis. Contribution No. 169 (Revised). Chem. Div., Sci. Ser., Can. Dep. Agr., Ottawa. 90 p.

Bouyoucos, G. J. 1936. Directions for making mechanical analyses of soils by the hydrometer method. Soil Sci. 42:225-230.

Dominion Bureau of Statistics. 1960. Climate, p. 31-77. *In* The Canada Year Book. Queen's Printer, Ottawa.

Hare, K. F. 1952. The climate of the Island of Newfoundland: A geographical analysis. Can. Dep. Mines and Tech Surveys, Geograph. Bull. No. 2, p. 36-38.

Hunting Survey Corporation Limited, 1964. A report of the ARDA study region in North Eastern Newfoundland. Prepared for the Agricultural Rehabilitation and Development Administration, Can. Dep. Agr., Ottawa. 135 p.

Jackson, M. L. 1958. Soil chemical analysis. Prentice-Hall, Inc.

Jenness, S. E. 1963. Terra Nova and Bonavista map areas (2D E½ and 2C). Memoir 327. Geological Survey of Canada, Dep. Mines and Tech. Surveys, Ottawa.

MacClintock, P., and Twenhofel, W. H. 1940. Wisconsin glaciation of Newfoundland. Bull. Geol. Soc. Amer. 51:729-1756.

McCormack, R. J. 1967. Land capability classification for forestry. Report No. 4. Canada Land Inventory, ARDA, Dep. Forest. Rural Develop., Ottawa. 26 p.

McKeague, J. A., and Day, J. H. 1966. Dithionate- and oxalate-extractable Fe and Al. Can. J. Soil Sci. 46:13-22.

National Soil Survey Committee. 1968. Proceedings of the seventh meeting, April 22-26, 1968. Univ. Alberta, Edmonton. 216 p.

Spurway, C. H. 1933. Soil testing. Michigan State College Bull. 132. 35 p.

Thornthwaite, C. W. 1948. An approach toward a more rational classification of climate. Geograph. Rev. 38:55-94.

COMMON AND BOTANICAL NAMES OF PLANTS

alder, green	*Alnus crispa* (Ait.) Pursh
alder, speckled	*Alnus rugosa* (DuRoi) Spreng.
aspen, trembling	*Populus tremuloides* Michx.
birch, white	*Betula papyrifera* Marsh.
blueberry, lowbush	*Vaccinium angustifolium* Ait.
bunchberry	*Cornus canadensis* L.
cherry, pin	*Prunus pensylvanica* L.
cloudberry	*Rubus chamaemorus* L.
cranberry, mountain	*Vaccinium vitis-idaea* L.
fir, balsam	*Abies balsamea* (L.) Mill.
lichen, reindeer	*Cladonia rangiferina* (L.) Web.
moss, feather	*Hylocomium* spp.
moss, plume	*Hypnum crista-castrensis* Hedw.
raspberry, dwarf	*Rubus pubescens* Raf.

serviceberry, Bartram's	*Amelanchier bartramiana* (Tausch) Roemer
sheep-laurel	*Kalmia angustifolia* L.
spruce, black	*Picea mariana* (Mill.) BSP.
spruce, white	*P. glauca* (Moench) Voss
tamarack	*Larix laricina* (DuRoi) K. Koch
tea, Labrador	*Ledum groenlandicum* Oeder
twinflower	*Linnaea borealis* L.