SOILS OF NORTHERN VICTORIA COUNTY NEW BRUNSWICK

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The soil map was prepared for lithographing by the Cartography Section of the Soil Research Institute, Canada Department of Agriculture, Ottawa.

PREFACE

This report is an inventory of the soil resources of about 1,335 square miles in the northern part of Victoria County.

The accompanying soil map shows the locations, extent, and distribution of the various soils. The soils of the settled areas have been mapped in greater detail than those of the forested areas. The map does not show pockets of soil on individual farms different from the soils mapped.

The report is useful not only to agricultural workers but also to those interested in land use planning, forest and wildlife management and conservation, highway construction, geography, surface geology, and hydrology.

The soils were classified according to the system set forth in *The System of Soil Classification for Canada*, published by the Canada Department of Agriculture.

GENERAL DESCRIPTION OF THE AREA

Location and Extent

The surveyed area includes the part of Victoria County that lies north of 47° N and the part of the County south of this and east of 67° W. It joins the State of Maine in the southwest corner of the map area. It is bounded on the west by Madawaska County, on the north by Restigouche County, on the east by Northumberland County, and on the south by York and Carleton counties and the southern part of Victoria County that was included in the Andover - Plaster Rock area. It has a total area of about 1,335 square miles, or 854,000 acres.

Principal Towns and Industries

Grand Falls is the only town in the area. It has a population of about 4,000, an increase of about 1,600 since 1951. Grand Falls is the center of an important potato-processing industry and is a shipping point on both the Canadian Pacific and Canadian National railways. There is a sawmill, which provides a market for the logs from the local farm woodlots; a shoe last manufacturing plant, which uses local and imported hardwoods; and two fertilizer-mixing plants.

The New Brunswick Electric Power Commission has a hydro-generating plant at Grand Falls and a small one at Sisson Lake.

A large lumbering operation is carried on in the northern part of the County at Black Brook by J. D. Irving Company, and in the Tobique Valley there are several small sawmills.

Transportation and Markets

The southwestern part of the area is well served with roads. The Trans Canada Highway passes through the southwestern part, and a good network of roads serves the district near Drummond and Grand Falls portage. There is a road through the Tobique Valley and the main road from St. Leonard to Campbellton crosses the northwest tip of the County. The Plaster Rock - Renous Highway crosses the southeastern tip of the area. There is a good network of privately owned roads serving the forested regions.

Grand Falls is served by the Canadian Pacific Railway and a Montreal-Halifax

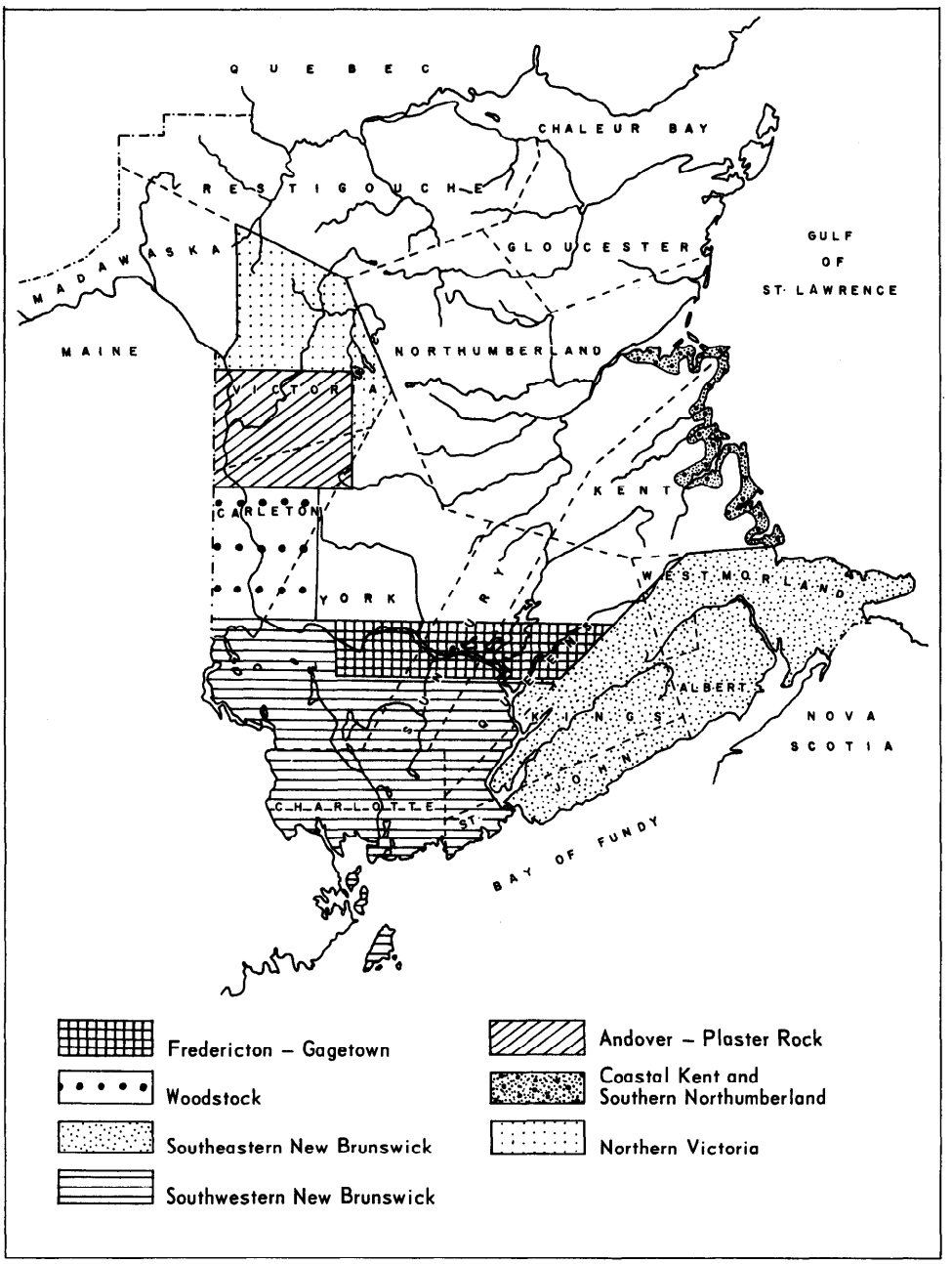

Fig. 1. Areas of New Brunswick in which the soils have been surveyed and reports have been published.

Line of the Canadian National Railways. The Campbellton - St. Leonard Branch Line of the Canadian National Railways crosses the northwestern tip of the County.

The local markets are small. The receipts from the export of seed and table stock potatoes and potato products make up most of the farm income.

Nonagricultural Industries

Lumbering is the main industry and there are several small mills in the Tobique Valley and near Grand Falls. The J. D. Irving Company has two modern sawmills just west of the area, and the Fraser Company has a large sawmill at Plaster Rock just south of the area. The pulp from Fraser's limits is trucked to their mill at Edmundston. The production of chips at the sawmills has eliminated much of the waste from these operations.

FACTORS IN SOIL FORMATION

Soil formation and development are influenced by parent material, climate, vegetation, drainage, topography, and time. In this section, these factors will be discussed in their relation to soil development in the mapped area.

Parent Material

The area was heavily glaciated and much of the area is covered with glacial material. Most of this glacial material has been moved over short distances and is derived from the underlying bedrock. Carbon dating indicates that the ice receded about 10,000 years ago (2). The Pleistocene and recent geology of the Grand Falls district has been reported by Lee. This report was confined to the immediate valley of the Saint John River and its tributaries. No attempt was made to map the upland districts. The Grand Falls drift covers the southwest corner of the surveyed area and has blocked the Saint John River and forced it to cut a gorge through the bedrock.

All the valleys of the area show extensive valley trains and outwash deposits and many of them have what appears to be reworked till or "dirty" gravel deposits plastered on their sides. The bottoms of the valleys have the better sorted gravels. Ground and ablation moraines cover much of the area. These tills are derived mainly from the underlying bedrock. Each main type of bedrock affects the kind and amount of rock fragments occurring in ground moraine, ablation moraine, reworked material, gravels, and sands. It would appear that they have also supplied most of the finer material in these deposits.

The lower terraces, which flood during the spring freshet, are composed of silt and fine sand. At higher elevations, there are similar deposits that have not flooded for long periods and have developed podzolic profiles.

Bedrock Geology

The bedrock geology of the surveyed area is best explained by Fig. 2, which shows the location, age, and characteristics of the various geologic formations.

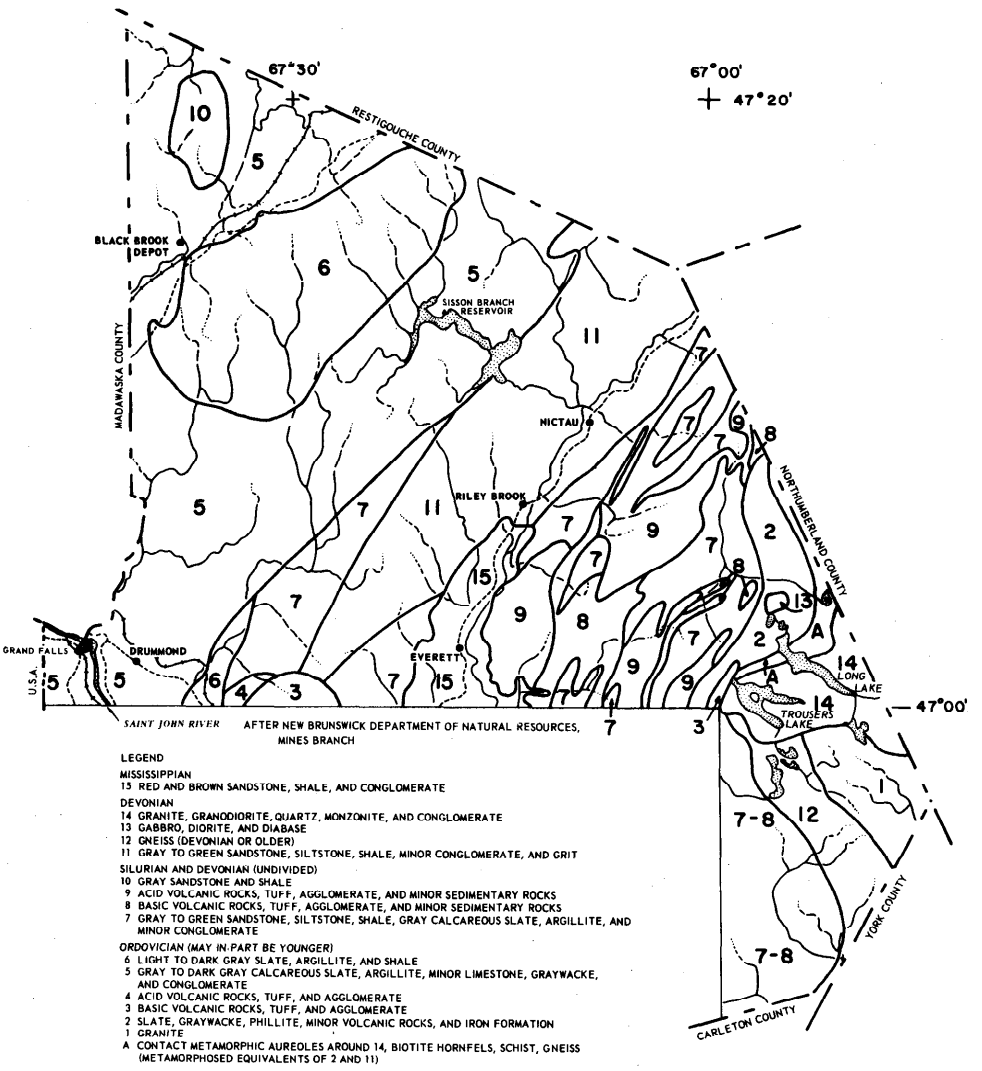

Fig. 2. Geology of the surveyed area.

Topography and Drainage

Topography and drainage are responsible for differences in the soils formed from the same parent material. Topography and parent material also determine the amount of water that will percolate through the soil.

The area falls in two of the main physiographic divisions of the province. The northern and western parts are in the Northern Upland and the southeastern part is in the Central Highlands.

The Central Highlands start east of the Tobique River and extend north and east beyond the County line. The height of the mountains increases from about 1,700 ft in the south to about 2,200 ft in the north. The difference in relief is about 700 ft in the south to 1,000 ft in the north.

The Northern Upland starts in a strongly dissected escarpment, about 600 ft high, forming the northwest side of the Tobique Valley. North of this is a gently rolling plateau, 800 to 900 ft in elevation. North and west of the plateau is another dissected region, about 1,300 ft in elevation, which forms the divide between the Salmon and Tobique drainage systems and the Grand and Restigouche watersheds. North of this region is another gently rolling area of about 900 ft in elevation, extending to the Restigouche River and the boundaries of the County.

The three principal river systems of New Brunswick drain this area. In the north, the Little Main Restigouche River and a number of its tributaries flow through the area. South of this, the Grand and Salmon rivers flow southwest into the Saint John River. The Tobique River and its tributaries, the Sisson, Mamozekel,

Fig. 3. Drummond and Ennishore from the southern boundary of the surveyed area.

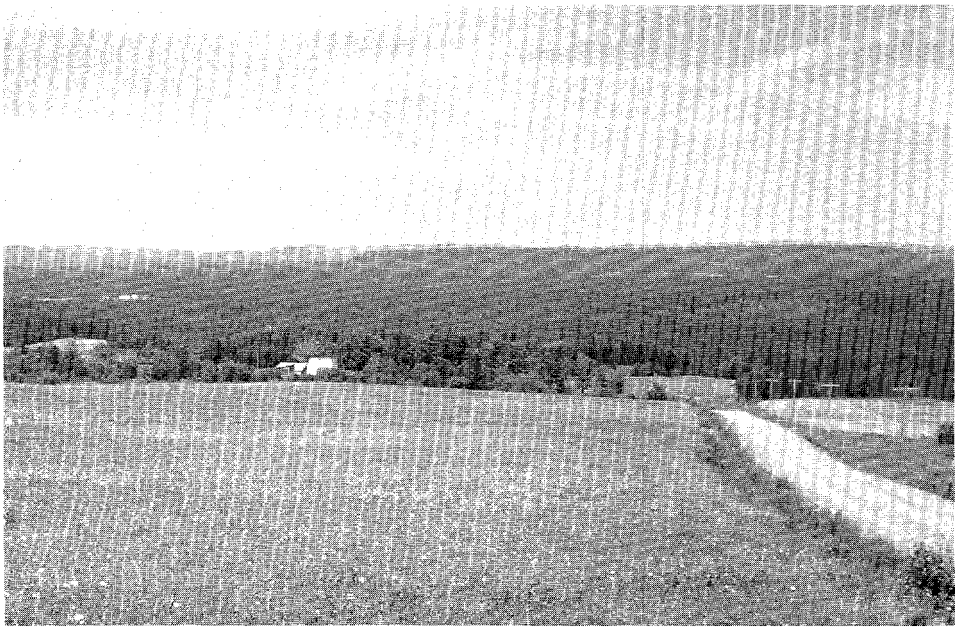

Fig. 4. Mississippian basin along the Tobique River. Upland in the distant background are Juniper, Tuadook, and Irving catenas.

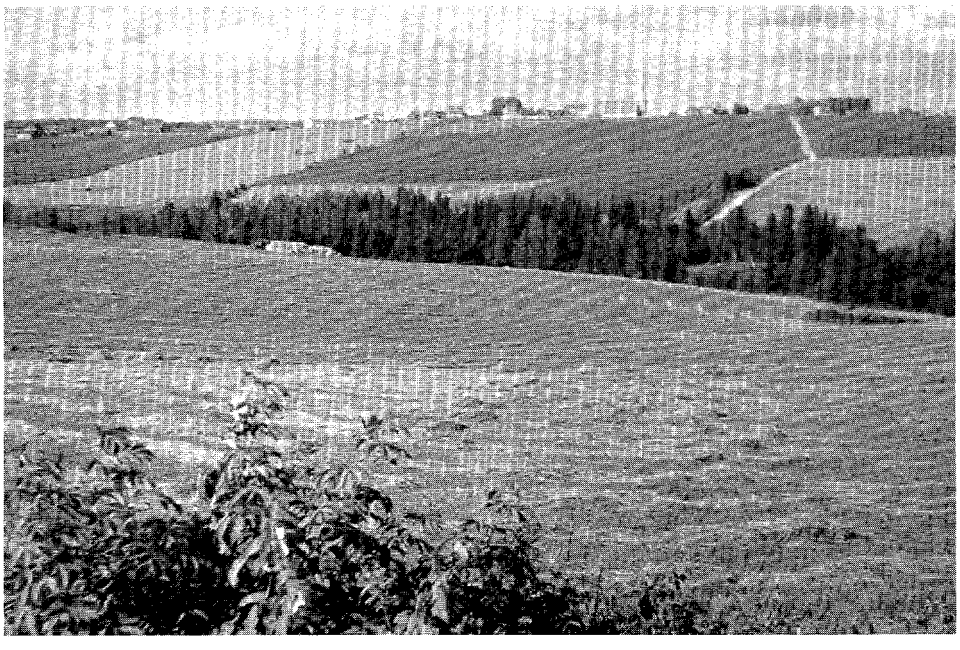

Fig. 5. Rolling topography near Drummond.

Fig. 6. Deeply carved stream channel south of Grand Falls.

and Campbell rivers, drain the main part of the area and the large lakes occurring in the eastern part. In the southwestern part is the headwater of the Tuadook River, which flows into the Little Southwest Miramichi, and the Clearwater and Burnthill brooks, which flow into the Southwest Miramichi River.

Climate

The climate of the area not only governs the formation of the soil, but also the life that the soil will support. Although the overall climate favors podzolization and gleization, local variations in climate modify the intensity of these processes.

There are eight weather stations in or near the area. The ones at Grand Falls and Riley Brook are within the area; the stations at Kedgwick, Plaster Rock, and the gate to Trousers Lake are just outside the surveyed area. Three weather stations in Maine are just south and west of the surveyed area and their records are helpful in developing the overall climatic picture. Grand Falls in the Saint John Valley is representative of the Valley, but the upland area around it is somewhat different. Plaster Rock and Riley Brook are both in the Tobique Valley and have some similarity even though the station at Riley Brook has records for only about 6 years. The station at Kedgwick is outside the area, but is on the plateau and is probably representative of the Northern Upland.

The station at the gate to Trousers Lake is at a slightly higher elevation. It is about 10 miles east of Plaster Rock and is located in a small clearing in a forested

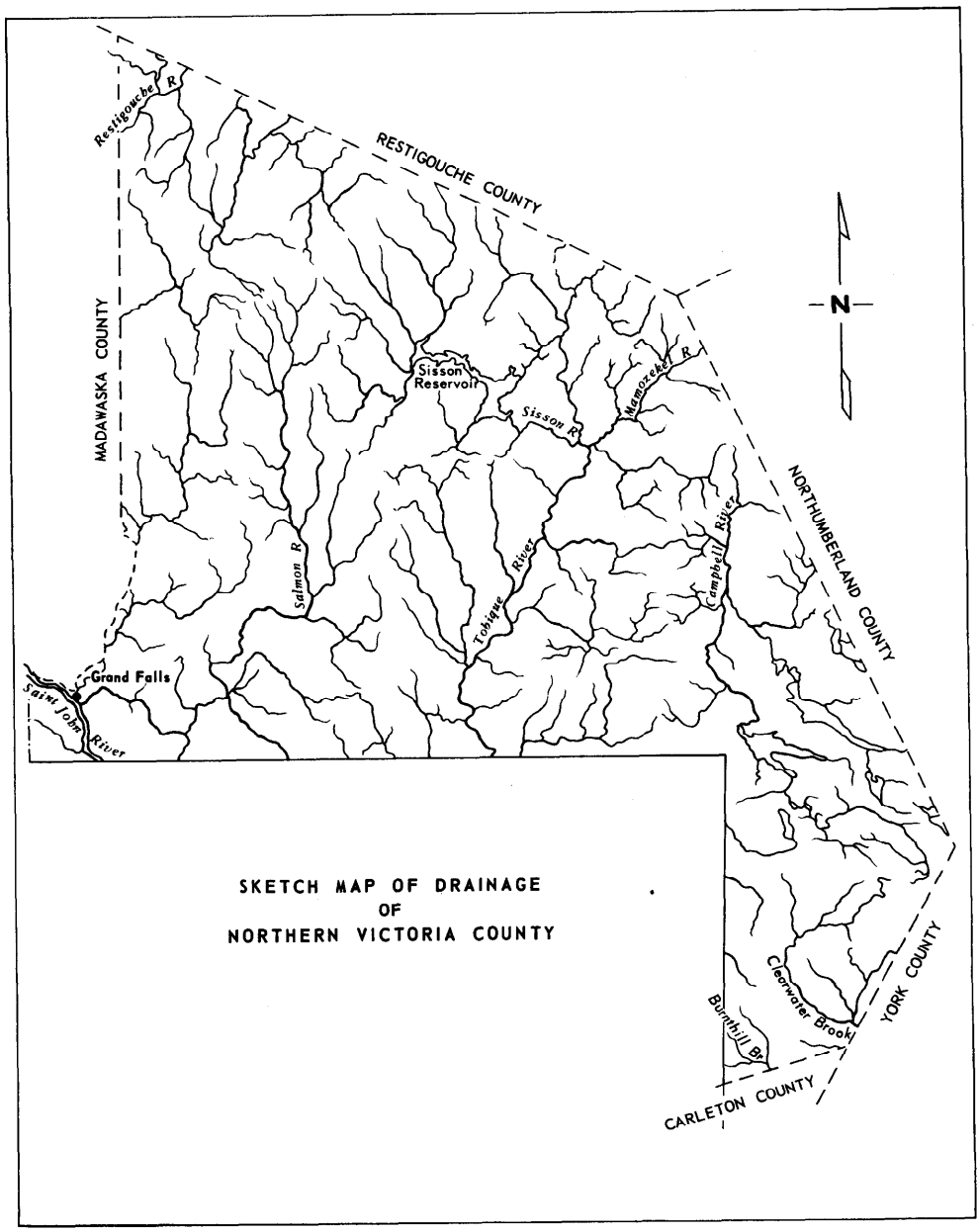

Fig. 7. Map showing the drainage of the surveyed area.

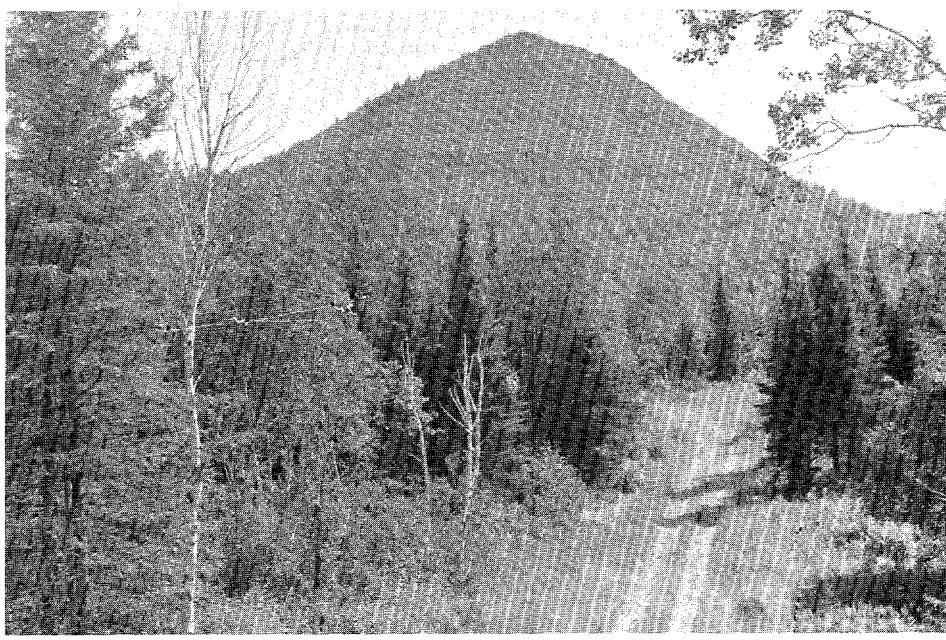

Fig. 8. Area of resistant rock at Bald Peak.

area. Although it is only a summer station, it is of interest in showing the variation in the rainfall pattern over a short distance.

The annual rainfall at Grand Falls is 36.48 inches, of which 15.90 inches falls in the period from May to September (Table 1). Plaster Rock has a yearly rainfall of 34.6 inches, with 14.5 inches falling in the growing season. The stations at Kedgwick and Riley Brook have annual rainfalls of 38.6 and 39.6 inches respectively and a growing-season rainfall of 18.9 inches.

The records taken at the gate to Trousers Lake do not show the May figures, but show more rain for the June to September period than for Plaster Rock for the whole season and nearly as much as Grand Falls. These stations also show slightly more rainfall than the three American stations for the June to September period.

The pattern of the rainfall (Tables 2–5) is very interesting. Riley Brook has been established for so short a time that the figures are not significant. Grand Falls normally shows about 1.5 inches more rainfall annually than Plaster Rock and had 22 weeks out of 330 without rainfall, whereas Plaster Rock had 66 weeks out of 326 without rainfall. At Grand Falls only twice in the 15 years were there 2 weeks in a row without rainfall, whereas at Plaster Rock this happened six times, one period was for 5 weeks. Grand Falls showed 30 weeks with 2 inches or more of rain, whereas Plaster Rock had only 16 weeks with this amount.

Although the records of the station at the gate to Trousers Lake do not cover exactly the same period, there appears to be a trend to a larger number of weeks having more than 2 inches of rainfall than the other stations.

Fig. 9. Hardwood forest in Sisson area containing sugar maple, yellow birch, and beech.

Fig. 10. Mixed wood forest in Sisson Lake area, Monquart soils. White pine was 100 ft high, 47 ft to the first branch, 37½ inches D.B.H., and approximately 300 years old. The rest of the forest was less than 50 years old.

Table 1. Mean monthly precipitation in inches recorded at selected stations in or near the surveyed area

	New Brunswick					Maine, USA		
	Grand Falls 31 yr	Plaster Rock 30 yr	Riley Brook 5+ yr	Kedgwick 12 yr	Trousers Lake gate 11 yr	Limestone 10 yr	Presque Isle 26 yr	Caribou 16 yr
December	2.8 (21.3)[1]	2.9 (20.4)	3.3 (22.3)	3.0		2.5	2.3 (19.3)	2.2 (19.6)
January	3.4 (26.7)	3.1 (23.0)	2.6 (16.9)	2.5		2.1	2.4 (18.4)	2.2 (20.6)
February	2.7 (21.8)	2.2 (19.2)	2.4 (22.5)	2.8		2.1	1.9 (18.4)	1.7 (22.6)
Total for period	8.9 (69.8)	8.1 (62.6)	8.3 (61.7)	8.3		6.7	6.6 (56.1)	6.1 (62.8)
March	2.5 (15.6)	2.3 (15.9)	2.3 (19.6)	2.2		2.5	2.3 (10.5)	2.4 (16.3)
April	2.7 (7.7)	2.2 (8.3)	3.2 (4.8)	2.5		2.6	2.5 (6.7)	2.6 (6.5)
May	2.6 (0.2)	2.1 (0.3)	3.2 (T)	2.7		3.1	2.9 (1.1)	3.1 (0.5)
Total for period	7.8 (23.5)	6.6 (24.5)	8.7 (24.4)	7.4		8.2	7.7 (18.3)	8.1 (23.3)
June	3.6	3.0 (0.1)	4.0	4.8	2.9	4.1	3.6	4.0
July	3.7	3.1	3.7	4.2	4.3	4.1	3.6	4.0
August	2.9	3.1	4.1	3.5	4.6	3.2	3.0	3.5
Total for period	10.2	9.2	11.8	12.5	11.8	11.4	10.2	11.5
September	3.2	3.1	2.9	3.7	3.8	3.1	3.4 (0.2)	3.5
October	3.6 (2.1)	3.0 (2.5)	3.0 (1.2)	3.5		3.4	3.4 (2.3)	3.5 (1.8)
November	3.0 (8.2)	3.2 (11.5)	3.8 (5.3)	3.3		3.4	2.5 (9.1)	3.0 (11.4)
Total for period	9.8 (10.4)	9.3 (14.0)	9.7 (6.5)	10.5		9.9	9.3 (11.6)	10.0
Total for year	36.7 (103.7)	33.2 (101.2)	38.5 (92.6)	38.7		36.2 (97.4)	33.8 (86.0)	35.7 (99.3)
Total, May-September	16.0	14.4	17.9	18.9	15.1[2]	17.6	16.5	18.1

[1]The figures in brackets refer to snow.
[2]June to September.

Table 2. Number of years in which various amounts of rain fell at Riley Brook each week from May to September, 1957–1961

Week	Inches					
	0.00	0.01–0.24	0.25–0.49	0.50–0.99	1.00–1.99	2.00
May 1 – 7	2	1	1	1	0	
8 – 14	0	1	1	0	2	0
15 – 21	0	1	2	2	0	1
22 – 28	1	2	0	1	0	0
May 29 – June 4	0	0	0	2	2	1
June 5 – 11	0	0	3	1	0	1
12 – 18	0	1	1	2	1	0
19 – 25	0	1	1	0	2	1
June 26 – July 2	0	0	0	2	2	1
3 – 9	0	1	1	2	1	0
10 – 16	0	1	1	2	1	0
17 – 23	0	0	2	1	2	0
24 – 30	0	0	1	3	0	1
July 31 – Aug. 6	1	3	1	0	1	0
7 – 13	0	1	2	0	2	1
14 – 20	0	1	1	0	3	1
21 – 27	0	0	2	0	3	1
Aug. 28 – Sept. 3	0	1	2	2	0	1
Sept. 4 – 10	1	2	2	0	0	1
11 – 17	0	1	1	2	2	0
18 – 27	0	2	2	0	0	2
Sept. 25 – Oct. 1	1	1	2	1	0	1

Table 3. Number of years in which various amounts of rain fell at Grand Falls in each week from May to September, 1947–1961

Week	Inches					
	0.00	0.01–0.24	0.25–0.49	0.50–0.99	1.00–1.99	2.00
May 1 – 7	3	6	4	1	0	1
8 – 14	1	4	3	3	3	1
15 – 21	2	3	1	6	1	2
22 – 28	2	2	1	4	4	2
May 29 – June 4	1	2	2	4	5	1
June 5 – 11	0	0	3	8	3	1
12 – 18	3	2	1	4	5	0
19 – 25	0	3	3	4	4	1
June 25 – July 2	1	1	3	3	4	3
July 3 – 9	2	0	6	4	3	0
10 – 16	0	2	1	5	7	0
17 – 23	0	3	2	2	8	0
24 – 30	0	3	4	1	6	1
July 31 – Aug. 6	0	4	5	2	2	2
Aug. 7 – 13	0	1	3	5	3	3
14 – 20	0	3	2	1	7	2
21 – 27	0	2	4	4	3	2
Aug. 28 – Sept. 3	1	2	2	7	1	2
Sept. 4 – 10	2	6	1	5	1	0
11 – 17	0	1	7	2	2	3
18 – 24	0	3	3	3	4	2
Sept. 25 – Oct. 1	4	4	3	2	1	1

Table 4. Number of years in which various amounts of rain fell at Plaster Rock each week from May to September, 1947-1961

Week	Inches					
	0.00	0.01–0.24	0.25–0.49	0.50–0.99	1.00–1.99	2.00
May 1 - 7	6	7	2	0	0	0
8 - 14	1	8	2	2	2	0
15 - 21	4	2	3	5	1	0
22 - 28	4	2	3	2	3	1
May 29 - June 4	1	2	3	2	6	1
5 - 11	2	2	2	4	3	2
12 - 18	5	2	4	4	0	0
19 - 25	1	5	3	2	3	1
June 25 - July 2	3	1	3	4	4	0
July 3 - 9	6	2	0	3	3	1
10 - 16	3	3	2	3	1	3
17 - 23	3	3	1	6	2	0
24 - 30	2	0	5	4	4	0
July 31 - Aug. 6	2	6	1	3	2	1
Aug 7 - 13	2	2	0	4	5	1
14 - 20	1	2	1	2	6	2
21 - 27	3	0	2	5	4	0
Aug. 28 - Sept. 3	0	3	0	6	4	1
Sept. 4 - 10	7	5	1	2	0	0
11 - 17	2	3	5	2	2	1
18 - 24	1	4	5	3	2	0
Sept. 25 - Oct. 1	7	2	3	1	1	1

Table 5. Number of years in which various amounts of rain fell at the gate at Trousers Lake in each week from May to September, 1955-1965

Week	Inches						
	0.00	0.01–0.24	0.25–0.49	0.50–0.99	1.00–1.99	2.00	Years
May 1 - 7	3	0	1	1	0	0	5
8 - 14	0	2	1	1	3	0	7
15 - 21	0	1	4	1	2	1	9
22 - 28	1	4	1	1	1	2	10
May 29 - June 4	0	3	1	2	4	0	10
5 - 11	0	2	1	4	2	2	11
12 - 18	2	2	2	3	2	0	11
19 - 25	0	2	2	3	4	0	11
June 26 - July 2	0	3	2	2	3	1	11
July 3 - 9	0	3	2	2	2	2	11
10 - 16	0	2	4	0	4	1	11
17 - 23	0	4	0	4	2	1	11
24 - 30	0	1	3	5	2	0	11
July 31 - Aug. 6	0	4	3	2	2	0	11
Aug. 7 - 13	0	0	1	2	6	2	11
14 - 20	1	1	2	1	3	3	11
21 - 27	0	1	2	4	1	3	11
Aug. 28 - Sept. 3	0	2	1	3	3	1	10
Sept. 4 - 10	0	4	2	2	2	0	10
11 - 17	0	1	5	1	2	1	10
18 - 24	0	3	2	3	2	1	11
Sept. 25 - Oct. 1	2	0	3	1	0	2	8
Oct. 2	0	0	1	0	1	0	2

The mean temperatures (Table 6) showed a marked difference between stations, Grand Falls and Riley Brook have the highest temperatures, whereas Plaster Rock has a mean temperature 5 degrees colder than Grand Falls and 2 degrees colder than Kedgwick. The average frost-free period (Table 7) ranges from 115 days at Grand Falls to 62 days at the gate to Trousers Lake, whereas Kedgwick is only slightly longer with 69 days. Riley Brook and Plaster Rock show an average of 70 and 93 days respectively.

According to Sanderson (5), the climate of the area is humid and the Central Highland is perhumid. There is a surplus of 15 inches of water and an evapotranspiration of 20–22 inches. The thermal efficiency is 61.6% to 68%.

Table 9 gives the available water for a few typical soils found in the area.

Vegetation

About 95% of the surveyed area is covered by forest. The distribution of the cover types is shown in Fig. 11.

The softwood species in order of dominance are balsam fir; black, white, and red spruce; white cedar; white pine; tamarack; red pine; and hemlock.

The hardwood species in order of dominance are: sugar maple, yellow birch, beech, trembling aspen, red maple, balsam poplar, and white birch.

There are a number of other smaller hardwoods such as striped maple, mountain maple, mountain ash, speckled alder, beaked hazel, pin cherry, various amelanchiers, and willows. These are considered to be weed trees because they are of little or no commercial importance.

The ground vegetation is widely varied. There are usually some of the mosses and club mosses present in varying amounts, and a number of ferns, the most common being the bracken, wood, and ostrich. There are a large number of herbaceous plants such as bunchberry, and small fruits such as blueberry and raspberry.

The soil texture, structure, depth, and reaction all influence the type of vegetation, its rate of growth, and the life-span and resistance to disease of trees.

Table 6. Mean daily temperatures (F) recorded at selected stations in or near the surveyed area

	New Brunswick						Maine, USA		
	Grand Falls 31 yr Elev. 498	Kedgwick 12 yr Elev. 901	Plaster Rock 30 yr Elev. 385	Riley Brook 5+ yr Elev. 500	Trousers Lake gate 11 yr Elev. 713 Max	Min	Limestone Loring Base 10 yr Elev. 700 (Approx)	Presque Isle 25 yr Elev. 606	Caribou 16 yr Elev. 624
December	16	12	12	18			15	17	15
January	9	5	6	12			9	11	9
February	9	9	6	11			10	11	10
Mean	11	9	8	14			11	13	11
March	23	18	20	23			22	24	22
April	36	34	32	37			35	38	35
May	50	48	43	50			49	51	49
Mean	36	33	32	36			35	38	35
June	59	57	53	58	70	44	58	60	58
July	65	63	58	63	74	49	64	66	64
August	63	60	56	61	73	47	62	64	62
Mean	62	60	56	60	67	39	61	63	61
September	54	51	48	54			53	55	53
October	44	39	40	43			42	44	42
November	32	26	26	33			29	31	29
Mean	43	39	38	43			41	43	41
Year	38	35	33	38			38	39	37

Table 7. Summary of frost records at selected stations in or near the surveyed area

Station	Lat °N	Long °W	Feet above mean sea level	Years	Average frost-free period days	Date of last frost in spring			Date of first frost in fall			Frost-free period, days					
												Longest			Shortest		
						Average	Earliest	Latest	Average	Earliest	Latest	Last in spring	First in fall	No. of days	Last in spring	First in fall	No. of days
Grand Falls	47 02	67 44	498	32	115	May 28	May 1	June 22	Sept. 20	Aug. 27	Oct. 2	May 18	Sept. 30	135	June 18	Sept. 12	86
Kedgwick	47 38	67 23	901	12	69	June 17	May 26	July 2	Aug. 25	July 18	Oct. 1	May 26	Sept. 3	100	July 2	July 18	16
Plaster Rock	46 54	67 22	385	12	93	June 8	May 12	July 3	Sept. 9	July 16	Sept. 13	June 8	Oct. 1	115	May 24	July 16	54
Riley Brook	47 10	67 13	500	7	70	June 19	June 8	July 3	Aug. 29	Aug. 11	Sept. 20	June 19	Sept. 14	85	July 1	Aug. 23	53
Trousers Lake gate, Fraser Co.	46 54	67 14	713	11	62	June 17	June 9	July 7	Aug. 21	July 18	Sept. 21	June 9	Sept. 8	91	June 17	July 24	37

Table 8. Chances of frost at Grand Falls

Season	Chances of temperature of 32 F or lower on or after indicated date in spring and on or before indicated date in fall						
Spring	May 11	May 19	May 23	May 28	June 3	June 6	June 14
Fall	Oct. 1	Sept. 26	Sept. 24	Sept. 20	Sept. 16	Sept. 14	Sept. 9
	9 in 10	3 in 4	2 in 3	1 in 2	1 in 3	1 in 4	1 in 10

Table 9. Moisture availability in some of the soils of the area

Soils	Condition	Thickness of soil inches	Total inches of available water
Bellefleur*	Virgin	24	6.4
Bellefleur	Virgin	36	10.8
Bellefleur	Virgin	24	6.2
Bellefleur	Ap horizon	6	1.8
Boston Brook	Virgin	24	4.3
Britt Brook	Virgin	22	3.7
Caribou*	Virgin	24	4.8
Caribou	Virgin	38	7.1
Caribou	Ap horizon	6	0.8
Carlingford	Virgin	15	3.3
Flemming*	Virgin	24	6.3
Flemming	Ap horizon	6	2.2
Flemming	Virgin	24	6.6
Flemming	Virgin	48	8.6
Glassville	Virgin	24	1.3
Glassville	Virgin	44	2.3
Grand Falls	Virgin	24	2.3
Harquail	Ap horizon	6	1.5
Harquail	Virgin	24	6.8
Holmesville	Virgin	24	4.0
Holmesville	Virgin	48	8.4
Holmesville silt loam	Virgin	24	4.4
Holmesville silt loam	Virgin	54	11.6
Holmesville silt loam	Virgin	24	2.4
Holmesville silt loam	Virgin	36	3.7
Jardine	Virgin	22	4.6
Johnville silt loam	Virgin	24	3.1
Johnville silt loam	Virgin	42	5.2
Johnville	Virgin	24	4.9
Kedgwick	Virgin	24	3.8
Kedgwick	Virgin	36	5.1
Kingsclear	Virgin	24	4.2
Kingsclear	Virgin	64	10.6
Long Lake	Virgin	20	2.5
Maliseet	Virgin	24	2.8
Maliseet	Virgin	66	12.5
McGee	Virgin	24	2.3
McGee	Virgin	24	2.2
Monquart	Virgin	24	4.0
Monquart	Virgin	64	10.4
Nackawic	Virgin	24	3.1
Nackawic	Virgin	54	9.0
Nickle Mills	Virgin	24	4.6
Nickle Mills	Virgin	39	7.2
Poitras silt loam	Virgin	25	2.9
Poitras	Virgin	24	3.8
Poitras	Virgin	53	9.5
Poitras	Virgin	24	3.1
Poitras	Virgin	20	3.8
Quisibis	Virgin	24	6.3
Siegas	Virgin	24	6.3
Siegas	Virgin	62	13.8
Thibault	Virgin	24	4.9
Tuadook	Virgin	24	2.1
Tuadook	Virgin	36	5.5

*Includes L-H horizons.

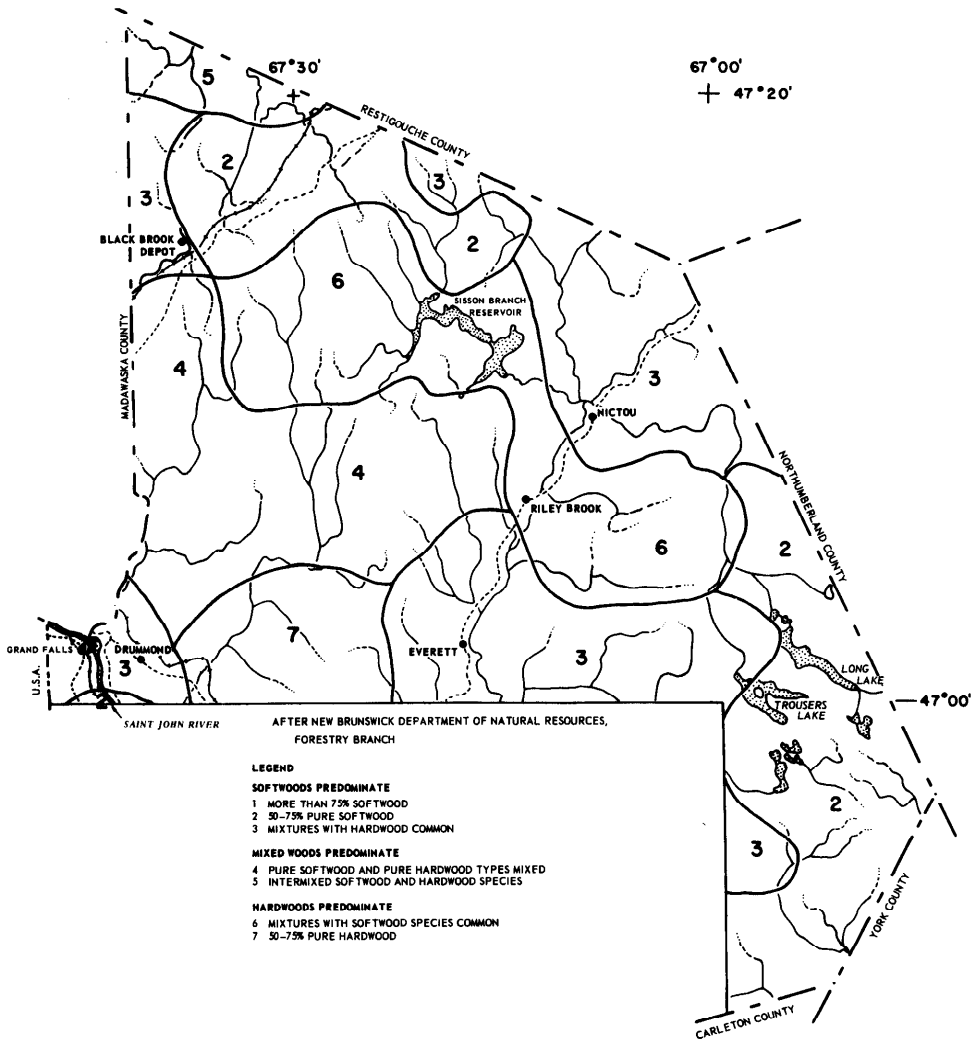

Fig. 11. Cover types of the surveyed area.

SOIL DEVELOPMENT, MAPPING, AND CLASSIFICATION

Soil Development

The cool, humid climate of the region, interacting with the other soil-forming factors over long periods of time, has produced changes in the soil mantle that can be observed in a vertical section or soil profile. The additions, losses, transformations, and translocations that occur have caused the formation of layers or horizons that differ from one another in thickness, texture, structure, or consistence. The horizons are named A, B, and C from the surface downward, and each may be subdivided on the basis of differences in observable characteristics. It is on the basis of the features of the horizons that the soils are classified. The main characteristics used are the number of horizons, their sequence, thickness, color, texture, structure, consistence, and mineral and chemical compositions.

Each soil does not have sharp boundaries, but grades along its margins into others of unlike properties. Also, as a soil has depth as well as area, the features of each horizon may vary both laterally and vertically. It is therefore necessary to choose arbitrarily the range in features for each soil named.

Under given climatic conditions over a fairly broad area, many soils on materials that have good drainage and aeration develop a few characteristics in common. In Victoria County most of the well-drained soils are members of the Podzolic Order. The profile of a typical virgin podzol is described as follows:

Horizon	
L	Recent fallen leaf litter, twigs.
F	Brown to dark brown partially decomposed material, often felted and matted with roots and mycelium; acid.
H	Black to dark brown, decomposed, greasy organic matter; usually well-developed structure; acid.
Ah	Black mineral horizon with up to 30% organic matter.
Ae	Light gray to pinkish gray mineral horizon; platy; acid.
Bhf	Dark reddish brown to black mineral layer; somewhat firm to weakly cemented; not always present.
Bfh	Yellowish red to dark yellowish brown; granular; soft, friable, plastic.
Bf	Yellowish brown; granular; soft, friable, plastic.

In some of the soils there has been an accumulation of organic matter, usually in the upper B horizon. This organic matter imparts a dark color to the horizon. If this horizon meets the depth requirements, these soils belong to the Ferro-Humic Podzol Great Group.

Some of the other soils show little profile development. The easily soluble salts have been leached out and a small amount of organic matter and iron have accumulated. No Ae horizon is present or it is very thin. These soils usually occur on parent materials that are weakly acid. These soils are members of the Brunisolic Order.

Where the parent material contained large amounts of free carbonates, the normal acid leaching process required for the formation of a podzolic soil was retarded until the free carbonates were leached from the soil. During this time, clay moved from the upper part of the profile and redeposited to form an argillic or Bt horizon. Where this process has gone only to this stage, the soils belong to the Luvisolic Order. When leaching has gone beyond this stage and the upper part of the profile is sufficiently acid, a podzolic profile has formed above the Bt horizon. These soils belong to the Bisequa Humo-Ferric Podzol, or Bisequa Gray Wooded (Gray Luvisol) subgroups.

Wherever drainage is restricted by the topography or the parent material, the soils remain moist for considerable periods of time. Under these conditions, the horizons are not so distinct and have duller colors than in the well-drained soils. Where drainage is only moderately slow, the horizons are usually distinct, but have yellowish brown, reddish brown, or gray mottles that become more prominent as drainage becomes poorer. The soils that retain the characteristic horizons of the well-drained order or great groups, but are mottled, have the term Gleyed prefixed before the appropriate subgroup name.

When conditions are such that water remains in the soil for a large part of the year, the horizons become less distinct, have colors of low chroma, and are prominently mottled. These soils belong to the Gleysolic Order.

A generalized description of an Orthic Gleysol follows:

Horizon	
L	Brown leaves, needles, twigs, and moss.
F	Dark brown semidecomposed organic material, felted.
H	Black well-decomposed organic material; strong, coarse crumb.
Ah	Dark grayish brown (10YR 4/2) to dark brown (10YR 2/2); coarse to medium granular; loose, friable.
Ahe	Grayish brown (10YR 5/2) to very dark grayish brown (10YR 3/2); common, fine, faint to no mottles; strong, medium granular to amorphous.
Aeg	Light olive gray (5Y 6/2) to dark gray (10YR 4/1); platy to granular to amorphous; mottled.
Bg	Olive gray (5Y 4/2) to dark yellowish brown (10YR 3/4); granular to amorphous; mottled.
Cg	Dark grayish brown (2.5Y 4/2) to dark brown (10YR 4/3); granular to amorphous; mottled.

Along the stream courses of the area, the sediments have not been in place long enough to develop profile characteristics, except for a surface horizon. Such soils belong to the Regosolic Order.

There are numerous depressional areas in the County that are saturated with water for a large part of the year and in which a considerable thickness of organic material has accumulated. Some of these areas are sites of former lakes. These organic soils do not have the distinct horizons found in the mineral soils, but have a succession of layers composed of moss and sedges in various stages of decomposition. If decomposition is well advanced, the surface layer may be a muck, but in most cases the material is only partially decomposed and is classed as peat. These may be acid or nearly neutral depending on the amount of carbonates in the parent material of the surrounding soils.

Soil Mapping

Soils were grouped into series on the basis of features and properties observed in the profiles. On a given parent material, a number of soils will develop that have similar profile characteristics and properties.

On soil maps, the boundaries between soil series are shown by single lines. Soils rarely have sharp boundaries, but often form a complex pattern on the landscape. For this and other reasons, the delineation and mapping of a pure series is difficult and often impossible except on a very large scale map. It is accepted practice to allow other soils to occupy up to 15% of the area delineated on the map as a soil series. Thus, on the scale of mapping used in Victoria County, the mapping unit may range from a single soil series to an area containing 85% of that series. Because of the dense forest cover and the inaccessibility of the area, complexes of two or more soil series were often mapped.

Soil profiles were examined near all roads and trails, in pits dug in fields and forested areas, and in road exposures. In places, inaccessible by road, traverses were made by canoe and on foot. The boundaries between the various soils were plotted on aerial photographs on a scale of 4 inches to 1 mile. Stoniness and slope were recorded for each soil and notes were taken on the vegetation, crops, agricultural practices, and capability. Samples were taken of the main soil types for physical and chemical analysis and the results are given in the tables.

Classification of the Soils

Each of the soil great groups has a distinct kind of profile. There are local variations in the texture, color, and consistence of the horizons usually associated with differences in the parent material. For this reason, it is convenient to divide the great groups into subgroups based on some characteristic, such as the kind of development of the B horizon. The subgroups are subdivided into series. The soils in each series have developed from the same kind of parent material and have the same drainage and horizon characteristics except for the texture of the surface layer. The surface texture is designated by adding the texture to the series name. The 12 textural class names and specifications are given in the glossary (Fig. 45). Each series normally has only two or three textural classes. Soil phases are subdivisions

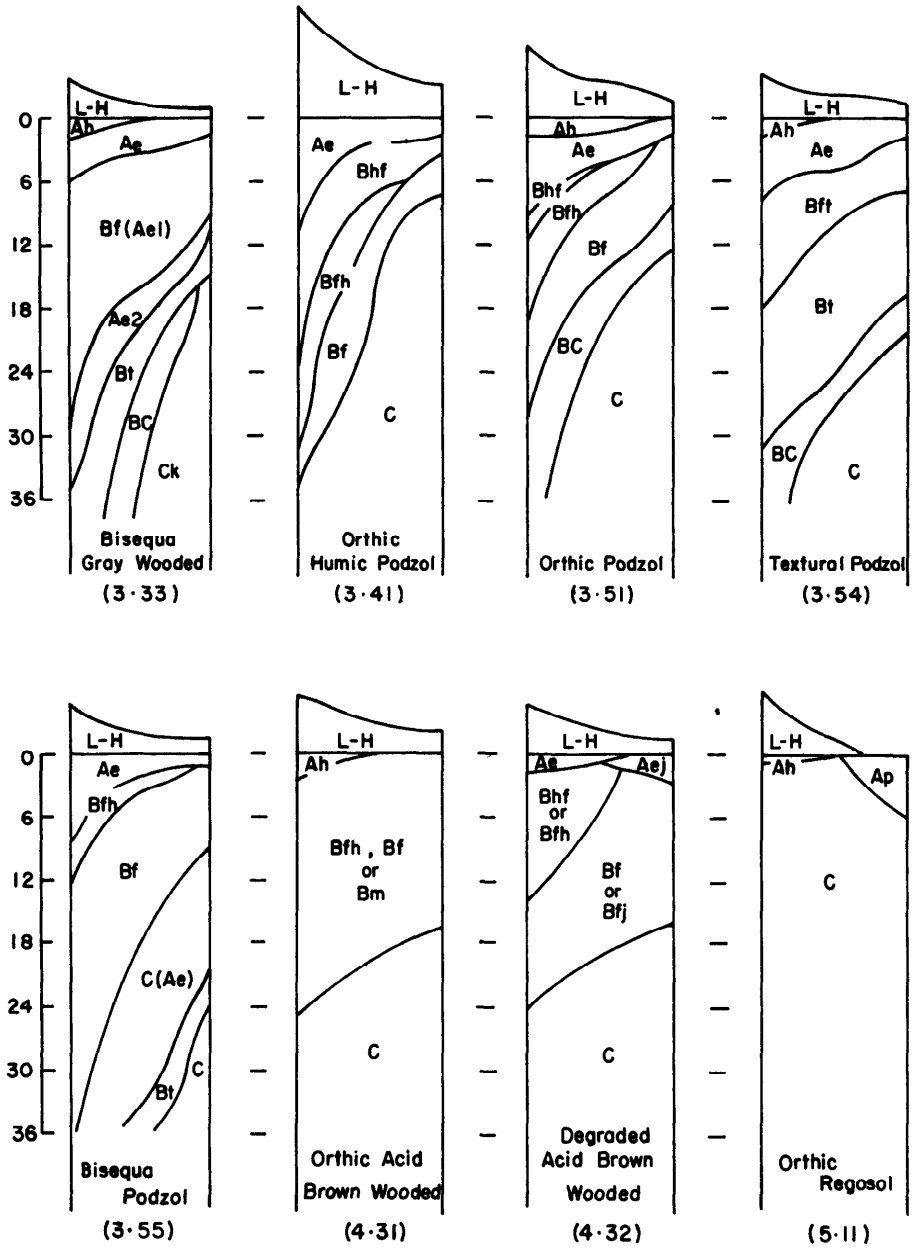

Fig. 12. Schematic diagrams of various profiles described in this report.

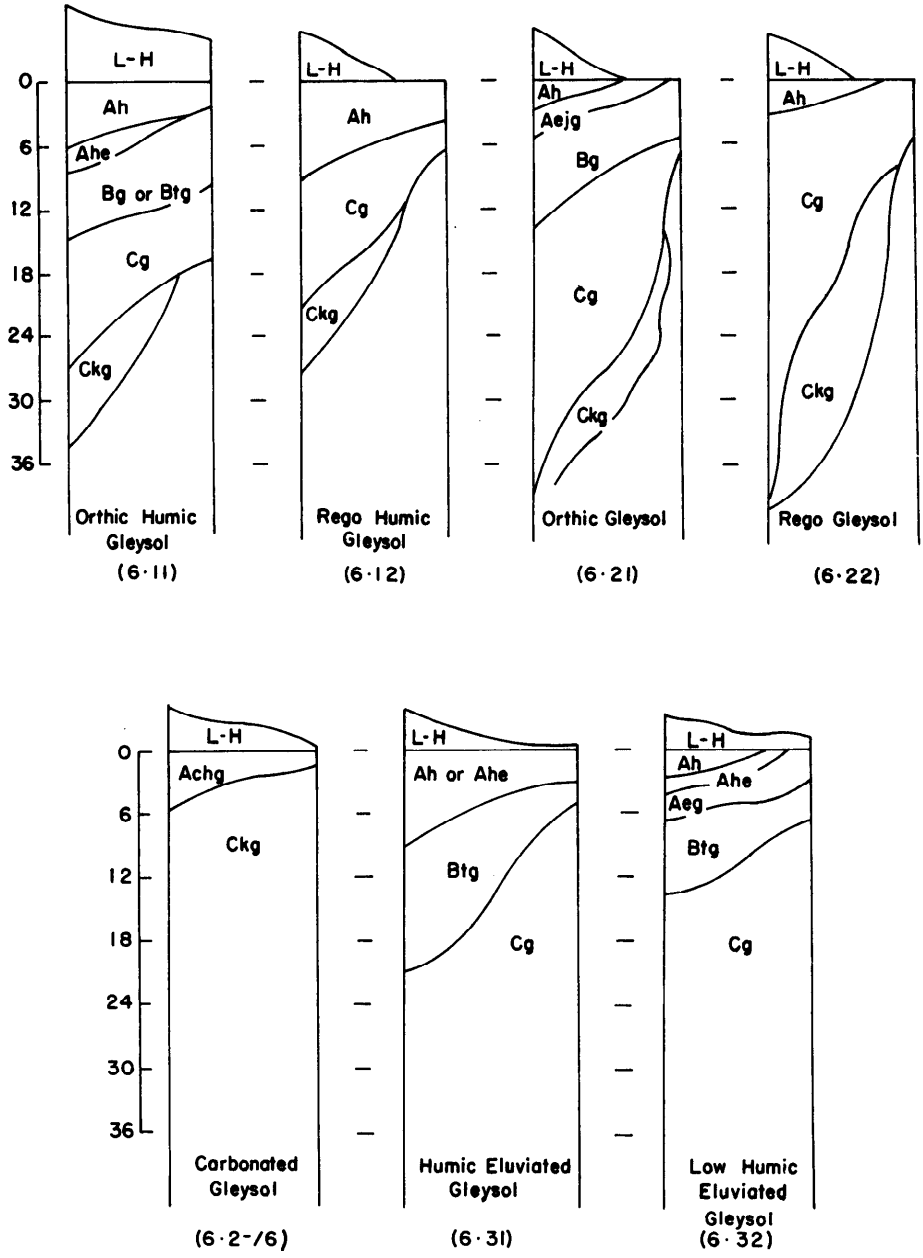

Fig. 13. Schematic diagrams of various profiles described in this report.

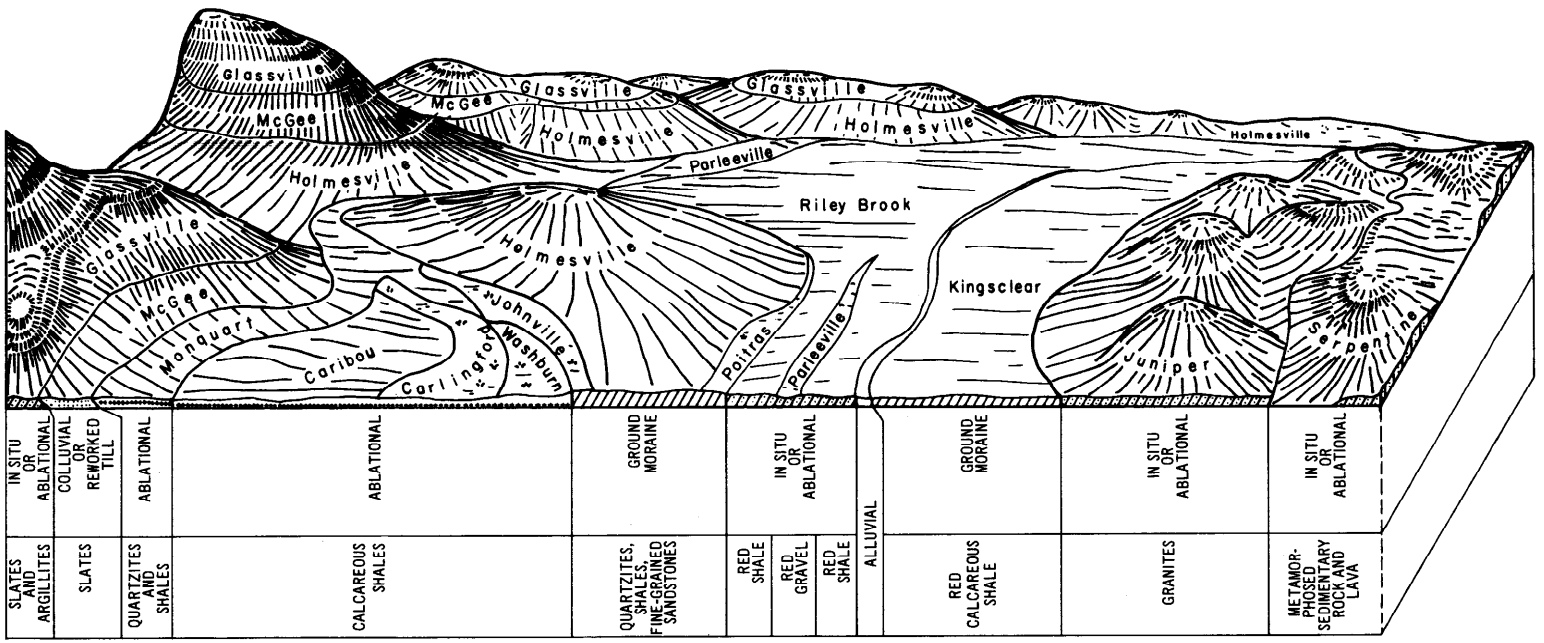

Fig. 14. Relationship of bedrock, surface geology, and soil catenas.

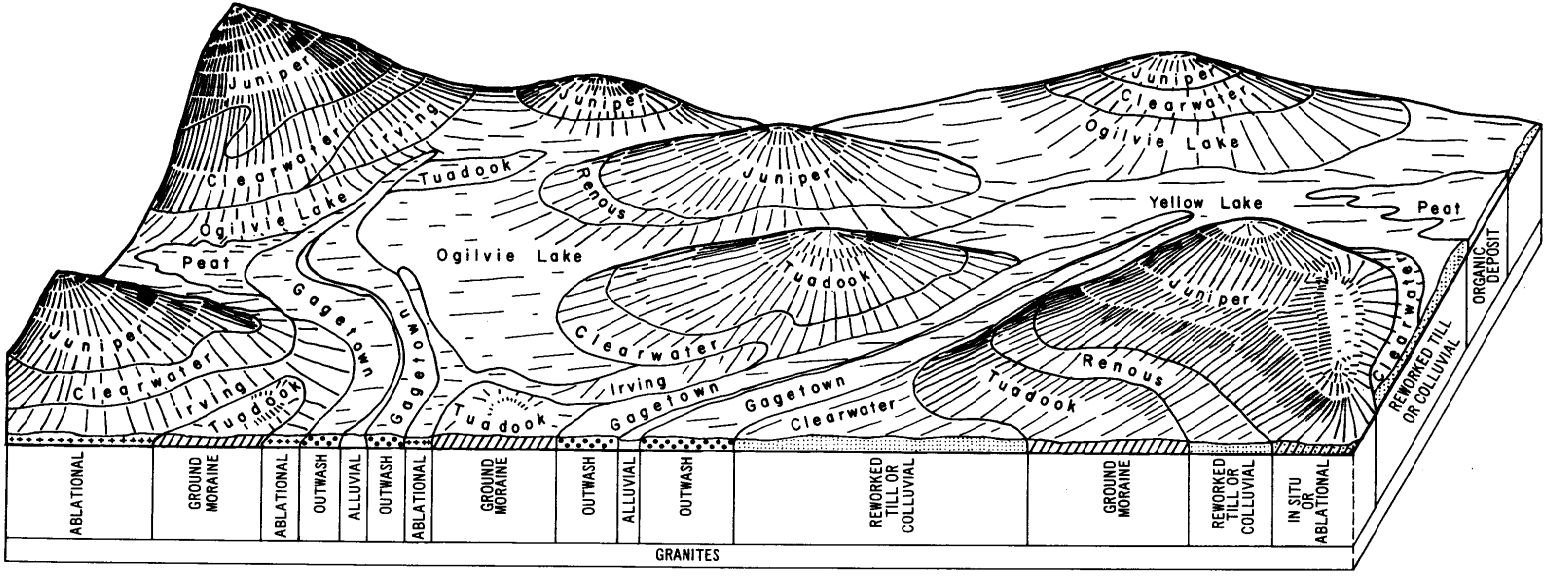

Fig. 15. Relationship of bedrock, surface geology, and soil catenas.

based on characteristics that affect man's use of the soil, such as topography, stoniness, and erosion.

Key to the Soils

The key to the soils (Table 10) is presented under three principal headings. The first is parent material, which is described under three subheadings: geologic source, color, and texture.

The second heading is the classification in the Canadian system.

The third heading covers the drainage of the soil. The combination of these groups shows the relationship of the various soil series to each other.

Table 10. Key to the soils

Mode of deposition	Parent material: Geologic source	Parent material: Color	Parent material: Texture	Drainage: Excessive to well	Drainage: Well	Drainage: Moderately well	Drainage: Imperfect to poor	Drainage: Very poor	Classification: Canadian 1968	Classification: USDA 1968
Shallow soils developed in situ	Weakly calcareous shales and fine grained sandstone	Yellowish brown	Shaly loam		Undine				Mini Humo-Ferric Podzol	Haplic Cryorthod
			Silty clay loam		Harquail				Lithic Bisequa Gray Wooded	Boralfic Cryorthod
Partly in situ, partly on till	Gray phyllites, argillites, slate, shale, may be weakly calcareous	Dark yellowish brown	Loam to silt loam	Quisibis					Lithic Orthic Humo-Ferric Podzol	Typic Cryorthod
							Dubé		Lithic Gleyed Orthic Humo-Ferric Podzol	Typic Acquic Cryorthod
								Big Spring	Lithic Rego Gleysol	Entic Cryaquept
	Gray slates, argillites, sandstone, quartzite, shist	Light olive brown; light yellowish brown	Channery stony loam	Glassville					Orthic Ferro-Humic Podzol	Humic Cryorthod
							Temiscouata		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Foreston	Rego Gleysol	Entic Cryaquept
		Olive	Channery stony silt loam		Serpentine				Orthic Ferro-Humic Podzol	Humic Cryorthod
							Adder		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Jenkins	Orthic Gleysol	Typic Cryaquept

Table 10. Key to the soils (continued)

Mode of deposition	Parent material: Geologic source	Parent material: Color	Parent material: Texture	Drainage: Excessive to well	Drainage: Well	Drainage: Moderately well	Drainage: Imperfect to poor	Drainage: Very poor	Classification: Canadian 1968	Classification: USDA 1968
		Light olive brown; light olive gray	Channery to stony clay loam			Boston Brook			Orthic Humo-Ferric Podzol	Typic Cryorthod
							Skin Gulch		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Yellow Brook	Orthic Gleysol	Typic Cryaquept
	Granites, felsites, basalts, volcanics, gneiss	Dark brown	Stony gravelly loam		Juniper				Orthic Humo-Ferric Podzol	Typic Cryorthod
							Jummet Brook		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								McKiel	Orthic Humic Gleysol	Typic Cryaquept
	Red sandstone and conglomerate	Weak red; reddish brown	Gravelly sandy loam	Parleeville					Orthic Humo-Ferric Podzol	Typic Cryorthod
							Midland		Gleyed Degraded Eutric Brunisol	Alfic Aquic Cryochrept
	Red sandstone and shale	Red	Loamy sand Gritty clay loam	Tobique					Orthic Humo-Ferric Podzol	Typic Cryorthod
					Riley Brook				Orthic Gray Wooded	Typic Cryoboralf
Loose ablational moraine	Shale, quartzite, argillite, sandstone, acid or weakly calcareous	Yellowish brown	Gravelly sandy loam; loam		Monquart				Orthic Humo-Ferric Podzol	Typic Cryorthod

Table 10. Key to the soils (continued)

Mode of deposition	Parent material: Geologic source	Parent material: Color	Parent material: Texture	Drainage: Excessive to well	Drainage: Well	Drainage: Moderately well	Drainage: Imperfect to poor	Drainage: Very poor	Classification: Canadian 1968	Classification: USDA 1968
	Shale, quartzite, argillite, sandstone, calcareous	Pale brown; pale olive	Shaly silt loam to shaly silty clay loam		Caribou		Carlingford		Bisequa Gray Wooded	Boralfic Cryorthod
									Gleyed Orthic Gray Wooded	Aquic Cryoboralf
								Washburn	Orthic Humic Gleysol	Cryaquoll
		Light olive brown; olive	Shaly silt loam to shaly silty clay loam		Jardine		Nickle Mills		Bisequa Gray Wooded	Boralfic Cryorthod
									Gleyed Gray Wooded	Aquic Cryoboralf
								Five Fingers	Carbonated Humic Gleysol	Calcic Cryaquoll
	Angular, weakly calcareous quartzite	Pale olive; light olive brown	Gravelly loam		Thibault				Orthic Humo-Ferric Podzol	Typic Cryorthod
							Guercheville		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryoboralf
								Lauzier	Fera Gleysol	Sideric Cryaquoll
	Granites, gneiss, basalt, other igneous and volcanic rocks	Brown; light yellowish brown	Loam to silt loam		Irving				Orthic Humo-Ferric Podzol	Typic Cryorthod
							Goodfellow		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Halls Brook	Orthic Gleysol	Typic Cryaquept
Ground moraine (compact)	Quartzite, sandstone, some shale, argillite, and slate	Olive- light olive gray	Gravelly sandy loam		Holmesville				Orthic Humo-Ferric Podzol	Typic Cryorthod
							Johnville		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Poitras	Orthic Gleysol	Typic Cryaquept

Table 10. Key to the soils (continued)

Mode of deposition	Parent material			Drainage					Classification	
	Geologic source	Color	Texture	Excessive to well	Well	Moderately well	Imperfect to poor	Very poor	Canadian 1968	USDA 1968
		Light olive brown; light grayish brown	Gravelly clay loam to gravelly clay			Siegas			Bisequa Gray Wooded	Boralfic Cryorthod
							Salmon		Gleyed Gray Wooded	Aquic Cryoboralf
								Bourgoin	Orthic Gleysol	Typic Cryaquept
	Calcareous shale and calcite	Olive; olive brown	Clay loam		Kedgwick				Bisequa Gray Wooded	Boralfic Cryorthod
	Strongly metamorphosed quartzite, slates, and volcanics	Olive; light olive brown	Gravelly sandy loam		Long Lake				Orthic Ferro-Humic Podzol	Humic Cryorthod
							Blue Mountain		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Colter Mountain	Peaty Orthic Gleysol	Typic Cryaquept
	Granites, basalts, felsites, volcanics, and gneiss	Dark yellowish brown; light olive brown	Stony gravelly loam		Tuadook				Orthic Ferro-Humic Podzol	Humic Cryorthod
							Redstone		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Lewis	Orthic Gleysol	Typic Cryaquept
	Shale, mudstone	Red	Clay loam to clay			Kingsclear			Orthic Gray Wooded	Eutric Cryoboralf
							Plaster Rock		Gleyed Gray Wooded	Aquic Cryoboralf
								Nackawic	Orthic Humic Gleysol	Typic Cryaquoll

Table 10. Key to the soils (continued)

Mode of deposition	Parent material: Geologic source	Parent material: Color	Parent material: Texture	Drainage: Excessive to well	Drainage: Well	Drainage: Moderately well	Drainage: Imperfect to poor	Drainage: Very poor	Classification: Canadian 1968	Classification: USDA 1968
Water or colluvial re-worked material	Sandstone, shale, quartzite	Light olive brown; pale olive	Gravelly sandy loam to gravelly clay loam		Victoria				Orthic Humo-Ferric Podzol	Typic Cryorthod
							McCluskey		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryoboralf
								Coté	Orthic Humic Gleysol	Typic Cryaquoll
	Gray slates and argillites	Light olive brown; grayish brown	Stony gravelly loam		McGee				Orthic Ferro-Humic Podzol	Humic Cryorthod
							Nason		Gleyed Mini Humo-Ferric Podzol	Aquic Cryorthod
								Trafton	Orthic Gleysol	Typic Cryaquept
	Strongly metamorphosed slates, quartzites and volcanics	Olive	Stony gravelly loam		Britt Brook				Orthic Ferro-Humic Podzol	Humic Cryorthod
							Portage Lake		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Babbit Brook	Orthic Humic Gleysol	Typic Cryaquoll
	Granite, gneiss, basalt, felsite	Brown; dark brown	Stony gravelly		Clearwater				Orthic Humo-Ferric Podzol	Typic Cryorthod
			sandy loam to stony gravelly				Ogilvie Lake		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
			loam					Yellow Lake	Orthic Humic Gleysol, peaty phase	Typic Cryaquoll

Table 10. Key to the soils (continued)

Mode of deposition	Parent material: Geologic source	Parent material: Color	Parent material: Texture	Drainage: Excessive to well	Drainage: Well	Drainage: Moderately well	Drainage: Imperfect to poor	Drainage: Very poor	Classification: Canadian 1968	Classification: USDA 1968
Reworked glaciolacustrine	Ponded material	Light olive brown	Silty clay loam			Bellefleur			Biscqua Gray Wooded	Boralfic Cryorthod
							St. Amand		Orthic Gleysol	Typic Cryaquept
								Rob	Rego Humic Gleysol	Typic Aquoll
Glacial outwash	Slates, shales, quartzites, sandstones, free carbonates	Light olive brown	Gravel and sand	Muniac					Orthic Humo-Ferric Podzol	Typic Cryorthod
							Ennishore		Gleyed Sombric Humo-Ferric Podzol	Umbric Haplorthod
								Cyr	Rego Humic Gleysol	Typic Aquoll
	Without free carbonates	Light olive brown; yellowish brown	Gravel and sand	Grand Falls					Orthic Humo-Ferric Podzol	Typic Cryorthod
							Sirois		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Cyr	Rego Gleysol	Entic Cryaquept
	Granite, basalt, volcanics, some sedimentary	Light yellowish brown; dark brown	Cobbly, gravel and sand	Gagetown					Orthic Humo-Ferric Podzol	Typic Cryorthod
							Geary		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Penobsquis	Orthic Gleysol	Typic Aquept
	Red conglomerate and sandstone, quartzite	Reddish brown	Cobbly, gravel and sand	Gulquac					Orthic Humo-Ferric Podzol	Typic Cryorthod

Table 10. Key to the soils (continued)

Mode of deposition	Parent material: Geologic source	Parent material: Color	Parent material: Texture	Drainage: Excessive to well	Drainage: Well	Drainage: Moderately well	Drainage: Imperfect to poor	Drainage: Very poor	Classification: Canadian 1968	Classification: USDA 1968
Glacial outwash and alluvial	Slates and shales	Olive gray	Sand		Maliseet				Orthic Humo-Ferric Podzol	Typic Cryorthod
							Wapske		Gleyed Orthic Humo-Ferric Podzol	Aquic Cryorthod
								Wapske	Rego Humic Gleysol	Typic Aquoll
		Light olive brown; gray	Stratified silt and sand		Flemming				Degraded Dystric Brunisol	Orthic Cryochrept
							Martial		Gleyed Eutric Brunisol	Aquic (Eutric) Cryochrept
								Kelly	Orthic Humic Gleysol	Bryaquoll
	Metamorphosed slates, quartzites and volcanics	Pale olive	Stratified sands		Benedict				Orthic Humo-Ferric Podzol	Typic Cryorthod
	Granites, basalts, and volcanics	Light brown	Stratified sands	Island Lake					Orthic Humo-Ferric Podzol	Typic Cryorthod
Recent alluvium	Various	Brown; grayish brown	Silt loam to fine sandy loam		Interval				Orthic Regosol	Typic Cryorthent
							Waasis		Gleyed Orthic Regosol	Aquic Cryorthent
			Silt over gravel		Bottomland				Orthic & Cumulic Regosols	Typic Cryorthent & Cryofluvents
								Bottomland	Rego Gleysol	Entic Cryaquept

Table 10. Key to the soils (concluded)

Mode of deposition	Parent material			Drainage					Classification	
	Geologic source	Color	Texture	Excessive to well	Well	Moderately well	Imperfect to poor	Very poor	Canadian 1968	USDA 1968
Organic soils		Dark brown; black	Slightly decomposed					Peat	Typic Mesisol	Typic Hemist
			Well decomposed					Muck	Terric Humisol	Terric Saprist and Fibric Saprist
			Well decomposed					St. Quentin	Terric Mesisol	Terric Hemist
Eroded steep	Various	Various	Various	Kintore					Orthic Regosol Orthic Humo-Ferric Podzol	Lithic Cryorthent and Typic Cryorthod

DESCRIPTIONS OF THE SOILS

In the following descriptions, a definite order has been followed. The terms used are defined in the glossary. The soil color, unless otherwise specified, is of the moist sample in the field. The Munsell color system* gives a color name followed by a symbol. The terms that may need explaining will be found in the glossary.

The order used in the horizon descriptions is color; texture; abundance, size, contrast, and color of mottles; degree of development and size of structure; moist, dry, and wet consistence; abundance and size of roots; clay films and flows, if present; rocks and pebbles; horizon boundary; and pH.

Shallow Soils Developed from Semiresidual Material

Undine Series (7,100 acres)

The Undine soils are associated with the Caribou, Monquart, and Holmesville soils. The Undine soils occur principally near Grand Falls, in the Wilson Brook – Sisson Dam area, at Black Brook, and along the Restigouche River. A sandy variant derived from fine-grained, weakly calcareous sandstone occurs near Everett Brook. The imperfectly and very poorly drained soils associated with the Undine series are the same as those of the Caribou catena.

Fig. 16. Rolling topography of Ennishore, Holmesville, and Undine soils.

*Munsell Color Company, Inc., Baltimore 18, Maryland, U.S.A.

Fig. 17. Natural reforestation on an abandoned field on Glassville soil.

The parent material of these soils was formed primarily by in situ weathering of a calcareous shale. The shale, of Silurian origin, increases with depth until there is only weathered shale that grades into the unweathered rock. Because of the nature of the parent material, these soils have very few stones, but rock outcrops may be common.

The soil usually occurs on hillsides and crests of hills and has broken slopes caused by outcrops of bedrock.

Generally, the trees consist of sugar maple, beech, yellow birch, white birch, red maple, mountain maple, trembling aspen, white spruce, red spruce, white pine, and balsam fir. The ground vegetation consists of Canada yew, hobblebush, sarsaparilla, one-sided pyrola, raspberry, common wood-sorrel, ground-pine, haircap moss, running club moss, and plume moss.

The Undine soils are Mini Humo-Ferric Podzols. A description of a profile of a moist soil under forest follows:

Horizon	*Depth inches*	
L	2 - 1½	Brown mixture of undecomposed leaves, needles, twigs, branches, cones; pH 5.4.
F	1½ - ½	Dark brown layer of semidecomposed organic material, felted with white and yellow filaments and undecomposed roots and twigs; abrupt boundary; pH 4.6.

H	½ - 0	Black or very dark gray (10YR 3/1) decomposed organic matter; strong, medium granular; friable, slightly sticky; abrupt, smooth boundary; pH 4.6.
Ae	0 - 1	Light gray (10YR 7/2) silt loam; strong, medium platy; friable, soft to slightly hard, slightly plastic, nonsticky; gravel is bleached, contains 70% moderately soft, fine-grained sandstone, 20% quartzite, and 10% soft shale; abrupt, wavy boundary; pH 4.6.
Bfh	1 - 8	Yellowish brown (10YR 5/4) shaly silt loam; moderate, medium granular; friable, soft, slightly plastic, nonsticky; gravel fraction 80% soft shale, 20% argillite, sandstone, and quartzite; abrupt, wavy boundary; pH 5.0.
Bf	8 - 12	Brownish yellow (10YR 6/6) shaly silt loam; strong, medium granular; friable, soft, plastic, slightly sticky; gravel as in Bfh; clear, wavy boundary; pH 5.0.
BC	12 - 15	Light yellowish brown (10YR 6/4) shaly silt loam; moderate, medium granular; friable, slightly hard, slightly plastic, nonsticky; gradual, smooth boundary. The gravel consists of 90% soft shale; pH 5.0.
C	15 - 22	Light olive brown (2.5Y 5/4) shaly silt loam; moderate, medium granular; friable, soft, slightly plastic, nonsticky; shale becomes continuous at this depth; pH 5.0.

Variations. A number of variations may be found from the profile given above. The texture may vary from a heavy loam to a silty clay loam in all or any one of the hozizons. The sandy variant has a sandy loam parent material and is more strongly podzolized. It belongs to the Orthic Humo-Ferric Podzol Subgroup. There are 442 acres of this soil mapped in the surveyed area. The plasticity and stickiness varies with the texture of the soil. The depth of the horizons and of the whole profile is subject to considerable variation. The Ae may be up to 4 inches thick in pockets or it may be absent. The Bfh horizon ranges from 2 to 7 inches thick, whereas the Bf is usually 4 to 5 inches. When these soils are cultivated, the organic layers are incorporated with the Ae and Bfh to form a brown shaly silt loam plowed layer. The BC may not be present. The solum is very variable in depth and the C may not be present in the very shallow phases of these soils. The degree and depth of weathering of the bedrock varies considerably. In some cases, it is weathered only slightly, whereas in others it is weathered and broken to a depth of several feet and may be shoveled easily. These soils would often be classified as Lithic Mini Humo-Ferric Podzols. There is considerable variation in color especially in the Bfh and Bf horizons. The Bfh ranges from a yellowish brown (10YR 5/4) to a reddish brown (5YR 4/4). The pH is rather variable, especially in the organic layers where it may go from about 4.2 to 5.4 and in the C where it ranges from 5.0 to 5.8.

Use. These soils are highly susceptible to erosion and must be handled carefully. Because of their shallowness and occurrence on hillsides, they are easily made nonarable. Where they can be used, they are suitable for all crops that may be grown in the region. Approximately 64% of these soils are considered arable, 24% are marginal, and the remainder are nonarable.

Harquail Series (2,400 acres)

The Harquail soils occur along the Restigouche River in the northwest corner of the area. They are associated with the Jardine and Kedgwick catenas and are similar to the Undine soils, except for the occurrence of a Bt horizon overlying bedrock. They are formed from residual material and shallow ablation till. The

bedrock is a weathered shale that contains a calcareous cementing material and calcite stringers. The poorly drained members are similar to those of the Jardine catena. The landscape is rolling, but these soils usually occur just below the brow of the hills or ridges where the overburden is thin or has been eroded. The vegetation is usually sugar maple, white birch, yellow birch, beech, mountain ash, white spruce, and balsam fir. These soils are classified as Lithic Bisequa Gray Wooded (Gray Luvisol) with the first sequence being an Orthic Humo-Ferric Podzol. The description of a moist undisturbed profile follows:

Horizon	*Depth inches*	
L	2 - 1½	Brown leaves, twigs, and other organic debris.
F-H	1½ - 0	Black to very dark gray well-decomposed organic matter; strong, medium granular in lower part; pH 5.0.
Ae	0 - 1	White (10YR 8/2) loam; strong, medium and fine granular, some weak, platy; slightly plastic, slightly sticky; wavy, abrupt boundary; pH 5.1.
Bfh	1 - 3	Brown to dark brown (7.5YR 4/4) loam; strong, fine granular; very friable, slightly plastic, slightly sticky; clear, wavy boundary; pH 5.4.
Bf	3 - 9	Yellowish brown (10YR 5/4) loam; strong, medium granular; friable, plastic, slightly sticky; clear, smooth boundary; pH 5.9.
Bt	9 - 13	Yellowish brown (10YR 5/6) clay loam; strong, medium granular; friable, plastic, sticky; clear boundary; pH 5.9.
Bt2	13+	Dark yellowish brown (10YR 4/4) silty clay loam; moderate, medium granular; plastic, sticky; clay films common; abrupt boundary; pH 5.8. This grades into soft weathered shale below.

Variations. There are some variations in the texture of this soil, ranging from a loam to a silty clay loam in the Bfh and Bf horizons and from a silty clay loam to a clay loam in the Bt horizon. The Bt horizon is usually only 1 to 5 inches thick and lies immediately on the weathered bedrock. The depth to bedrock is variable, usually 12 to 24 inches; the latter is the limit for this series. The organic horizons are incorporated with the Ae, Bfh, and Bf horizons to form a brown loam plowed layer 8 inches thick. The profile, whose analysis is shown in the tables, is from a different location.

Use. In the surveyed area, these soils are not used for agriculture, but where they occur in settled areas, they are suitable for growing most crops. The pH is high for potato growing and these soils erode rapidly if good management practices are not employed. Approximately 16% of the soils in the area are considered arable, 32% are marginal, and the remainder are nonarable. The limitations are shallowness to bedrock and the steepness of the slopes.

Soils Developed Partly from Till and Partly from Residual Materials

Quisibis Catena

The members of the Quisibis Catena are the well-drained Quisibis soils, imperfectly to poorly drained Dubé soils, and the very poorly drained Big Spring soils. These soils occur in a limited area along the Stewart Highway associated with the Caribou and Violette catenas, but occur extensively in Madawaska County. The

parent material is a shallow ablation till or semiresidual material derived from the underlying bedrock. The bedrock is a thinly bedded shale or phyllite, which is sometimes slightly calcareous and considered to be Silurian in age. Usually these soils are not very stony, but occasionally erratics occur.

The topography is broadly rolling, with the Quisibis soils being found on the well-drained tops of the ridges and slopes; the Dubé and Big Spring soils are found on the lower seepage slopes and in depressions. Only the Quisibis and Dubé soils were mapped in this area, but the Big Spring soils undoubtedly occur and were mapped with the Dubé soils.

Quisibis Series (1,993 acres)

The Quisibis soils are classified as Lithic Orthic Humo-Ferric Podzols, which are strongly acid throughout the profile. The vegetation consists of balsam fir, red and black spruce, beech, sugar maple, yellow birch, white birch, ground-pine, and hobblebush. As a general rule, the hardwoods grow on the upper slopes and tops of ridges, whereas the softwoods occur on the lower slopes, but grow at higher elevations on north-facing slopes. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2¼	Undecomposed leaf litter; pH 5.4.
F	2¼ - 1½	Brown semidecomposed organic material; matted; pH 5.2.
H	1½ - 0	Black well-decomposed organic matter; granular; pH 5.2.
Ae	0 - 2½	Light gray (10YR 7/2) silt loam; strong, medium granular; friable, slightly plastic, slightly sticky; wavy boundary; pH 5.0.
Bfh	2½ - 4½	Strong brown (7.5YR 5/6) loam; strong, medium granular; friable, loose; irregular boundary; pH 4.8.
Bf	4½ - 8½	Yellowish brown (10YR 5/6) silt loam; weak, granular; friable, loose, slightly plastic; pH 4.8.
BC	8½ - 15	Dark yellowish brown (10YR 4/4) mostly fines between bedrock; a lot of well-weathered bedrock; pH 5.0.
R	15+	Well-weathered bedrock consisting of weathered slate and some fines washed down; pockety.

Variations. The main variation of these soils is the depth of the organic horizons, which may range from 3–4 inches down to 1 inch or less. The other variation is the depth to bedrock, which ranges from several inches to 24 inches. Small areas of Dystric Brunisols occur with these soils. Where these soils are cultivated, a brown shaly or slaty silt loam layer is formed 6–8 inches deep and the other horizons disappear down to the Bf or BC horizons.

Use. These soils are not used for agriculture in the surveyed area, but are used outside the area. They will grow most crops suited to the area, but careful management practices are required to prevent erosion. Because of the unevenness of the rock, small wet spots are common and rock outcrops may be a problem. Approximately 24% of these soils are considered arable, 49% are marginal, and 27% are nonarable. The limiting factors are shallowness to bedrock and topography.

Dubé Series (160 acres)

The Dubé soils occur with the Quisibis soils and are the imperfectly and poorly drained members of the Quisibis catena. The topography is gently sloping to level. The tree species occurring on these soils are yellow birch, white birch, red maple,

white cedar, balsam fir, red and black spruce, and willows. The ground vegetation consists of hepatica, raspberry, mosses, ferns, and sedges. These soils are classified as Lithic Gleyed Orthic Humo-Ferric Podzols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	9¾ - 9½	Undecomposed vegetation, such as leaves and needles.
F	9½ - 9	Partly decomposed leaves, needles, and twigs.
H	9 - 0	Black (2.5YR 2/0) well-decomposed humus; pH 4.8.
Aegj	0 - 1½	Pinkish gray (5YR 6/2) silt loam; many, fine, distinct mottles; coarse granular; firm, slightly hard, slightly plastic, slightly sticky; some traces of Aheg, a few rock fragments of well-weathered papery slate; pH 4.8.
BAgj	1½ - 2½	Brown (10YR 5/3, moist), very pale brown (10YR 8/4, dry) silt loam; prominent mottling; structure and consistence similar to Aeg; pH 4.8.
Bfgj	2½ - 7½	Reddish brown (5YR 4/3, moist), strong brown (7.5YR 5/6, dry) silt loam; few, medium, faint mottles; moderate, coarse granular; friable, loose, slightly plastic, slightly sticky; papery slate gravel fragments; abrupt, smooth boundary; pH 5.0.
BCgj	7½ - 17	Dark yellowish brown (10YR 4/4, moist), light yellowish brown (2.5YR 6/4, dry) silt loam; some evidence of mottles on slate fragments; weak granular; friable, loose, slightly plastic, slightly sticky; very few fines; pH 5.0.
R	17+	Shattered bedrock, very few fines between stone fragments.

Variations. The Dubé soils vary in the depth of organic horizons and depth to bedrock. As the drainage becomes poorer, the color of the matrix becomes duller and the intensity of the mottling increases. A very dark brown cultivated horizon is formed when these soils are farmed.

Use. None of these soils are used for agriculture in the area. All of them are considered marginal at the present time, but could be drained and would then fall into an arable class.

Big Spring Series

No Big Spring soils were mapped in this area, but they exist in small areas associated with the other catenary members. They are the very poorly drained soils of the Quisibis catena. The vegetation consists of black spruce, white cedar, speckled alder, gray birch, willows, red maple, hepatica, mosses, raspberry, ferns, and sedges. The soils occur in flat and depressional areas and are classified as Lithic Rego Gleysols. A description of a typical profile follows:

Horizon	*Depth inches*	
L	Trace	Mostly deciduous leaves, some needles, and twigs.
F-H	8 - 0	Very dusky red (2.5YR 2/2, dry), black (2.5YR 2/0 - 5YR 2/1, moist) well-decomposed somewhat fibrous humus; pH 4.8.
Cg1	0 - 5	Dark gray (5Y 4/1, moist), gray (5Y 6/1, dry) silty clay loam; weak, granular; friable, loose, slightly plastic, sticky; very few fines; papery, flat gravel fragments; thin shale and slate; water table at top of this horizon; abrupt boundary; pH 5.2.

Cg2	5 - 16	Dark gray to gray (5Y 4/1 to 5Y 5/1, moist), light gray (5Y 7/1, dry) silty clay loam; horizon seems to be shattered bedrock with fines washed in between the rather closely packed rock fragments, the rock fragments seem somewhat harder than the horizon above; pH 5.3.

Variations. The variations in these soils are depth of organic layers, the presence of an Ah layer, intensity of mottling, and depth of weathering or accumulation at the top of the mineral profile. The depth to bedrock is variable as in the rest of the catena.

Use. Without drainage, these soils are of no agricultural value. They produce a slow-growing forest.

Glassville Catena

The soils of the Glassville Catena occur in two large districts. One is in a series of hills east of the Stewart Highway (Route 17), and the second is in a ridge of hills along the Tobique River. The catena is associated on its eastern boundary with the Serpentine and Juniper catenas, and on the north and western boundaries with the Boston Brook and Thibault catenas, and in both areas with the McGee catena. The members of the Glassville catena are the well-drained Glassville soils and the imperfect to poor and very poorly drained Temiscouata and Foreston soils.

The mode of origin of the parent material varies from in situ weathering to colluvial and ablational materials. The sources of this material are metamorphosed slates and quartzitic sandstones of Ordovician, Devonian, and Silurian ages. The topography is generally strongly rolling to hilly because of the resistance of the bedrock to weathering. These soils are very channery and often very stony. The stones tend to be long, flat, and very hard.

Glassville Series (112,600 acres)

The Glassville soils cover 112,600 acres or 13% of the total area; 1,682 acres of this falls into the sandy variant of the series. These soils generally occupy the well-drained upper slopes of the hills and are frequently closely associated with the McGee soils. On the upper slopes, the vegetation consists of yellow birch, sugar maple, beech, white birch, red maple, striped maple, mountain maple, red spruce, balsam fir, bunchberry, common wood-sorrel, goldthread, sarsaparilla, spinulose wood-fern, raspberry, haircap moss, plume moss, hobblebush, and running club moss. The vegetation on the lower slopes consists of red spruce, balsam fir, white cedar, yellow birch, white birch, striped maple, mountain maple, honeysuckle, bunchberry, spinulose wood-fern, ground-pine, and common wood-sorrel. The Glassville soils are classified as Orthic Ferro-Humic Podzols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2½	Brown to dark brown undecomposed needles, leaves, branches, twigs, cones, club moss, and caribou moss.
F	2½ - ½	Dark brown, semidecomposed, matted, fibrous organic layer with yellow and white filaments, and undecomposed roots, cones, and twigs; abrupt boundary; pH 3.6.
H	½ - 0	Very dark gray (10YR 3/1) decomposed organic matter; moderate, medium granular; friable, sticky but nonplastic; abrupt boundary; pH 3.6.

Ae	0 - 3	White (10YR 8/2) to light gray (10YR 7/2) slaty silt loam; weak, medium granular; friable; stone fragments mainly slate and sandstone with some quartzite, argillite, and schist; abrupt boundary; pH 3.8.
Bhf	3 - 5	Dark reddish brown (5YR 2/2) slaty loam to silt loam; moderate, medium granular; friable; stone fragments as in Ae horizon; clear boundary; pH 4.0.
Bhf2	5 - 13	Yellowish brown (10YR 5/4) slaty loam; moderate, medium granular; friable; stone fragments as in Ae horizon along with a few shale fragments; gradual boundary; pH 4.6.
Bfh	13 - 18	Brownish yellow (10YR 6/6) slaty loam; strong, medium granular; friable, soft; gradual boundary; pH 4.9.
BC	18 - 22	Light yellowish brown (2.5Y 6/4) slaty loam; weak, medium granular; very friable; gradual boundary; pH 4.9.
C	22 - 48	Pale yellow (2.5Y 7/4) slaty loam; weak, fine granular; very friable, loose; pH 4.9.

Variations. A sandy variant occurs that has developed on a coarse-textured material. The Bhf and Bfh usually contain more silt than the parent materials. The depth of the L, F, and H horizons varies from 1 to 3 inches. The Ae horizon varies from 1 to 5 inches in depth and may be very wavy. The dark-colored Bhf horizon is generally present at altitudes above 1,200 feet. The dark reddish brown color of the B horizon ranges from 5YR 3/2 to 2.5YR 2/4. The color of the C horizon varies from a pale yellow (2.5Y 7/4) to an olive (5Y 3/4). The drainage varies from excessive, on the upper slopes where it is shallow over bedrock, to moderately well drained part way down the slopes where seepage occurs. The soils are usually very stony and have a large percentage of slaty gravel and channers. Where these soils are cleared and cultivated, the L-H, Ae, and at least part of the Bhf horizons are mixed to form a slaty loam.

Use. Some of these soils have been cleared and used for agriculture in the past; however, much of this land has since been abandoned and has reverted to forest. The soils are usually too stony and channery to clear and use for intertilled crops. They respond well to fertilizer and good crops of hay and grain have been grown on them. They are best left under forest and only cleared under exceptional circumstances. Approximately 7% of the soils could be considered arable, 21% are marginal, and the remaining 72% are nonarable. The limiting factors are stoniness, topography, and shallowness to bedrock. The available water and the water-holding capacity are low on these soils.

Temiscouata Series (3,260 acres)

The Temiscouata soils are associated with the Glassville soils of which they are the imperfectly to poorly drained catenary members. They occupy the lower seepage slopes and depressional areas. The vegetation consists of white cedar, balsam fir, red maple, red spruce, bunchberry, common wood-sorrel, roundleaf pyrola, and Schreber's moss. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of an imperfectly drained virgin profile is given below.

Fig. 18. A typical scene of spraying a potato field, Monquart soil.

Fig. 19. Land clearing on Monquart soil.

Horizon	*Depth inches*	
L	Trace - ¼	Leaves and moss; pH 5.2.
F	2 - 1½	Brown, felted, partially decomposed organic matter; pH 5.4.
H	1½ - 0	Black well-decomposed greasy organic matter; strong, fine granular; pH 5.4.
Aeg	0 - 4	Light gray (10YR 7/1) silt loam; common, medium, faint very pale brown (10YR 7/4) mottles; moderate, fine platy; abrupt, wavy boundary; pH 5.2.
Bfgj	4 - 12	Yellowish brown (10YR 5/4) gravelly stony loam; many, medium, faint reddish yellow (7.5YR 6/6) mottles; strong, fine granular; plastic, slightly sticky; pH 5.2.
Cgj	12 - 24	Light olive brown (2.5Y 5/4) stony loam to silt loam; many, medium, distinct yellowish brown (10YR 5/6) mottles; moderate, medium granular; plastic, slightly sticky; pH 5.0.
R	24+	Vertical-lying slates and argillites; the upper part may have some fines in the cracks of the bedding joints.

Variations. The variations from this profile of this poorly drained member are in the development of the solum. When the drainage is imperfect, the sola are better developed and two Bfg horizons are present. An Ah is sometimes present just below the H horizon. The more poorly drained soils of this series are finer textured near the surface. A dark brown to black plowed layer occurs when these soils are cleared and cultivated because the organic layers, the Aeg, and part of the Bfg horizons are mixed together. The depth to bedrock ranges from 18 to 36 or more inches.

Use. There has been no extensive clearing of these soils, and where they have been cleared they are pastured. The soils are too stony to be economical to clear and would require drainage before they could be cultivated. They should be left in forest for their most economic use. Approximately 7% of them can be considered arable, 22% are marginal, and the remainder are nonarable. The limitations are stoniness and poor drainage.

Foreston Series (3,172 acres)

The Foreston soils are the very poorly drained members of the Glassville catena. They are associated with the Glassville and Temiscouata soils. They have a similar mode of origin, but may have material from local siltation deposited in the upper part of the mineral soil. They usually occur on depressional topography and along water channels. The vegetation consists of white cedar, black spruce, tamarack, black ash, red maple, and sphagnum mosses. The Foreston soils are classified as Rego Gleysols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2½	Brown undecomposed needles and leaves with branches, twigs, and cones.
F	2½ - 1	Dark brown semidecomposed matted fibrous organic matter with white filaments and undecomposed roots, cones, and seeds; abrupt boundary; pH 4.8.
H	1 - 0	Black (5YR 2/1) decomposed organic matter; nonplastic, sticky when wet; strong, fine granular when moist; abrupt boundary; pH 4.6.

Cg1	0 - 8	Dark grayish brown (10YR 4/2) slaty loam and slaty silt loam; common, fine, faint mottles; plastic, slightly sticky; gradual boundary; pH 4.6.
Cg2	8 - 15	Gray (5Y 5/1) slaty silt loam and silty clay loam; common, coarse mottles; plastic, sticky; gradual boundary; pH 5.0.
C	15+	Dark gray (5Y 4/1) slaty loam; plastic, slightly sticky; pH 5.0.

Variations. The combined depth of the L, F, and H layers may be as much as 12 inches and frequently there is an Ah horizon of up to 3 inches. The Cg1 and Cg2 horizons have more clay and silt and this may be caused by increased weathering, lateral movement of these materials, or by siltation during the period immediately after glacial recession. Some Fera Gleysols occur associated with these soils. They have a bleached Aeg horizon and a Bgf horizon that is heavily mottled.

Use. These soils are nonagricultural because of their poor drainage and stoniness. The only effective use is for forestry. They grow species that are tolerant of water, but in general they are slow growing.

Serpentine Catena

The soils of the Serpentine catena occur east of the Tobique River in the northeastern part of Victoria County and extend east to the granite intrusives at Long and Trousers lakes. They mix with the Glassville catena on the west and the Kingsclear and Juniper catenas on the south and east. They are intimately associated with the Long Lake and Britt Brook catenas. The Serpentine series is the well-drained member of the Serpentine catena. The other catenary members are the imperfectly drained Adder and the very poorly drained Jenkins series. There is also an unnamed Dystric Brunisol associated with the moderately well drained series.

The Serpentine catena has formed from residual, colluvial, and ablational material derived from highly metamorphosed slates, quartzite, schist, and volcanic extrusives. The topography is rolling to hilly with elevations from 1,000 to 1,400 ft and hills rising to 2,000 ft. The soils of this catena are usually stony and bouldery.

Serpentine Series (26,280 acres)

The Serpentine soils usually occur on the upper slopes and crests. They are the well-drained members of the catena and are classified as Orthic Ferro-Humic Podzols. The vegetation consists of balsam fir, spruce, striped maple, white birch, yellow birch, mountain ash, spinulose wood-fern, mountain maple, common wood-sorrel, bunchberry, and haircap moss. A typical virgin profile is described below:

Horizon	*Depth inches*	
L	1 - ¾	Brown freshly fallen leaves, needles, and twigs; pH 5.0.
F	¾ - ½	Dark brown semidecomposed organic material; fibrous; pH 4.5.
H	½ - 0	Black well-decomposed organic material; granular; pH 4.3.
Ae	0 - 1	Pinkish gray (5YR 6/2) gravelly silt loam; fine granular; slightly plastic, sticky; wavy boundary; pH 3.6.
Bhf	1 - 2½	Dark reddish brown (2.5YR 2/4) silt loam; strong, fine granular; loose, soft; irregular boundary; pH 3.8.
Bhf2	2½ - 5½	Reddish brown (5YR 4/4) silt loam; strong, fine granular; loose, slightly plastic, slightly sticky; wavy boundary; pH 4.5.

Bfh	5½ - 7½	Yellowish red (5YR 4/6) loam; strong, fine granular; friable, soft, slightly plastic, slightly sticky; wavy boundary; pH 4.7.
Bf	7½ - 13½	Yellowish brown (10YR 5/4) gravelly silt loam; weak, fine granular; slightly plastic, slightly sticky; wavy boundary; pH 4.6.
BC	13½ - 25½	Yellowish brown (10YR 5/6) gravelly silt loam; moderate, fine granular; firm, slightly plastic, slightly sticky; wavy boundary; pH 4.7.
C	25½ - 33	Light olive (2.5Y 5/4) gravelly silt loam; weak, subangular blocky; very firm, very hard; plastic, sticky; clay films common; pH 5.0.
C2	33 - 42+	Light olive brown (2.5Y 5/4) gravelly silt loam; weak, subangular blocky; very firm, very hard, sticky, compact; clay films common; pH 5.3.

Variations. The L, F, and H horizons may vary from 1 to 3 inches or more, whereas the Ae is never less than 1 inch and is often 2 inches or more in pockets. Although the Bhf horizon was confirmed by the chemical analysis, the field characteristics were not such as to qualify this profile as a Ferro-Humic Podzol. The Bhf horizon is usually more pronounced on the lower north-facing slopes. The texture is fairly uniform and is often a silt loam in the Bfh horizon. Near Long Lake, there are several areas that become somewhat lighter in texture in the BC and C. In these areas, a fragipan has developed in the upper C. These profiles usually have 3 to 3.5 inches of a dark Bhf horizon, but the Bfh horizons may meet the requirements of a Bhf. Often there is over 20% channery gravel in the profile. A moderately well drained Dystric Brunisol profile develops under telluric conditions, but none were separated and mapped because of their limited extent and the relative inaccessibility of the area.

Use. These soils have not been cleared for agricultural use, but have good physical and chemical properties. The excessive stoniness and the steep slopes preclude their economic use for agriculture at this time. These soils should be left in forest because they appear to produce a fast-growing forest vegetation. Only 1% of them could be considered arable, 2% are marginal, and the remaining 97% are nonarable.

Adder Series (1,130 acres)

The Adder soils are the imperfectly and poorly drained members of the Serpentine catena. They belong to the Gleyed Orthic Humo-Ferric Podzol Subgroup and occur on the seepage slopes and around depressional areas. The topography is gently sloping to depressional and under the forest cover, cradle knolls or mounds are common. The vegetation consists of balsam fir, red spruce, black spruce, sphagnum mosses, bunchberry, and creeping snowberry. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2½	Freshly fallen leaves and litter; pH 4.6.
F	2½ - 1½	Very dark brown to reddish brown semidecomposed organic material; felted; pH 4.0.
H	1½ - 0	Very dusky red to black well-decomposed organic material; fine granular; pH 3.8.

Aeg	0 - 2	Light gray (10YR 7/1) gravelly silt loam; common, medium, faint, very pale brown (10YR 7/3) mottles; weak, medium platy; firm, slightly hard, plastic, slightly sticky; abrupt, wavy boundary; pH 4.2.
Bhfgj	2 - 4	Dark reddish brown (5YR 3/3) gravelly silt loam; common, medium, faint, reddish brown (5YR 5/4) mottles; weak, fine granular; soft, plastic, slightly sticky; pH 4.4.
Bfgj	4 - 6	Very pale brown (10YR 7/4) gravelly silt loam; common, medium, distinct yellowish brown (10YR 5/4) mottles; weak, fine granular and fine subangular blocky; slightly plastic, slightly sticky; clear, wavy boundary; pH 4.8.
BCgj	6 - 10	Pale yellow (2.5Y 7/4) gravelly silt loam; many, coarse, distinct olive yellow (2.5Y 6/4) mottles; weak, fine granular; friable, soft, slightly plastic, slightly sticky; pH 4.8.
Cg	10 - 19	Light olive gray (5Y 6/2) gravelly silt loam; common, coarse, distinct light yellowish brown (10YR 6/4) mottles; medium subangular blocky breaks to granular; firm, slightly hard, plastic, sticky; pH 5.0.
Cg2	19 - 34	Olive (5Y 5/3) gravelly silt loam to gravelly silty clay loam; common, coarse, distinct light yellowish brown (10YR 6/4) mottles; strong, coarse blocky; very firm, hard to slightly hard, plastic, sticky; pH 5.4.

Variations. The variations in the horizons are generally in depth. The Aeg horizon varies from 1 to 4 inches and the Bhfg may not be present, but it occasionally will be up to 3 inches thick. No sample of this soil was analyzed so the horizon designation must be accepted as it was given in the field. However, it is possible that at least some of these soils should be classified as Gleyed Ferro-Humic Podzols. The solum may reach a depth of 16 to 18 inches. The organic material may be 6 inches thick, but this is unusual. The amount of gravel is variable, but is usually over 20% and may run to 40%.

Use. None of these soils have ever been cleared. Very few or none of them would be considered arable and probably only 1% or 2% could be considered marginal. The remainder are nonarable. Besides the stoniness and poor drainage, the probability of frost in all months would be a severe limitation.

Jenkins Series (260 acres)

The Jenkins soils are the very poorly drained members of the Serpentine catena. They occur closely associated with the other members of this catena.

The mode of origin and the material from which they have been derived are the same as for the Serpentine soils. The topography is level to depressional. The vegetation of the upper story consists of balsam fir, black spruce, and white birch, and the ground vegetation consists of bunchberry, creeping snowberry, spinulose wood-fern, northern white violet, woodland strawberry, and acuteleaf sphagnum moss. These soils are classified as Orthic Gleysols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2½	Leaf litter, twigs, and other organic litter; pH 4.6.
F	2½ - 1¾	Very dark brown semidecomposed organic material; fibrous; pH 4.6.
H	1¾ - 0	Black well-decomposed organic material; fine granular; pH 4.6.

Ah	0 - 2	Gray (5YR 5/1) silt loam; structureless; friable, loose, slightly plastic, sticky; wavy boundary; pH 4.6.
Aeg	2 - 4	Light brownish gray (10YR 6/2) gravelly silt loam; many, coarse, distinct pale brown (10YR 6/3) mottles; weak, platy; firm, soft, slightly plastic, slightly sticky; clear, smooth boundary; pH 5.0.
Bg	4 - 15	Pale olive (5Y 6/3) gravelly silt loam; many, coarse, prominent dark brown (10YR 4/3) mottles; weak, coarse subangular blocky; firm, slightly hard, plastic, slightly sticky; clear boundary; pH 5.4.
Cg	15 - 36	Light olive gray (5Y 6/2) gravelly silt loam; common, medium, distinct olive (5Y 5/3) mottles; weak, subangular blocky; firm, slightly hard, plastic, slightly sticky; pH 6.0.

Variations. The most important variation in these soils is the depth of organic layers. As the soils become more poorly drained or the water more stagnant, the organic material builds up to a peat and there is an intergrade zone classified as a peaty Orthic Gleysol. The depth of the Ah may vary from 1 to 3 inches and frequently there is evidence of siltation at the top of the mineral soils, which then becomes free from gravel and somewhat amorphous in structure. There is often a stone pavement at the surface of these soils.

Use. These soils have never been cleared for agriculture. They would require drainage and stone removal before they could be considered arable. They are generally classed as stony Class 4 and should be left in forest. They produce a rather slow-growing forest.

Boston Brook Catena

The Boston Brook catena is found in the northwestern part of the surveyed area. It is usually associated with the Glassville catena and in a few areas appears to be intermediate between the Glassville and Caribou catenas. The catenary members are the well-drained Boston Brook series, the imperfectly and poorly drained Skin Gulch series, and the very poorly drained Yellow Brook series. The soils have been formed from parent material deposited as stony ablation till that has been derived from gray argillites, slates, and fine-grained sandstones. The topography is gently rolling to rolling.

Boston Brook Series (21,206 acres)

The Boston Brook soils are the well-drained members of the catena. They usually occur on the tops and slopes of the ridges. The vegetation consists of yellow birch, white cedar, spruce, balsam fir, sugar maple, white birch, beech, white pine, striped maple, hobblebush, serviceberry, pin cherry, beaked hazel, ferns, haircap moss, bunchberry, and raspberry. The soils are classified as Orthic Humo-Ferric Podzols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1¾	Freshly fallen leaf litter, twigs; pH 5.2.
F	1¾ - 1	Brown to black moderately decomposed organic matter; felted; pH 4.4.
H	1 - 0	Black well-decomposed organic matter; strong, coarse granular; pH 4.6.

Ae	0 - 2	Light brownish gray (10YR 6/2) gravelly silty clay loam; weak, platy breaking to fine granular; firm, slightly hard, slightly plastic, slightly sticky; abrupt, wavy boundary; pH 4.6.
Bfh	2 - 5	Brown to dark brown (7.5YR 4/4) gravelly loam; strong, fine granular; loose, slightly plastic, slightly sticky; clear boundary; pH 4.7.
Bfh2	5 - 9	Yellowish brown (10YR 5/4) gravelly loam; moderate, fine granular; friable, soft, slightly plastic, slightly sticky; roots penetrate to bottom of this horizon and some beyond; clear boundary; pH 4.8.
BC	9 - 15	Yellowish brown (10YR 5/6) gravelly loam; fine, medium granular; firm, loose, plastic, sticky; clear boundary; pH 5.4.
C	15 - 48	Light olive brown (2.5Y 5.4) gravelly clay loam; weak, coarse granular; firm, plastic, sticky; very stony; pH 5.5.

Variations. The organic horizons range in depth from 1 to 4 inches. The Ae ranges from 1 to 2 inches in thickness with pockets to 4 inches and the texture may vary to a very fine sandy loam. Sometimes a pale brown AB horizon is present. A thin Bhf horizon may be present. The BC horizon may be up to 12 inches thick with a light olive brown (2.5Y 5/6) color. The depth of the solum varies from 15 to 27 inches. The texture of the parent material ranges through a silt loam, silty clay loam, to a clay loam. The color may sometimes become as dark as a yellowish brown (10YR 4/4). The soils are all gravelly and stony. There are pockets of gravel several feet in diameter, free from fines, scattered through the material. The Boston Brook soils have a shaly variation of this containing highly metamorphosed shale. In some places a mixture of the soft shale associated with the Caribou catena and the harder slates and argillites usually associated with this series are found. The profiles developed on this mixture have the appearance of a transition between the Glassville and Caribou series.

Use. These soils are used for forestry at present and none have been cleared for agriculture. Although they have a good water-holding capacity, the stones and channers would be an impediment to cultivation. The soils grow a wide variety of trees, the tops of the ridges are predominantly hardwoods, and softwood species are dominant on the lower slopes. These soils should be left in forest production. Approximately one-third of the area covered by these soils could be considered arable.

Skin Gulch Series (4,920 acres)

The Skin Gulch soils are the poorly drained members of the Boston Brook catena. They are found on the lower slopes and where surface runoff is slow. The vegetation consists of balsam fir, red and black spruce, red maple, speckled alder, and mosses. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of an imperfectly drained virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1¾	Brown litter of leaves and needles; pH 4.8.
F	1¾ - ¾	Dark brown partially decomposed organic material; felted; abundant root fibers; pH 4.6.
H	¾ - 0	Black well-decomposed organic matter; strong, medium granular; pH 4.3.

Aeg	0 - 1½	Light gray (10YR 7/2) gravelly silt loam; common, medium, faint mottles; strong, medium granular; firm, slightly plastic, slightly sticky; flaggy and channery; abrupt, wavy boundary pH 4.3.
Bfhgj	1½ - 4½	Dark brown to brown (10YR 4/3) gravelly clay loam; common, fine, faint mottles; fine granular; friable, loose, plastic, slightly sticky; clear, wavy boundary; pH 4.5.
Bfhgj2	4½ - 9½	Dark grayish brown (10YR 4/2) channery loam; common, medium, faint mottles; moderate, medium granular; firm, slightly plastic, slightly sticky; pH 4.8.
Cg	9½ - 36+	Light olive gray (5Y 6/2) channery clay loam; common, medium, distinct mottles; coarse subangular blocky breaking to weak, coarse granular; hard, plastic, sticky; pH 5.1.

Variations. As the drainage becomes poorer in these soils, the chroma decreases and the intensity of the mottling increases. The Bfhgj becomes less distinct and usually only one can be observed. The depth of the solum varies. The color of the parent material is the same as that of the Boston Brook soils. The structure tends to be more blocky, but because of the large amount of gravel and channers, it breaks up when moist.

Use. These soils have not been cleared or used for agriculture. They would require drainage and are too stony to be cultivated easily. Approximately 25% of these soils are considered potentially arable.

Yellow Brook Series (1,320 acres)

The Yellow Brook soils are the very poorly drained members of the Boston Brook catena. They occur in the level to depressional areas associated with the Boston Brook and Skin Gulch series. The vegetation consists of white cedar, balsam fir, black spruce, white birch, red maple, speckled alder, willows, bunchberry, common wood-sorrel, creeping snowberry, naked miterwort, twinflower, violet, *Hylocomium splendens,* toothed mnium, haircap moss, and bristly club moss. The soils are classified as Orthic Gleysols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1½	Reddish black (10R 2/1) undecomposed leaves and twigs; abrupt boundary; pH 5.0.
F	1½ - 1	Black (5YR 2/1) semidecomposed organic material; felted; abrupt boundary; pH 5.0.
H	1 - 0	Black (7.5YR 2/0) well-decomposed organic material; strong, fine granular; abrupt boundary; pH 5.0.
Aegj	0 - 11	Olive gray (5Y 5/2) clay loam; common, fine, faint yellowish brown (10YR 5/6) mottles; weak, platy breaking to fine granular; friable, plastic, sticky; clear boundary; pH 5.0.
Bg	11 - 21	Olive (5Y 5/3) clay loam; common, medium, distinct yellowish brown (10YR 5/4) mottles; weak, granular; friable, plastic, sticky; clear boundary; pH 5.0.
Cg	21 - 26+	Dark yellowish brown (10YR 4/4) gravelly clay loam; common, medium, distinct light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 3/4) mottles; amorphous; firm, plastic, sticky; pH 5.0.

Variations. The organic horizons may be considerably thicker than these and in

some instances they approach a peat. The Bg horizon may be somewhat more strongly mottled. Fera Gleysols and Rego Gleysols are associated with the Yellow Brook series and were included with it on the map.

Use. These soils have not been cleared and because of the stoniness and wetness, they probably should not be cleared. They are considered nonarable.

Juniper Catena

The soils of the Juniper catena are located in the southeastern section of the County. The catena is associated with the Irving, Tuadook, Clearwater, Gagetown, and Island Lake catenas. The other catenary members are the imperfect to poorly drained Jummet Brook and the very poorly drained McKiel series. The origin of the parent material appears to be ablational or residual. The material was derived from gray and red granites, basalts, felsites, and volcanics. The soils are often shallow and rocky and slopes may be precipitous.

The topography is rolling to hilly with an elevation of about 1,100 ft. Some hills rise to 2,000 ft.

Juniper Series (81,070 acres)

The Juniper soils are the well-drained members of the catena. They occur on the tops of hills and the well-drained upper slopes. The profiles are usually stony and rocky and have been classified as Orthic Humo-Ferric Podzols. The vegetation consists of balsam fir, red spruce, black spruce, yellow and white birch, bunchberry, broom moss, haircap moss, spoonleaf sphagnum, and squarrose sphagnum. The red spruce, and yellow and white birch usually occupy the upper slopes and especially the south-facing slopes. The mosses usually occur with the fir and black spruce on the north slope. A description of a well-drained virgin profile follows:

Horizon	*Depth inches*	
L	2½ - 2	Freshly fallen litter of needles, twigs, and moss; pH 4.0.
F	2 - 1	Semidecomposed organic material; fibrous; pH 3.8.
H	1 - 0	Black well-decomposed organic matter; fine granular; pH 3.8.
Ae	0 - 4	Light gray (10YR 7/1) loam; moderate, fine granular; friable, loose, nonplastic; abrupt, wavy boundary; pH 3.8.
Bfh	4 - 7	Yellowish red (5YR 5/6) loam to silt loam; strong, fine granular; loose, slightly plastic, nonsticky; abrupt, wavy boundary; pH 4.2.
Bf	7 - 12	Brownish yellow (10YR 6/6) gravelly loam; moderate, fine granular; friable, soft, slightly plastic, nonsticky; clear, smooth boundary; pH 4.6.
Bf2	12 - 18	Reddish yellow (7.5YR 6/6) gravelly gritty loam; moderate, fine granular; friable, soft, slightly plastic, nonsticky; pH 5.4.
BC	18 - 33	Yellowish brown (10YR 5/4) gravelly gritty silt loam; strong, fine granular; friable, soft to slightly hard, slightly plastic, slightly sticky; gradual, smooth boundary; pH 5.0.
C	33+	Dark brown (10YR 4/3) gravelly loam; weak, granular; loose, slightly plastic, slightly sticky; pH 5.0.

Variations. The Ae horizon may vary in thickness from 2 to 6 inches and from a sandy loam to loam. Bhf and Bfhc horizons may be present. In small areas, the Bfh and Bhfc are sufficiently developed to classify the profiles as Ferro-Humic

Podzols. The depth of the solum varies from about 20 to 33 inches. The texture ranges from a gravelly loam to a loamy gravel. The soils are generally very stony, but occasionally areas containing a small volume of stones may be found. The parent material in some places contains small hard lumps resembling the parent material of the Tuadook soils.

Use. None of these soils have been cleared and used for agriculture. They are best suited for forestry, but might be used for permanent pasture if they could be kept clear. Ninety-eight percent of these soils are in Classes 5 and 7.

Jummet Brook Series (6,600 acres)

The Jummet Brook soils are the imperfectly and poorly drained members of the Juniper catena. They are closely associated with the Juniper and McKiel soils and have a mode of deposition and a geological origin similar to those of the Juniper soils. They occur on low seepage slopes and depressional areas. The vegetation consists of balsam fir, spruce, white birch, red maple, bunchberry, flat-topped aster, spinulose wood-fern, and mosses. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2¾	Needles, twigs, leaves, and moss; pH 4.0.
F	2¾ - 1¾	Brown semidecomposed organic material, felted; pH 3.8.
H	1¾ - 0	Black well-decomposed organic material; medium granular; pH 3.8.
Aeg	0 - 4	Gray (10YR 6/1) silt loam; common, medium, distinct mottles; weak, fine platy; firm, slightly plastic, slightly sticky; abrupt, wavy boundary; pH 4.2.
Bfgj	4 - 8	Brown (7.5YR 5/4) gravelly loam; common, fine, faint mottles; moderate, medium granular; friable, slightly plastic, slightly sticky; clear boundary; pH 4.4.
Bfgj2	8 - 17	Brown (10YR 5/3) gravelly loam; common, medium, distinct mottles; weak, medium granular; firm, slightly plastic, slightly sticky; clear boundary; pH 4.6.
Cgj	17 - 36+	Dark brown (10YR 4/5) gravelly loam; common, medium, distinct mottles; amorphous breaking to medium granular; firm, slightly plastic, slightly sticky; pH 4.8.

Variations. The textural variations range from sandy loams to loams in the parent material and from loams to silt loams in the solum. The distinctness of the Bfgj horizon fades as the drainage becomes poorer and the mottling becomes more apparent. The depth of organic material varies from about 2 to 4 inches. The stoniness ranges from 3 to 5 and the amount of gravel is sufficient to place all these soils in the gravelly phase.

Use. None of this land has been cleared for agricultural use. Because of its excessive stoniness and rockiness, it is considered unsuitable for any agricultural purpose except permanent pasture. The land grows a good forest cover of commercial species and has good regeneration. Drainage would be a problem if the land were cleared.

McKiel Series (6,390 acres)

The McKiel soils are the very poorly drained soils of the Juniper catena. They

occur in depressional areas. The soils are classified as Orthic Humic Gleysols and grade into the peaty phase and into peat where they occur adjacent to peat bogs. The vegetation consists of red maple, speckled alder, black spruce, tamarack, sphagnum mosses, and bunchberry. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	4½ - 3½	Needles, twigs, leaves, and moss; pH 4.2.
F	3½ - 2	Dark brown semidecomposed organic material; felted; pH 3.8.
H	2 - 0	Black well-decomposed organic material; medium granular; pH 3.8.
Ah	0 - 3	Very dark brown (10YR 2/2) silty clay loam; weak, medium granular; loose, soft, slightly plastic, slightly sticky; smooth boundary; pH 4.2.
Aheg	3 - 7	Very dark grayish brown (10YR 3/2) silt loam; common, fine, faint mottles; weak, medium granular; slightly plastic, slightly sticky; clear boundary; pH 4.4.
Aeg	7 - 10	Dark gray (10YR 4/1) silt loam; common, coarse, distinct mottles; weak, platy to medium granular; slightly plastic; clear, smooth boundary; pH 4.4.
Bgj	10 - 18	Dark yellowish brown (10YR 3/4) gravelly sandy loam; many, large, distinct mottles; weak, medium granular; loose, slightly hard, slightly plastic, slightly sticky; gradual boundary; pH 4.6.
Cgj	18 - 36+	Dark brown (10YR 4/3) gravelly sandy loam; common, medium, distinct mottles; weak, medium granular to structureless; pH 4.8.

Variations. The organic horizons vary from 3 to 24 inches in depth. Where the organic horizons are deeper than this, the soil is classified as a peat or muck. Usually where the organic material is over 6 inches in depth, the surface material is sphagnum peat. The degree of mottling varies somewhat and the Bg horizon gives the appearance of a concentration of mottles. The texture varies from a sandy loam to a loam and is always gravelly. The soil is generally stony and has large numbers of granite boulders scattered over and through it.

Use. These soils are suitable for forestry. The best-drained sites produce a fair forest growth, but where the drainage is poor the vegetation is slow growing (black spruce and sphagnum).

Parleeville Catena

These soils occur in the southern part of the area in the Tobique Valley and in the lowland between the Blue Mountains and the Gulquac Mountains. They are associated with the Tobique and Riley Brook soils and the Kingsclear catena. There are only two members of this catena, the well to excessively drained Parleeville series and the imperfectly to poorly drained Midland series. These soils are formed from residual deposits or ablation till, derived from a red Mississippian conglomerate that has a weakly calcareous cementing material. The topography is gently rolling with small isolated hills or knolls of conglomerate or kames of cemented Pleistocene gravel.

Parleeville Series (13,310 acres)

The Parleeville soils occupy the dry upper parts of the slopes and hills. The

vegetation consists of balsam fir, spruce, red maple, white pine, serviceberry, white birch, bunchberry, ground pine, hawkweed, running club moss, flat-topped aster, and blueberry. These soils are classified as Orthic Humo-Ferric Podzols. A description of a moist virgin profile follows:

Horizon	*Depth inches*	
L	1 - ¾	Leaves and twigs; pH 6.0.
F	¾ - ½	Partially decomposed matted organic material; pH 6.0.
H	½ - 0	Dark brown well-decomposed organic material; weak, granular; pH 4.8.
Ae	0 - 4	Pinkish gray (5YR 7/2) sandy loam; moderate, medium granular; very friable, loose, nonplastic, nonsticky; abrupt, wavy boundary; pH 4.6.
Bfh	4 - 9	Yellowish red (5YR 4/6) gravelly loam; moderate, medium and fine granular; very friable, soft, slightly plastic, slightly sticky; gradual, wavy boundary; pH 4.8.
Bf	9 - 14	Yellowish red (5YR 5/6) gravelly sandy loam; weak, fine granular; very friable, nonplastic, nonsticky; gradual, smooth boundary; pH 5.0.
BC	14 - 21	Reddish brown (2.5YR 4/4) gravelly sandy loam and loamy gravel; nearly structureless; friable, loose, silt caps on top of stones are firm and brittle; gradual boundary; pH 5.0.
C	21 - 40	Reddish brown (2.5YR 4/3) gravelly sandy loam; structureless; very friable, nonplastic, nonsticky; pH 5.0.
C2	40 - 80	Weak red (10R 4/3) gravelly loam; silt caps on rocks; roots penetrate to 45 inches; some pockets of calcareous materials.

Variations. The organic layers range in depth from 1 to 2 inches. The Ae horizon varies in depth from 2 to 4 inches and in texture from a gravelly sandy loam to a gravelly loam, whereas the structure may be weakly platy. The Bfh horizon varies in color from a yellowish red to a reddish yellow and in texture from a loam to a gravelly, fine sandy loam. The rest of the solum and parent material varies from a gravelly loam to a gravelly sandy loam and in the deep profiles appears to be slightly sorted. The soil is very porous. In the deeper deposits there are silt caps on the pebbles even at depths of 6 ft. The depth of parent material may be up to 7 or 8 ft, but more often it is 2 to 3 ft. In the parent material there is some calcareous material that effervesces with acid.

Use. Where these soils occur in settled areas, they are used for agriculture. Potatoes, grain, and hay are the principal crops. The soils are classified as 3MF in the soil capability classification for agriculture. These soils tend to be droughty and in this area where summer droughtiness is frequent, this is a problem. They are good forestry soils, but their rapid permeability and low water-holding capacity are liabilities. Approximately 65% of these soils are considered arable, 6% are marginal, and the remainder are nonarable.

Midland Series (4,730 acres)

The Midland soils are the imperfectly to poorly drained members of the Parleeville catena. They are intimately associated with the Parleeville series and occur on the lower slopes and in the depressions. The vegetation consists of white cedar, red spruce, black spruce, balsam fir, speckled alder, willows, common woodsorrel, creeping snowberry, violet, toothed mnium, fern moss, and naked miterwort.

The soils are classified as Gleyed Degraded Eutric Brunisols. A description of a moist virgin profile follows:

Horizon	*Depth inches*	
L	1 - ¾	Freshly fallen litter; pH 6.8.
F	¾ - ½	Brown semidecomposed litter; slightly matted; pH 6.0.
H	½ - 0	Black well-decomposed organic material; weak, granular; pH 6.8.
Ah	0 - 2	Reddish black (10R 2/1) silt loam; strong, fine granular; friable, plastic, sticky; clear, wavy boundary; pH 6.4.
Aeg	2 - 3	Dark reddish gray (10R 3/1) gravelly silt loam; few, fine, faint mottles; weak, medium granular; friable, slightly plastic, slightly sticky; pH 6.4.
Bmg	3 - 11	Weak red (10R 5/3) gravelly silt loam; many, medium, distinct mottles; weak, medium granular; firm, slightly plastic, slightly sticky; diffuse boundary; pH 6.4.
Cg	11 - 24+	Weak red (10R 4/3) gravelly sandy loam; many, medium, faint mottles; single grain and moderate, medium granular; loose, nonplastic, nonsticky; pH 6.4.

Variations. There are considerable variations in these soils. The drainage range is from an imperfectly drained to a poorly drained soil. The red color of the parent material masks the colors that indicate profile development. The Midland soils described in the survey of the Andover - Plaster Rock area are not as poorly drained as these. The texture is usually somewhat finer in the Midland than in the Parleeville soils. The parent material seldom reaches the extreme depths that occasionally occur in the well-drained soils. When cultivated, a very dark brown to black plow layer is formed, which rests on the remaining Bmg horizon.

Use. These soils may be used for agriculture after they have been drained. Where the soils are not too poorly drained, they may be used for pasture. Only 1% of the soils are considered arable, 19% are marginal, and the remaining 80% are nonarable. Many of these soils could be drained by a cooperative effort. They should grow all the crops of the region and initially be high in organic material.

Tobique and Riley Brook Series

Tobique Series (2,660 acres)

The Tobique soils are located in the Tobique Valley between Riley Brook and Oxbow on gently rolling to undulating topography. They are associated with the Parleeville and Kingsclear catenas, and the Riley Brook soils. The Tobique soils are well to excessively drained and where they are poorly drained, they were mapped as the Midland series. They appear to have weathered in situ from a coarse-grained red Mississippian sandstone. The vegetation consists of spruce, balsam fir, and trembling aspen. These soils are Orthic Humo-Ferric Podzols. A description of a well-drained virgin profile follows:

Horizon	*Depth inches*	
L	2½ - 2	Brown needles, leaves, twigs, and moss; pH 4.4.
F	2 - 1	Dark brown felted organic material; pH 4.2.

H	1 - 0	Black well-decomposed organic material; strong, coarse granular; pH 4.2.
Ae	0 - 3	Pinkish white (7.5YR 8/2) loamy sand; single grain; loose, nonplastic, nonsticky; abrupt, wavy boundary; pH 4.6.
Bfh	3 - 4	Dark reddish brown (5YR 3/4) loamy sand; single grain; loose, nonplastic, nonsticky; abrupt, wavy boundary; pH 4.6.
Bf	4 - 7	Yellowish red (5YR 5/6) sandy loam; strong, fine granular; friable, loose, slightly plastic, slightly sticky; clear, wavy boundary; pH 4.8.
Bf2	7 - 13	Yellowish red (5YR 4/6) loamy sand; single grain; loose, nonplastic, nonsticky; clear, smooth boundary; pH 4.8.
C	13 - 24	Dark red (10R 3/6) loamy sand; single grain; loose, nonplastic, nonsticky; pH 4.8. Material becomes more consolidated and finally merges with the consolidated sandstone.

Variations. The variations are mainly in the depth of the horizons and in the depth of weathered material above the bedrock. The C horizon gradually becomes coarser with depth and finally becomes small particles of sandstone.

Use. Where these soils have been cleared, they may be used to grow the various crops adaptable to the region. The soils tend to be excessively drained and droughty and because of the small amounts of clay, the exchange capacity is low. About 20% of these soils belong to Class 3 and the remainder to Class 4.

Riley Brook Series (1,888 acres)

These soils are found in the Tobique Valley between Riley Brook and Oxbow. They appear to be formed from a red shale weathering in situ, but in a few places they appear to be formed from ponded material that has developed a strong, fine subangular blocky structure. The topography is undulating. These soils are intimately associated with the Parleeville and Kingsclear catenas and the Tobique series. In general appearance, they resemble the Tobique soils, but contain more clay. The vegetation consists of black spruce, balsam fir, white birch, tamarack, trembling aspen, bracken fern, bunchberry, blueberry, sheep-laurel, and Schreber's moss. The soils are classified as Orthic Gray Wooded (Gray Luvisol) soils. A description of a typical moist profile follows:

Horizon	*Depth inches*	
L	3 - 2¾	Moss and last year's leaves and needles; pH 4.6.
F	2¾ - 1¼	Dark reddish brown (5YR 2/2), felted; golden mycelium through it; pH 3.8.
H	1¼ - 0	Black (5YR 2/1) well-decomposed organic material; weak, fine granular; slightly felted; charcoal; abrupt boundary; pH 3.8.
Ae	0 - 4	Pinkish gray (5YR 7/2), loamy coarse sand; moderate, platy breaking to single grain; nonplastic, nonsticky; clear, wavy boundary; pH 4.2.
AB	4 - 5	Weak red (10R 5/2) gritty silt loam; weak, platy; firm, slightly plastic, nonsticky; pH 4.2.
Bt	5 - 17½	Red (10R 4/8) clay loam; fine to medium subangular blocky; firm, plastic, slightly sticky; roots penetrate to bottom of horizon; clay films common; pH 4.6.
C	17½ - 29	Red (10R 5/6) gritty clay loam; strong, coarse granular breaking to strong, medium granular; plastic, slightly sticky, not as hard as Bt horizon, sandstone pebbles; pH 4.6.
R		Red sandstone.

Variations. There appears to be little variation in texture. The depth to consolidated material varies widely and may be 8 to 10 ft. The texture is very deceiving because it appears very coarse on first examination, but on moistening and rubbing it shows the characteristics of a clay loam.

Use. Some of these soils have been cleared and used for agriculture. They respond well to management and will grow most crops. Most of these soils are considered arable.

Soils Developed from Loose Ablation Moraine Materials

These soils are not less than 2 ft over bedrock and seldom more than 10 ft. They have good moisture-holding capacity and many of them are not very stony. The topography is undulating to hilly.

Monquart Series (29,100 acres)

The Monquart soils occur between the Tobique and Salmon rivers and in a few scattered areas north and west of the Salmon River. They are associated with the Caribou, Holmesville, and Victoria catenas. The imperfectly and poorly drained soils associated with the Monquart series have been included in the lower drainage members of the Caribou catena.

These soils have formed on relatively deep ablation till, which is derived from easily weathered calcareous shales, quartzite, and argillites considered to be of Silurian age. The topography is undulating to rolling. The vegetation consists of spruce, balsam fir, white birch, yellow birch, beech, sugar maple, red maple, trembling aspen, white cedar, striped maple, mountain maple, beaked hazel, serviceberry, mountain ash, hobblebush, gooseberries, raspberry, moccasin flower, yellow lady-slipper, trillium, bunchberry, creeping snowberry, spinulose wood-fern, ground-pine, plume moss, haircap moss, and running club moss. These soils have been classified as Orthic Humo-Ferric Podzols. A description of a moist well-drained virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1¾	Brown undecomposed leaves with running club moss, and some needles and branches; pH 4.8.
F	1¾ - ½	Dark brown, semidecomposed, compressed, foliated mat of organic matter with undecomposed roots and branches; abrupt boundary; pH 5.1.
H	½ - 0	Black well-decomposed greasy organic matter; moderate, coarse granular; friable, nonplastic, sticky; abrupt boundary; pH 4.4.
Ae	0 - 2	White (2.5Y 8/2) gravelly silt loam; moderate, fine to medium granular and platy; friable, slightly plastic, slightly sticky; predominantly angular fragments of fine-grained sandstone and quartzite with small quantities of quartz, argillite, and weathered shale; abrupt, irregular boundary; pH 4.4.
Bfh	2 - 6	Brown to dark brown (7.5YR 4/4) gravelly loam; strong, medium granular; friable, slightly plastic, slightly sticky; fragments of fine-grained sandstone, quartzite, and soft shale with small amounts of quartz and argillite; clear boundary; pH 4.5.

Bfh2	6 - 10	Reddish yellow (7.5YR 6/6) gravelly loam; strong, medium granular; friable, slightly plastic, slightly sticky; fragments of fine-grained sandstone and soft shale with some quartzite, quartz, and argillite; gradual boundary; pH 4.9.
Bfj	10 - 26	Light yellowish brown (10YR 6/4) gravelly sandy loam; moderate, medium granular; friable; about 50% of rock fragments are soft shale, the remainder are fine-grained sandstone, quartzite, quartz, and argillite; diffuse boundary; pH 5.0.
C	26 - 42	Olive yellow (2.5Y 6/6) gravelly sandy loam; weak, fine granular; friable; stone fragments as above; diffuse boundary; pH 4.9.
C2	42 - 60	Pale yellow (2.5Y 7/4) gravelly sandy loam; weak, granular; friable; stone fragments same as above; pH 5.4.
C3	60 - 64	Pale yellow (2.5Y 7/4) gravelly clay loam; weak, granular; friable, plastic, sticky; pH 6.0.

Fig. 20. Pulp operations on Monquart soil showing its suitability for traffic.

Variations. The L, F, and H horizons vary from less than 1 to 3 inches in depth. The individual horizons are highly variable in thickness from less than ¼ to 1½ inches in either the F or H horizon. The Ae horizon varies in thickness from 1 to 3 inches and in color from white to pinkish gray. The texture remains fairly uniform as a silt loam or loam. A thin Bhf horizon is sometimes present especially at higher elevations. The Bfh horizon varies in thickness from 3 to 8 inches and in color from a dark red (2.5YR 3/6) to a strong brown (7.5YR 5/8). The texture is generally gravelly loam and occasionally a gravelly sandy loam. The Bf horizon extends to a depth of about 13 to 19 inches from the mineral surface. The texture is generally a

little coarser than the upper horizons and contains more gravel. The BC horizon extends to a depth of 18 to 30 inches. The color is from a light olive brown to a dark yellowish brown. The C horizon varies in color from an olive gray to a light yellowish brown. The pH of the parent material varies from 4.8 to 5.4. The pH values of the organic horizons range from 4.0 to 5.2 and the Ae ranges from 3.8 to 4.4. The Bfh and Bf horizons range from a pH of 4.6 to 5.0. The amount of soft leached shale varies from 25% to 50% of the amount of gravel present.

Use. Many of these soils are still in forest or have been burned over. They are very suitable for forestry because they will grow a wide range of commercial species. Where they are cultivated, they grow all the crops climatically suited to the region. They are easily cultivated and are only moderately subject to erosion. They have been rated as Class 2 in the soil capability classification for agriculture where the slopes are 5% or less. Generally stoniness is no problem. Approximately 64% of the area is considered arable, 20% marginal, and the remaining 16% nonarable.

Caribou Catena

The Caribou soils occur extensively between the Tobique and Salmon rivers where they are associated with the Monquart series. They occur along the Stewart Highway associated with the Holmesville and Jardine catenas, and along the Restigouche River. The Caribou soils are also closely associated with the Monquart and Undine series. The Caribou soils are the well-drained members of the Caribou catena and are intimately associated with the Carlingford and Washburn series, which are the imperfectly and very poorly drained catenary members.

Fig. 21. Potato crop on Caribou soil.

Fig. 22. Grain crop on gently undulating Caribou soil with Undine and Holmesville soils in the background.

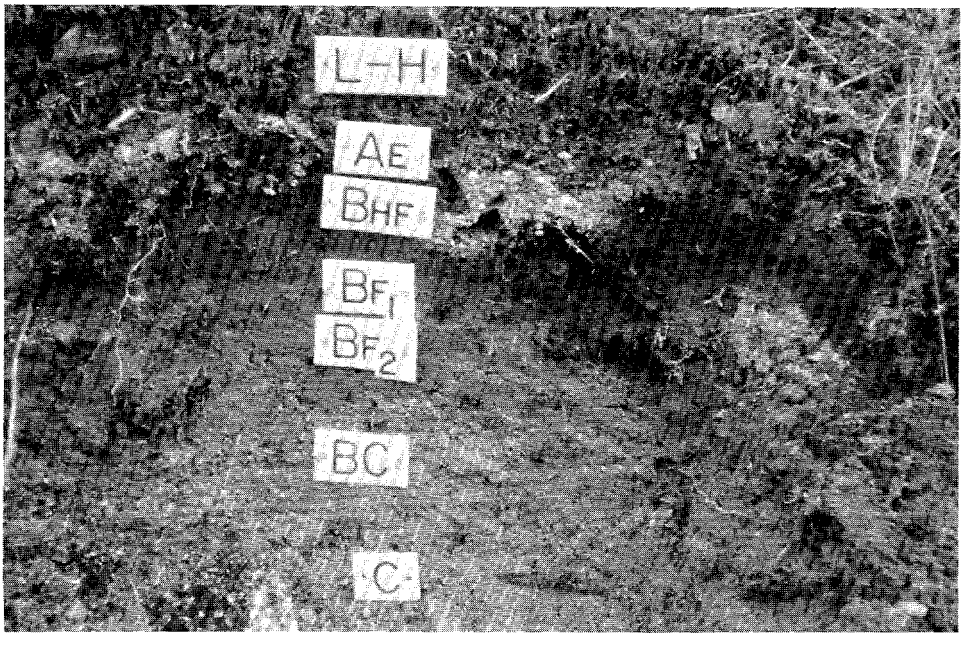

Fig. 23. Orthic Humo-Ferric Podzol, Thibault soil.

The Caribou soils have formed on ablation till derived from calcareous shales and some argillites and quartzites of Silurian age. The topography is gently undulating to rolling and steeply sloping where the rivers have cut deeply into the soft shale.

Caribou Series (41,080 acres)

The Caribou soils are the well-drained members of the catena and have been classified as part of the Bisequa Gray Wooded (Gray Luvisol) Subgroup. The vegetation consists of balsam fir, spruce, white cedar, yellow birch, white birch, sugar maple, red maple, trembling aspen, hop-hornbeam, pin cherry, mountain ash, beaked hazel, bunchberry, blueberry, raspberry, aster, spinulose wood-fern, sarsaparilla, and plume moss. A description of a well-drained virgin profile follows:

Horizon	*Depth inches*	
L	1 - ¾	Brown undecomposed leaves with needles, club moss and moss, branches, twigs, and cones; pH 6.8.
F	¾ - ¼	Black or very dark brown, semidecomposed, compressed, foliated organic matter with undecomposed roots and branches; abrupt boundary; pH 4.6.
H	¼ - 0	Black well-decomposed organic matter; strong, medium granular; abrupt boundary; pH 4.4.
Ah	0 - 2	Black (10YR 2/1) silt loam, high in organic matter; moderate, medium granular; friable to firm; a few fragments of shale, argillite, fine-grained sandstone, and quartzite (the quartzite increasing in quantity in the fine gravel fraction); abrupt boundary; pH 5.0.
Ae	Trace	White (10YR 8/2) silt loam; moderate, medium granular with a tendency to weak platiness; firm, slightly plastic, slightly sticky; stone fragments of white leached sandstone, shale, gray argillite, quartzite, and quartz; clear, wavy boundary; pH 4.9.
AB	Trace	Very pale brown (10YR 7/3) silt loam; moderate, medium granular; firm, plastic, sticky; rock fragments of gray sandstone, argillite, shale, quartzite, and quartz; abrupt, wavy boundary; pH 4.9.
Bfh	2 - 10	Strong brown (7.5YR 5/6) clay loam; strong, medium granular; firm, plastic, sticky; 50% of the rock fragments of brown soft shale, the remainder are gray sandstone, quartzite, and argillite; gradual boundary; pH 4.9.
Bf	10 - 14	Brownish yellow (10YR 6/6) loam; moderate to strong, medium granular; friable, plastic, slightly sticky; 70% of the rock fragments of brown and gray shale, the remainder are sandstone, quartzite, and quartz; diffuse boundary; pH 5.0.
Bt	14 - 24	Light yellowish brown (10YR 6/4) gravelly clay loam; compound weak, coarse granular to moderate, fine granular; permeable, friable; common clay films; diffuse boundary; pH 5.2.
Bt2	24 - 30	Pale yellow (2.5Y 8/4) gravelly clay loam; moderate, medium granular; friable; many clay films; diffuse boundary; pH 5.1.
C	30 - 40	Light olive brown (2.5Y 5/4) gravelly clay loam; moderate, coarse granular and strong, fine subangular blocky; firm, plastic, sticky; diffuse boundary; pH 5.7.
C2	40 - 49	Pale brown (10YR 6/3) gravelly clay loam; strong, coarse granular to fine subangular blocky; firm, plastic, sticky; gradual boundary; pH 6.2.
R	49+	Weathered bedrock.

The shale fragments are leached and weathered and are very porous. These are often referred to as ghosts.

Variations. The organic horizons vary in depth from a thin L horizon to about 2 inches of combined L, F, and H. The Ah horizon may not be present, but where earthworms are active, it may reach depths of 3 or 4 inches and the organic and Ae horizons are obliterated. The Ae horizon may be intermittent or occur in pockets 2 to 3 inches deep. The texture may vary from a loam, high in clay, to a silty clay loam. The AB horizon is often not present. The Bfh and Bf horizons are characterized by their strong granular structure, which persists even after continuous clean cultivation. The texture varies from a silt loam to a silty clay loam. This same texture variation occurs throughout the profile and parent material. There is a slight increase in clay from 24 to 30 inches in some of the profiles and a gradual increase in the pH down the profile. The depth of the solum varies from 18 to 30 inches. The rock fragments may be nearly 100% soft weathered shales.

Use. Most of these soils are still under forest or in burned-over areas. When cleared and cultivated, they are some of the better soils of the area and are used for intensive cultivation of potatoes, peas, and beans. They are capable of growing all crops suited to the region. The strong structure, texture, and porosity make them easy to cultivate and excess water is removed rapidly. They have been placed in Class 2 of the soil capability classification for agriculture. Approximately 73% of these soils are considered arable, 16% are marginal, and the remaining 11% are nonarable.

Fig. 24. Typical potato farm on Holmesville soil.

Carlingford Series (6,350 acres)

The Carlingford soils are the imperfectly drained members of the Caribou catena. They usually occur on seepage slopes and level to depressional areas. The vegetation consists of balsam fir, red spruce, white spruce, black spruce, eastern white cedar, larch, red maple, black ash, white birch, trembling aspen, balsam poplar, large-toothed aspen, and striped maple. The lower story consists of raspberries, aster, creeping snowberry, haircap moss, plume moss, beaked hazel, and fern. The soils have been classified as members of the Gleyed Orthic Gray Wooded (Gray Luvisol) Subgroup. A description of a moist virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1½	Light brown to brown undecomposed needles with mosses, branches, twigs, and cones; pH 6.4.
F	1½ - 1	Reddish black, semidecomposed, matted, and fibrous organic matter with undecomposed roots, branches, and cones; abrupt boundary; pH 6.4.
H	1 - 0	Black well-decomposed organic matter; strong, granular; greasy when wet; pH 6.4.
Ah	0 - 2	Very dark brown (10YR 2/2) silt loam, high in organic matter; strong, medium granular; firm, plastic; stone fragments of brown soft shale and fine-grained sandstone with some quartzite; abrupt boundary; pH 6.5.
Aegj	2 - 5	Pale yellow (5Y 7/4) silt loam; few, fine, faint mottles; weak, fine granular; friable, slightly hard, slightly plastic, slightly sticky; rock fragments, mainly argillite with fine-grained sandstone and shale; clear, irregular boundary; pH 6.6.
Btjgj	5 - 11	Yellowish brown (10YR 5/4) loam; common, fine, faint mottles; weak to moderate, medium granular; friable, loose, slightly plastic, slightly sticky; clay films and clay flows common; stone fragments of brown soft shale, argillite, and micaceous fine-grained sandstone; clear boundary; pH 6.6.
Btjg	11 - 15	Light olive brown (2.5Y 5/5) loam; common, medium, distinct brownish yellow (10YR 6/6) mottles; moderate, medium granular; friable; less permeable than other horizons, slightly plastic, slightly sticky; rock fragments mostly of soft shale with some fine-grained sandstone and quartzite; clay films and clay flows common; gradual boundary; pH 6.5.
Cg	15 - 30	Light olive brown (2.5Y 5/4) loam; common, medium, distinct brownish yellow (10YR 6/6) and pale yellow (2.5Y 7/4) mottles; weak, fine granular; friable, slightly plastic, slightly sticky; rock fragments mainly of soft shale with some sandstone and quartzite; clay films common; diffuse boundary; pH 6.5.
C	30+	Pale olive (5Y 6/3) gravelly clay loam; weak, coarse granular; friable, plastic, sticky; rock fragments same as in Cg horizon; some rock fragments and fines adhere to stones and effervesce with acid; clay films common; pH 6.5.

Variations. The depth of the L, F, and H horizons may vary from 2 to 6 inches. The Ah horizon is frequently absent from the profile. The Aegj horizon varies in thickness from 1 to 3 inches. The Btjg varies in thickness and in the amount of organic material present, and as the drainage approaches the lower limits, the Btjg becomes very weak. The texture of the profile may range from a loam to a silty clay loam and occasionally a clay loam. The amount of gravel will vary slightly. The pH

has a wide range of variability from about 4.0 to 6.5 in the Aegj and from about 5.0 to 6.5 in the parent material.

A Gleyed Dystric Brunisol variant of this occurs. It occurs in small localities on the more acid parent material.

Use. These soils, when drained, may be used for any crops grown in the area. Where the pH is high, care must be taken not to grow crops that are adversely affected by this. All the soils would be arable if drained.

Washburn Complex (3,420 acres)

The Washburn soils are the poorly to very poorly drained members of the Caribou catena and are associated with Caribou, Undine, and Monquart soils. They occupy depressions or regions where the permanent water table is close to the surface. Topography is level to depressional.

The parent material was deposited as an ablation moraine and the surface probably had some material added by siltation. The vegetation consists of black spruce, balsam fir, tamarack, white cedar, black ash, red maple, trembling aspen, white birch, beaked hazel, speckled alder, and sphagnum mosses. The profile is classified as an Orthic Humic Gleysol. The description of a very poorly drained profile follows:

Horizon	*Depth inches*	
L	4 - 3½	Brown undecomposed leaf litter, twigs, and needles; pH 6.2.
F	3½ - 2	Very dark brown (10YR 2/2) semidecomposed litter, felted; pH 6.2.
H	2 - 0	Black (10YR 2/1) well-decomposed organic material; strong, coarse granular; somewhat greasy when wet; pH 6.6.
Ah	0 - 4	Very dark brown (10YR 2/2) silt loam; weak, granular; very friable, loose; abrupt boundary; pH 6.6.
Bg	4 - 17	Olive gray (5Y 5/2) silty clay loam; many, coarse, prominent olive yellow (2.5Y 6/6) mottles; amorphous; plastic, sticky; diffuse boundary; pH 6.6.
Ckg	17 - 23	Olive gray (5Y 5/2) silty clay loam; many, medium, prominent olive brown (2.5Y 5/4) mottles; amorphous; plastic, sticky; strongly effervescent; abrupt boundary; pH 7.6.
Ckg2	23+	Dark gray (5Y 4/1) silty clay loam; common, medium, prominent mottles; amorphous; plastic, sticky; calcite fragments common; strongly effervescent; pH 7.2.

Variations. There are a number of variations in the upper horizons of the solum that change the classification of these soils. Often the L, F, and H horizons increase to depths of 6 to 12 inches and cause the soil to be placed in the peaty phase, Orthic Humic Gleysol. Soils with an Ah less than 3 inches and an Aeg and a Bg or Bgf horizon or horizons giving rise to variants that would be classified as a Rego Gleysol, Orthic Gleysol, or Fera Gleysol are associated and mapped with the Washburn complex. Infrequently a much coarser textured material is found associated with the Monquart series. The pH may be considerably lower than that described and range from 4.0 in the organic horizons to 5.6 in the parent material. This is apparently dependent on the supply of carbonates in the surrounding soils and the degree of drainage or water movement within the soils.

Use. These soils are generally left in forest. Where they occur in small areas in cleared sections, they may be drained and farmed. Care must be taken to use them

for crops that are not harmed by the unusually high pH. When drained and cultivated, these soils are suitable for growing hay, pasture, and grain. The larger sections would require a cooperative effort to drain them and would be considered nonarable at the present time.

JARDINE CATENA

The Jardine catena is found in the northwest corner of the area. The catena has the well-drained Jardine, the imperfectly to poorly drained Nickel Mill, and the very poorly drained Five Fingers series as members. They are intimately associated with the Caribou catena, which they resemble very closely in the upper solum. The parent material was deposited as a calcareous ablation material derived from highly calcareous shale with calcite stringers. Calcite is still present in the parent material. The topography is gently undulating to gently rolling except along the stream channels, which are deeply incised. In the surveyed area, they occur at elevations of 800 to 1000 ft.

Jardine Series (7,050 acres)

The Jardine soils occupy the well-drained upper slopes and ridges. They generally have few surface stones, but may be very stony in the unweathered parent material. The vegetation consists of white spruce, balsam fir, white birch, red maple, trembling aspen, beaked hazel, ground-pine, running club moss, haircap moss, spinulose wood-fern, and bunchberry. The soils are classified in the Bisequa Gray Wooded (Gray Luvisol) Subgroup. A description of a well-drained virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2¾	Freshly fallen litter of needles and twigs; pH 4.8.
F	2¾ - 1	Dark reddish brown to black semidecomposed organic material; felted; pH 3.8.
H	1 - 0	Black very well decomposed greasy organic material; fine granular; pH 4.4.
Ae	0 - 1	Pinkish gray (5YR 6/2) silt loam; strong, granular; friable, slightly plastic, slightly sticky; abrupt, wavy boundary; pH 4.6.
Bfh	1 - 2	Dark brown (7.5YR 4/4) silty clay loam; moderate, fine granular; friable, plastic, sticky; abrupt, irregular boundary; pH 4.6.
Bf	2 - 8	Brownish yellow (10YR 6/6) silt loam; moderate, fine granular; friable, soft, slightly plastic, slightly sticky; pH 4.2.
Bf2	8 - 15	Yellowish brown (10YR 5/8) loam; weak, fine granular; friable, loose, slightly plastic, slightly sticky; pH 4.4.
Btj	15 - 23	Pale brown (10YR 6/3) gravelly clay loam; moderate, medium granular and moderate, medium blocky; friable, plastic, sticky; rock fragments, angular and subangular, soft shale and some slate; pH 4.6.
Bt	23 - 32	Very dark grayish brown (2.5Y 3/2) silty clay loam; moderate, medium blocky; plastic, very sticky; common clay films; pH 4.8.
Ck	32 +	Light olive brown (2.5Y 5/4) gravelly clay loam; moderate, medium blocky; firm, plastic; strongly effervescent; gravel flat to subangular; pH above 7.6.

Variations. The depth of the L, F, and H horizons varies from 1 to 3 inches. An

Ah is sometimes present due to worm action. The Ae horizon is seldom more than 1 inch deep and the upper part of the profile would be an Orthic Humo-Ferric Podzol and is very similar to the Caribou profile. The depth to the Bt horizon varies from 11 to 30 inches. The texture of the Bf2 will range to a clay loam. The pH of the Btj is often 5.0, the Bt 5.0 to 5.4, and the C usually 7 or higher. The C is usually stony because of unweathered shales and calcite. The texture is often a gravelly silty clay loam. The analyses given in the appendix are of a slightly different profile.

Use. None of these soils are under cultivation in the surveyed area. In other areas where they have been cleared and cultivated, good yields of climatically suited crops are grown. The high pH of the parent material should make the soils suitable for alfalfa if it can be established. They should give similar responses to management as the Caribou soils. Approximately 85% of these soils are considered arable, 11% are marginal, and the remaining 4% are nonarable. The limitation is topography.

Nickel Mill Series (5,920 acres)

The Nickel Mill soils are the imperfectly to poorly drained members of the Jardine catena. They occur on the seepage slopes and level areas associated with the Jardine series. The vegetation consists of red spruce, eastern white cedar, trembling aspen, white birch, balsam fir, pearly everlasting, goldenrod, bunchberry, creeping snowberry, hawkweed, and wild grasses. The soils are classified as members of the Gleyed Gray Wooded (Gray Luvisol) Subgroup. A description of an imperfectly drained virgin profile follows:

Horizon	*Depth inches*	
L	Trace	Litter; pH 7.4.
F	6 - 3	Dark brown very well decomposed organic material, felted; pH 6.6.
H	3 - 0	Black well-decomposed greasy organic material; weak, coarse granular; pH 6.6.
Ae	Trace to less than ¼	Light gray (10YR 7/2) silt loam; weak, fine platy; slightly plastic, slightly sticky; broken boundary; pH 6.4.
Bmgj	¼ - 1¼	Yellowish brown (10YR 5/4) silt loam; few, fine, faint mottles; weak, medium platy breaking to weak, moderate granular; slightly plastic, slightly sticky; gradual, wavy boundary; pH 6.6.
Bmg2	1¼ - 5	Very pale brown (10YR 7/4) silty clay loam; common, fine, distinct brownish yellow (10YR 6/8) mottles; strong, coarse granular and fine blocky; friable, plastic, slightly sticky; clear, wavy boundary; pH 6.8.
Btg	5 - 9	Light yellowish brown (2.5Y 6/4) silty clay loam; common, medium, distinct yellowish brown (10YR 5/8) mottles; moderate, medium platy breaking to coarse granular or fine blocky; few clay films; abrupt boundary; pH 7.0.
Ckg	9 - 19	Light olive brown (2.5Y 5/4) gravelly sandy clay loam; common, medium, faint light yellowish-brown (10YR 6/4) mottles; weak, medium pseudoplaty; firm, plastic, sticky; common clay films; strongly effervescent; pH 7.4.
Ckg2	19 - 36	Light olive brown (2.5Y 5/4) gravelly clay loam; common, many, distinct yellowish brown (10YR 5/4) mottles; fine pseudoplaty; plastic, sticky; common clay films; strongly effervescent; pH 7.6.

Ckg3	36 - 48+	Olive (5Y 5/3) gravelly clay loam; common, medium, distinct yellowish brown (10YR 5/6) mottles; pseudoplaty; plastic, sticky; strongly effervescent; pH 7.6.

Variations. The organic horizons may vary from about 3 to 6 inches. It is difficult to detect if a Bt horizon is present or not. The Ckg horizons may have many clay films, but it is difficult to determine the actual amount of clay increase. The pH is higher in the upper part of the profile and the profile is shallower than the well-drained member. The Ae horizon may be slightly deeper in places, but is seldom, if ever, more than 1 inch. The structure of the parent material suggests that this may be formed on a ground moraine, but generally it appears to be ablational and is friable. These soils will have Gleyed Brunisolic Gray Wooded (Gray Luvisol) soils associated with them as the Bmg horizons will sometimes be more than 6 inches in depth.

Use. None of these soils are being used for agriculture in the present surveyed area. They have nearly all been severely burned twice in the last 50 years. When cleared, they would make excellent pasture and if drained would grow good crops of hay, grain, and other crops that can be grown at the high pH that prevails in these soils.

Five Fingers Series (3,740 acres)

The Five Fingers soils are the very poorly drained members of the Jardine catena. They are found intimately associated with the well-drained and imperfectly drained members of the catena and with the St. Quentin Peat. The topography is nearly level to depressional. The vegetation consists of black spruce, white cedar, willow, red-osier dogwood, and fern moss. The profile is classified as a peaty phase of the Carbonated Humic Gleysol. A description of a typical moist virgin profile follows:

Horizon	*Depth inches*	
L	11 - 10	Litter and moss; pH 6.8.
F-H	10 - 0	Black decomposed organic material and rotten wood; pH 7.6.
Aheg	0 - 6	Very dark gray (10YR 3/1) silt loam; common, medium, distinct yellowish red (5YR 5/8) mottles; moderate, medium granular; clear boundary; pH 7.6.
Bg	6 - 16	Light olive brown (2.5Y 5/4) silt loam with some medium sand; common, medium, distinct reddish yellow (5YR 6/6) and light gray (2.5Y 7/0) mottles; weak, fine blocky; firm, slightly plastic, slightly sticky; moderately effervescent; pH 7.6.
Ckgj	16 - 32	Olive (5Y 5/3) gravelly sandy clay loam; few, fine, faint mottles; weak, medium blocky; little more friable than above, plastic, slightly sticky; strongly effervescent; pH 7.6.

Variations. The depth of the organic material ranges from 6 to 24 inches and the same mineral profile is found under the St. Quentin Peat. An Ah is sometimes present, but the dark gray Aheg is always present. The structure and texture vary somewhat, the texture varies from a sandy clay loam to a silty clay loam, and the structure from nearly amorphous to medium blocky. Because these soils are nearly always wet, the structure does not develop very well. The analysis in Table 20 is of a profile taken 25 ft from the one described above, which is slightly different.

Use. None of these soils are used for agriculture in the present surveyed area. If

cleared and drained, they should grow grass and legumes or crops that require a high pH.

THIBAULT CATENA

The Thibault catena is found between the Tobique and Salmon rivers and is associated with the Caribou, Glassville, and Holmesville catenas and the Monquart series. The parent material was deposited as ablation moraine and was derived from weakly calcareous quartzites of Silurian age. The topography is undulating to strongly rolling. The well-drained member of the catena is the Thibault series. The imperfectly and very poorly drained members are the Guercheville and Lauzier series.

Thibault Series (20,370 acres)

The Thibault gravelly loam is found on the well-drained ridges and upper slopes. The vegetation consists of balsam fir, red spruce, trembling aspen, white spruce, yellow birch, sugar maple, beech, spinulose wood-fern, blueberry, ground cedar, hobblebush, and plume moss. The soils have been classified as Orthic Humo-Ferric Podzols. A description of a well-drained virgin profile in a moist condition follows:

Fig. 25. Topography and potato crop on Holmesville soil. The same soil is in the area occupied by forest.

Horizon	*Depth inches*	
L	1½ - 1¼	New litter, freshly fallen leaves, and twigs; pH 5.0.
F	1¼ - ½	Semidecomposed litter, some charcoal; pH 5.0.
H	½ - 0	Dark brown well-decomposed organic material; fine granular; pH 4.2.
Ah	0 - 1	Dark gray (10YR 4/1) silt loam; weak, fine granular; friable, soft, slightly plastic, nonsticky; abrupt, irregular boundary; pH 3.8.
Ae	1 - 3	Light gray (10YR 7/1) loam; moderate, fine granular; friable, soft, slightly plastic, slightly sticky; abrupt, irregular boundary; pH 4.2.
Bfh	3 - 8	Strong brown (7.5YR 5/6) loam; moderate, medium granular; friable, soft, slightly plastic, slightly sticky; abrupt, wavy boundary; pH 4.6.
Bf	8 - 14	Brownish yellow (10YR 6/6) gravelly loam; moderate, medium granular; friable, soft, slightly plastic, nonsticky; gradual, smooth boundary; pH 5.0.
Bf2	14 - 26	Pale brown (10YR 6/3) gravelly sandy loam; small pockets of silty material; weak, coarse granular; friable, soft, nonplastic, nonsticky; smooth, gradual boundary; pH 5.0.
C	26 - 54	Pale olive (5Y 6/4) gravelly sandy loam; weak, granular; friable, loose, nonplastic, nonsticky; pH 5.0.
C2	54+	Pale olive (5Y 6/4) gravelly sandy loam; weak, fine granular; friable, loose, nonplastic, nonsticky; pH 5.0.

Variations. The organic layers vary from 1 to 3 inches. The pH of these horizons ranges from 4.3 to 6.4. The Ah horizon may be present and, if present, varies from a trace to about 2 inches. The pH has a range of 3.8 to 5. The Ae horizon ranges from 1 to 2 inches in thickness with pockets to 4 inches. The texture varies from a sandy loam to a silt loam and the pH is 4.2 to 4.6. The B horizons range from 14 to 17 inches in depth and from gravelly sandy loams to gravelly loams in texture. The BC horizon has a thickness of 9 to 12 inches and ranges in color from a pale brown to a light olive brown. The C horizons vary from pale olive to grayish brown. The pH of the parent material ranges from 4.6 to 5.0 and occasionally to 6.2. The stoniness varies from 2 to 3. The analysis was done on a different profile.

Use. Only a small section of these soils has been cleared and used for agriculture. It may be used for growing most crops climatically suited to the region. The only limiting factors are stoniness and slope. These soils have been placed in Class 2 in the soil capability classification for agriculture. Approximately 45% of these soils are arable, 1% marginal, and 54% nonarable.

Guercheville Series (540 acres)

The Guercheville soils are the imperfectly and poorly drained members of the Thibault catena. They occur on seepage slopes and depressions. The vegetation consists of white spruce, white cedar, trembling aspen, willows, speckled alder, red maple, white birch, bunchberry, blueberry, and plume moss. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of an imperfectly drained virgin profile follows:

Horizon	*Depth inches*	
L	2½ - 2	Fresh litter, twigs, and fallen leaves; pH 5.0.
F	2 - 1½	Dark reddish brown (5YR 2/2) semidecomposed litter, felted; pH 4.6.
H	1½ - 0	Black (5YR 2/1) well-decomposed organic material; strong, granular; pH 3.8.
Aeg	0 - 3	Light gray (10YR 7/1) loam; common, medium, distinct mottles; weak, fine platy; friable, slightly plastic, slightly sticky; clear, wavy boundary; pH 4.2.
Bfgj	3 - 12	Yellowish brown (10YR 5/4) gravelly loam; common, medium, distinct mottles; moderate, medium granular; friable, slightly plastic, slightly sticky; clear, wavy boundary; pH 4.6.
BCg	12 - 18	Light brownish gray (10YR 6/2) gravelly loam; common, coarse, distinct mottles; moderate, fine granular; firm, slightly plastic, slightly sticky; pH 5.2.
Cg	18 - 36+	Pale olive (5Y 6/4) gravelly loam; common, medium, distinct mottles; weak, fine granular to amorphous; hard, slightly plastic, slightly sticky; pH 5.4.

Variations. The depth of the horizons varies considerably, especially the organic and Ae horizons. The depth of the solum ranges up to 26 inches from the surface. The poorly drained soils usually contain more silt and clay than the well-drained Thibault soils, especially in the solum. The structure is not well defined and it appears amorphous.

Use. Except for small areas, associated with larger areas of well-drained soils, these soils are not cleared and cultivated. They may be used for pasture, but require drainage before they can be cultivated. They should grow the same crops as the Thibault soils. When the soils are drained, they will be classified as 3w, otherwise 5w. Approximately 89% of these soils are considered marginal for agriculture.

Lauzier Series (440 acres)

The Lauzier soils are the very poorly drained members of the Thibault catena. They are located geographically in the same regions as the other members of the catena and occupy the depressions. The vegetation consists of spruce, white cedar, trembling aspen, speckled alder, willows, goldenrod, dwarf raspberry, bunchberry, violets, Schreber's moss, big-leaved aster, and goldthread. The soils are classified as Fera Gleysols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	4 - 3¼	Fallen leaves and mosses; pH 5.0.
F	3¼ - 3¼	Black (5YR 2/1) semidecomposed organic matter; slightly felted; pH 4.6.
H	3¼ - 0	Black (5YR 2/1) well-decomposed, well-humified organic matter; strong, fine granular, breaks down easily; pH 3.8.
Aeg	0 - 4	Light gray (10YR 7/2) silt loam; common, faint yellowish brown (10YR 5/6) and greenish gray (5BG 6/1) mottles; moderate, medium platy; plastic, slightly sticky; some gravel; pH 4.2.
Aeg2	4 - 12	Light gray (2.5Y 7/2) silt loam; few, coarse, yellowish brown (10YR 5/6) and greenish gray (5BG 6/1) mottles becoming more common with depth; weak, platy; gives the appearance of being amorphous; pH 4.6.

Bgf	12 - 26	Grayish brown (2.5Y 5/2) gravelly loam; fine, streaked olive brown (2.5Y 4/4) mottles; moderate, coarse granular; friable, slightly plastic, slightly sticky; pH 4.6.
Cg	26 - 30	Light olive brown (2.5Y 5/4) gravelly loam; streaked light greenish gray (5GY 7/1) mottles; amorphous; friable, slightly hard, slightly plastic, slightly sticky; clear boundary; pH 5.4.
Cgj	30+	Light olive brown (2.5Y 5/4) gravelly loam; few, faint mottles; amorphous; friable, slightly hard, slightly plastic, slightly sticky; pH 5.4.

Variations. The organic horizons vary in depth up to 12 inches. An Ah may be present. Rego Gleysol profiles have been mapped along with the Lauzier soils in some of the more poorly drained sites. The texture is finer in the Lauzier series than in the other two members of the catena. The amorphous structure in the Cg slows up the percolation of water causing the very poorly drained conditions associated with these soils.

Use. The Lauzier soils are best left in forest. If they are cleared, they will require drainage before any use can be made of them and even then, they will usually be later warming up and drying in the spring than the well-drained soils. This limits the crops to be grown on them. In their present state, these soils are considered nonarable.

Irving Catena

The Irving catena is found in the eastern part of the mapped area. It is associated with the Juniper and Clearwater catenas. It has formed from material deposited as ablation moraine and derived from rocks of igneous origin such as red and gray granites, basalts, volcanics, and gneisses. It is made up of the well-drained Irving silt loam, the imperfectly to poorly drained Goodfellow silt loam, and the very poorly drained Halls Brook silt loam. The topography of the area varies from gently rolling to hilly and these soils usually occur on the less rugged topography. They are usually stony and bouldery, but some places occur where they have fewer stones. These soils will be described and discussed in detail below.

Irving Series (5,600 acres)

The Irving soils are the well-drained members of the catena. The vegetation consists of sugar maple, yellow birch, beech, white birch, balsam fir, white spruce, dwarf raspberry, bunchberry, hobblebush, ferns, and mosses. The soils are classified as Orthic Humo-Ferric Podzols. A description of a well-drained virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1¾	Newly fallen litter; pH 5.0.
F	1¾ - ½	Brown partially decomposed matted organic matter; pH 5.0.
H	½ - 0	Dark brown well-decomposed organic material; weak, fine granular; pH 4.0.
Ae	0 - 2	Gray (10YR 5/1) sandy loam; weak, medium platy breaking to moderate, fine granular; friable, slightly plastic, slightly sticky; abrupt, irregular boundary; pH 4.6.
Bhf	2 - 2½	Dark reddish brown (5YR 2/2) silt loam; moderate, medium granular; friable, slightly plastic; irregular boundary; pH 5.0.

Bfh	2½ - 13½	Dark red (2.5YR 3/6) silt loam; moderate, medium granular; firm, slightly plastic, slightly sticky; pockets of dark material along roots and rocks; clear, irregular boundary; pH 5.4.
Bf	13½ - 20	Dark brown (10YR 4/3) silt loam; weak, coarse platy breaking to weak, medium granular; firm, slightly plastic, slightly sticky; pH 5.4.
C	20 - 42	Brown (10YR 5/3) gritty silt loam; subangular blocky to pseudoplaty; firm, slightly plastic, slightly sticky; pH 5.4.
C2	42+	Brown (10YR 5/3) gravelly silt loam; subangular blocky; stony; pH 5.4.

Variations. The organic horizons vary from 2 to 3 inches in depth. The Ae horizon varies from 1 to 2 inches in thickness, but may reach 4 inches in pockets. The texture varies from a sandy loam to loam. The Bhf horizon may not always be present and varies from 0 to 2 inches in thickness. Some profiles with a Bhf horizon, 3 to 4 inches thick, were found but were not mapped separately. The thickness of the B horizons is variable. The textures of the B and C horizons are quite uniform and the overall depth of the solum varies from 20 to 34 inches. The pseudoplaty structure indicates some movement or orientation of the material caused by pressure during deposition. It is weak and not always present. The color of the parent material varies from a brown to a dark grayish brown and is probably caused by the variation in the rock material from which it is derived.

Use. None of these soils have been cleared and they should be left in forest. The limiting factors for agriculture are stoniness and frequency of bedrock outcrops. Small areas of these soils may be found without these limiting factors and they are classified as Class 3, but are too small for economic units. Approximately 2% of these soils are considered arable and another 3% marginal. The remainder are nonarable.

Goodfellow Series (670 acres)

The Goodfellow soils are the imperfectly to poorly drained members of the Irving catena. They occur on the seepage slopes and around depressional areas. The vegetation consists of balsam fir, black spruce, bunchberry, blueberry, creeping snowberry, spinulose wood-fern, Schreber's moss, and wavy dicranum. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of an imperfectly drained virgin profile follows:

Horizon	*Depth inches*	
L	4 - 3½	Leaf litter, needles, and twigs; pH 5.0.
F	3½ - 2	Semidecomposed organic material; felted; pH 4.0.
H	2 - 0	Black to dark reddish brown well-decomposed organic material; coarse granular; pH 3.8.
Aeg	0 - 2	Gray (10YR 6/1) silt loam; sand fraction is coarse; common, coarse, distinct mottles; weak, medium platy; friable, slightly plastic, slightly sticky; pH 3.8.
Bhfgj	2 - 3½	Very dusky red (2.5YR 2/2) silt loam; very high in organic matter; common, coarse, faint mottles; moderate, medium granular; firm, slightly plastic, nonsticky; pH 4.6.
Bfhgj	3½ - 5½	Dark reddish brown (5YR 3/4) silt loam; few, fine, faint mottles; weak, platy breaking to weak, medium granular; firm, plastic, slightly sticky; pH 4.8.

Bfgj	5½ - 8½	Reddish brown (5YR 4/4) silt loam; common, medium, faint mottles; weak, fine subangular blocky to amorphous; firm, slightly plastic, slightly sticky; pH 5.0.
Bfgj2	8½ - 12	Dark brown (7.5YR 3/2) silt loam; few, medium, faint mottles; weak, fine subangular blocky breaking to granular; firm, slightly plastic, slightly sticky; pH 5.0.
BCgj	12 - 21	Yellowish brown (10YR 5/4) silt loam; many, coarse, faint brownish yellow (10YR 6/8) mottles; amorphous to subangular blocky; firm, slightly plastic, slightly sticky; pH 5.0.
Cgj	21 - 48	Light yellowish brown (10YR 6/4) silt loam; many, coarse, prominent grayish brown (10YR 5/2) mottles; weak, medium platy to amorphous; firm, slightly plastic, slightly sticky; pH 5.2.

Variations. The depth of the organic matter may vary from 3 to 6 inches and the Aeg from 1 to 3 inches and in pockets to 5 inches. The Bhfgj varies in thickness from 0 to 2 inches and the Bfhgj horizon is seldom thicker than this. Occasionally the Bhfgj horizon is 4 inches or more thick and the soils are Gleyed Ferro-Humic Podzols; although they were not mapped, they do occur. The texture remains uniform as a silt loam, but the gravel and stone contents vary. The color of the soils varies from brown to dark grayish brown as does that of the Irving soils. The B horizons vary from the well-developed ones described to a simple Bfg when the profile is poorly drained.

Use. These soils have not been cleared or used for agriculture. They grow good-quality commercial species of trees and should be left in forest. The limitations are stoniness, frequency of bedrock outcrops, and drainage. All these soils are considered nonarable.

Halls Brook Series

The Halls Brook soils are the very poorly drained members of the Irving catena. They are found on level to depressional areas associated with the Goodfellow soils and have been mapped with them. The vegetation consists of black spruce, balsam fir, tamarack, speckled alders, willows, sedges, and plume moss. They are classified as Orthic Gleysols. The description of a very poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	6 - 5	Gray to green moss, needles, leaves, not decomposed; pH 4.7.
F	5 - 2	Brown semidecomposed organic material; slightly felted; pH 4.0.
H	2 - 0	Black well-decomposed greasy organic material; coarse granular; pH 3.8.
Ahg	0 - 2	Very dark brown (10YR 2/2) silty clay loam; medium granular; loose, soft, slightly plastic, slightly sticky; smooth boundary; pH 4.2.
Ahcg	2 - 6	Very dark grayish brown (10YR 3/2) silt loam; common, fine, faint mottles; weak, medium granular; slightly plastic, slightly sticky; clear boundary; pH 4.4.
Aegj	6 - 10	Dark gray (10YR 4/1) silt loam; faint mottling; weak, platy and medium granular; slightly plastic; clear, smooth boundary; pH 4.4.

Bgj	10 - 17	Yellowish brown (10YR 5/4) silt loam; many, coarse, prominent brownish yellow (10YR 6/8) mottles; weak, subangular blocky to amorphous; firm, slightly plastic, slightly sticky; clear, wavy boundary; pH 4.8.
Cg	17 - 36+	Light yellowish brown (10YR 6/4) silt loam; many, coarse, prominent grayish brown (10YR 5/2) mottles; weak, medium subangular blocky to amorphous; slightly plastic, slightly sticky; pH 5.2.

Variations. The depth of the L, F, and H may vary up to 24 inches and become the peaty phase of Orthic Gleysols. The Ah varies in thickness from 1 to 3 inches and the Ahe from 2 to 6 inches. The texture varies little, but may be slightly finer in the Aheg and Aeg than is described here.

Use. These soils have never been cleared and are best left in forest. They produce a relatively slow growing forest because of the high water table. The excessive stoniness also precludes their use for agriculture. They are classified as 7PW.

Soils Developed from Compact Ground Moraine Materials

These soils have developed on material deposited under the ice as ground moraine. The parent material was derived from a number of very different geological materials. The soil-forming processes have acted differently on these, to form very different profiles.

HOLMESVILLE CATENA

The Holmesville catena is probably the most widespread one mapped in the area. It occurs from the Tobique River west to the county boundary. It is associated with the Caribou, Thibault, Siegas, and Victoria catenas and the Monquart series. The parent material was deposited as a relatively thin, 3 to 10 ft, mantle over the bedrock. It is possible that the loose material in which the solum formed is a thin layer of ablation material from the same bedrock source deposited on top of the ground moraine by the melting of the ice. This would account for the varying depths of loose material overlying the compact till. It was derived from Silurian quartzite, slightly metamorphosed fine-grained sandstone, and small amounts of shale, argillites, and slates. The topography is undulating to strongly rolling and is controlled by the bedrock. The catena consists of the well-drained Holmesville, the imperfectly and poorly drained Johnville, and the very poorly drained Poitras series and their silt loam variants. These soils are generally not too stony to prevent their use for agriculture.

Holmesville Series (81,450 acres)

The Holmesville soils are classified as Orthic Humo-Ferric Podzols. The vegetation consists of sugar maple, beech, yellow birch, red and white spruce, balsam fir, red maple, white pine, trembling aspen, pin cherry, striped maple, mountain maple, bracken fern, blueberry, bunchberry, fall dandelion, lichens, mosses, dwarf raspberry, and hobblebush. A description of a well-drained virgin profile follows:

Fig. 26. Clearing land on Holmesville soil.

Horizon	*Depth inches*	
L	2 - 1½	Brown undecomposed needles, leaves, twigs, and moss; pH 3.9.
F	1½ - 1	Very dark brown partially decomposed felty mor; abundant white filaments; pH 4.0.
H	1 - 0	Black well-decomposed organic material; moderate, medium granular; friable, charcoal; pH 3.9.
Ae	0 - 2	White (10YR 8/2) loam; weak, platy breaking to weak, fine granular; friable, soft, slightly plastic, slightly sticky; abrupt, irregular boundary; pH 3.5.
Bhf	2 - 2½	Dusky red (2.5YR 3/2) loam; strong, fine and medium granular; friable, soft, slightly plastic, slightly sticky; abrupt boundary; pH 3.9.
Bhf2	2½ - 4	Dark reddish brown (5YR 3/4) silt loam; moderate, medium granular; friable, soft, plastic, sticky; clear boundary; pH 4.2.
Bf	4 - 6	Brown (7.5YR 5/2) loam; moderate, fine granular; friable, soft, plastic, sticky; clear boundary; pH 4.6.
Bf2	6 - 12	Yellowish brown (10YR 5/4) gravelly loam; moderate, fine granular; friable, soft, plastic, sticky; gradual boundary; pH 4.7.
BC	12 - 18	Light olive brown (2.5Y 5/4) gravelly loam; weak, coarse platy breaking to moderate, medium subangular blocky; many clay films; clear boundary; pH 4.8.

C	18 - 40	Grayish brown (2.5Y 5/2) gravelly sandy loam; moderate, coarse pseudoplaty breaking to medium blocky; very compact and firm in place, somewhat brittle, very firm, hard, slightly plastic, slightly sticky; many clay or silt films or flows; abrupt boundary; pH 5.2.
Cgj	40 - 52	Grayish brown (2.5Y 5/2) gravelly loam to clay loam; few, fine, yellowish red (5YR 5/6) mottles; coarse pseudoplaty and coarse subangular blocky; very firm, hard, plastic, sticky; few clay films; pH 5.5. This is a heterogeneous till with lenses of gravelly clay loam, gravelly loam, and gravelly sandy loam.

Variations. The organic horizons vary in thickness from 1 to 2 inches. These horizons are absent where worms have invaded the area and destroyed them. The Ae horizon ranges in thickness from 1 to 2 inches and in pockets to about 4 inches. The texture varies from a loam to a silt loam and the structure shows varying degrees of platiness that breaks on handling to medium granular. A thin Bhf horizon is often present at high elevations, but it is seldom thicker than 1 inch. Humic Podzol profiles occur on this parent material, but none were found in this area. The depth of the solum varies considerably. Occasionally, it will be only 11 to 12 inches in depth, but may be 28 to 30 inches. The usual depth is 20 to 26 inches. The texture of the profile and parent material varies from a gravelly sandy loam to a gravelly loam. A silty variant (8,531 acres) of these soils occurs and is very extensive north and west of this area. It is a silt loam throughout the depth of the soil. It becomes more slaty in the parent material and silt caps become common. The stone content of the soil varies and occasionally a soil is classified as Stones 3.

Use. The Holmesville soils are the most extensively farmed soils of the area. They are used for growing potatoes, peas, grain, and hay. They respond well to fertilization and stand up well when they are used for continuous intertilled crops. They are subject to erosion, but the large amount of gravel helps to retard this.

Fig. 27. Clover crop on Holmesville soil.

Where the slope is 5% or less, the soils were placed in capability class 2F. There are considerable areas of these soils still in forest and they support a good-quality fast-growing forest. Approximately 69% of these soils are considered arable, 26% marginal, and the remainder, 5%, nonarable. The limitations are topography and stoniness.

Johnville Series (18,530 acres)

The Johnville soils are the imperfectly and poorly drained members of the Holmesville catena. They occur on the seepage slopes and on the edges of depressional areas. The vegetation consists of black spruce, balsam fir, tamarack, white cedar, white birch, gray birch, red maple, willow, pin cherry, speckled alder, black ash, and mosses. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of an imperfectly drained virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2½	Dark yellowish brown to brown undecomposed leaves and needles; bristly club moss, sphagnum moss, branches, twigs, and cones; pH 4.2.
F	2½ - 1½	Dark brown semidecomposed fibrous and matted organic matter with white filaments and undecomposed roots, branches, and cones; abrupt boundary; pH 4.0.
H	1½ - 0	Black decomposed greasy organic matter; strong, medium granular; friable, nonplastic, sticky; pH 4.0.
Ahe	Trace	Very dark gray (10YR 3/1) to gray (10YR 5/1) rubbed; gravelly loam; moderate, medium granular; friable, loose; pH 4.2.
Aegj	0 - 2	Light gray (2.5Y 7/2) gravelly silt loam; few, fine, faint light yellowish-brown (10YR 6/4) mottles; moderate, medium granular and weak, fine platy; friable, loose, slightly plastic, slightly sticky; abrupt, wavy boundary; pH 3.8.
Bfhgj	2 - 4	Strong brown (7.5YR 5/6) gravelly silt loam; few, fine, faint dark yellowish-brown (10YR 4/4) mottles; moderate, medium granular; friable, loose, plastic, slightly sticky, permeable; clear boundary; pH 4.3.
Bfjg	4 - 9	Brownish yellow (10YR 6/6) gravelly loam; common, coarse, prominent yellow (10YR 7/6) and white (2.5Y 8/2) mottles; moderate, coarse granular breaking to weak, medium granular; friable, slightly hard, slightly plastic, slightly sticky; gradual boundary; pH 4.8.
BCg	9 - 22	Yellowish brown (10YR 5/8) gravelly loam; common, medium, prominent yellow (10YR 7/6) and reddish yellow (7.5YR 7/8) mottles; weak, medium granular; friable, slightly hard, slightly plastic, slightly sticky; sometimes more gravelly than other horizons; clear boundary; pH 4.8.
Cg	22 - 32	Light yellowish-brown (2.5Y 6/4) gravelly loam; common, fine, distinct yellow (2.5Y 7/8) and brownish yellow (10YR 6/6) mottles; strong, fine pseudoplaty; firm, slightly plastic, slightly sticky; gradual boundary; pH 4.9.
Cg2	32 - 48	Olive gray (5Y 5/2) gravelly loam; few, fine, distinct yellowish brown (10YR 5/4) mottles; strong, coarse pseudoplaty and subangular blocky; very firm, hard, slightly sticky; diffuse boundary; pH 5.0.
C	48 - 60+	Olive (5Y 5/3) gravelly loam to clay loam; strong, coarse pseudoplaty; hard, dense, plastic, sticky; pH 5.0.

Fig. 28. Holmesville silty variant in foreground with Glassville soil on the hills in the background.

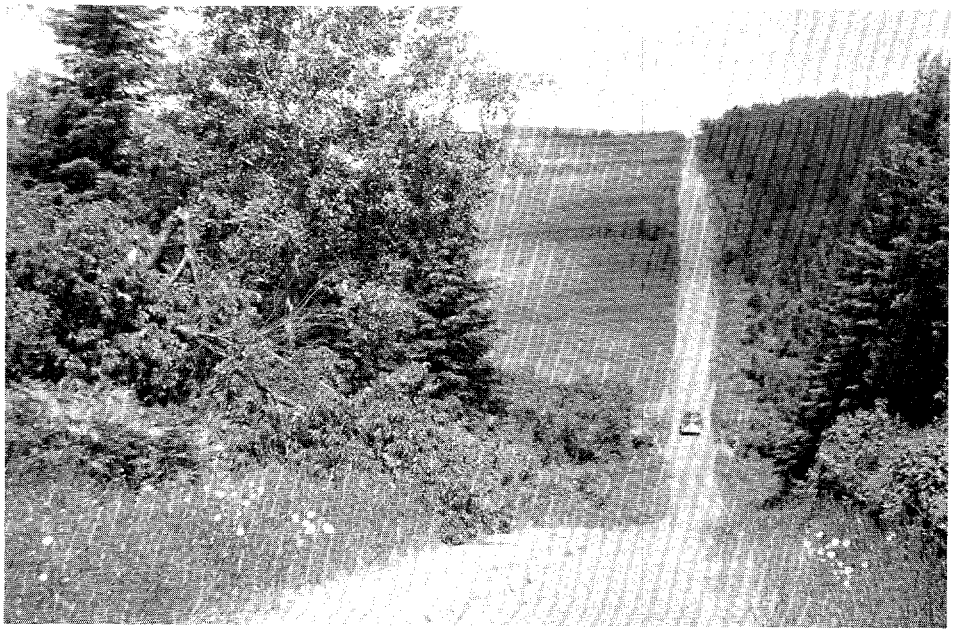

Fig. 29. Holmesville catena showing very poorly drained Poitras in a valley bottom, imperfectly drained Johnville on the lower slope, and a steep phase of Holmesville grading off to the gently undulating phase on the top.

Fig. 30. Pea crop on Victoria soil.

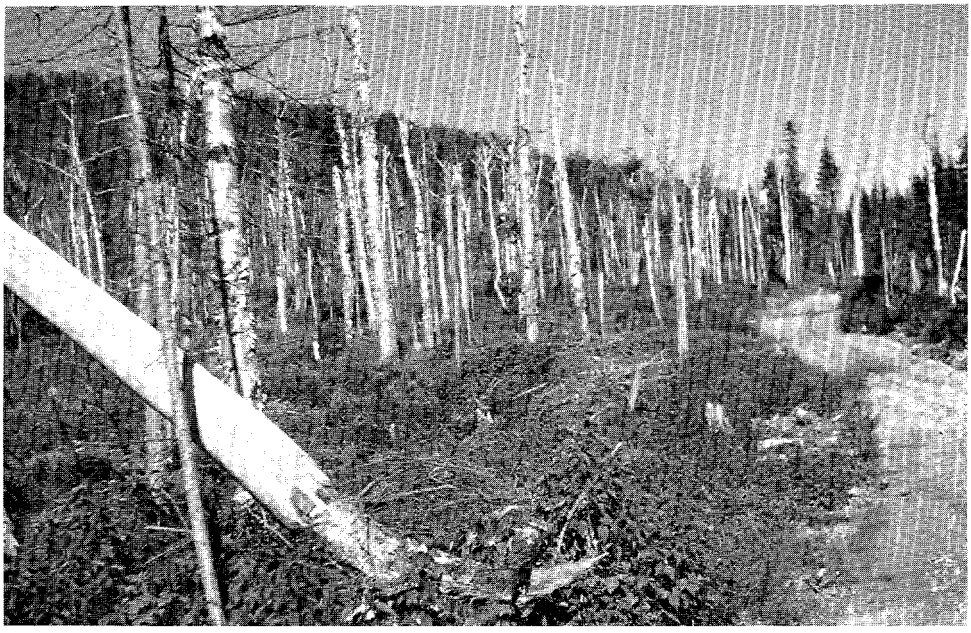

Fig. 31 Results of birch dieback on Victoria soil.

Rock and gravel fragments are quartz, quarzite, sandstone, and some argillite throughout the profile. The silty variant often has more soft shale occurring in it.

Variations. The thickness of the L–H horizon remains about the same under different drainage conditions, but a thin Ah may occur under very moist conditions. An intermittent and thin Bhfgj horizon may occur under the leached layer in the imperfectly drained areas, about a third of the way up the slope. Under poorly drained conditions, the Aegj horizon is mottled and underlain by a Bfg horizon. The colors become less intense as the drainage deteriorates. Texture varies from a sandy loam to a loam in the parent material and to a silt loam in the Aeg horizon. In the silt loam variant (449 acres), the soil contains more silt in the parent material and consequently the whole profile has a finer texture.

The pH of the organic layers may be higher, with the pH of the L horizon 5.6 and the H horizon 4.4. The pH of the mineral horizons may be slightly higher in the solum. The depth of the solum varies from 9 to 29 inches.

Use. Most large areas of these soils have been left in forest. Where they are cleared, they may be used to grow permanent pasture or hay. When they are drained, they may be used for the same crops as the Holmesville soils with as good results, but they may be slightly later in the spring. Approximately 4% are marginal, 58% could be drained with relative ease, and the remainder are nonarable.

Poitras Series (10,710 acres)

The Poitras soils are the very poorly drained members of the Holmesville catena. They occur in the depressional areas and are classified as Orthic Gleysols. The vegetation consists of black spruce, white cedar, speckled alder, balsam fir, running club moss, spinulose wood-fern, goldthread, sphagnum mosses, tree moss, haircap moss, and sedges. The description of a moist virgin profile follows:

Horizon	*Depth inches*	
L	Trace	Leaf litter, mostly moss and twigs; pH 4.2.
F	2 - 1¼	Brown semidecomposed litter and roots, felted; pH 4.2
H	1¼ - 0	Black well-decomposed organic material; moderate, medium granular; pH 4.2.
Aeg	0 - 10	Light gray (10YR 7/1) gravelly loam; many, coarse, prominent very pale brown (10YR 7/4) mottles; amorphous; plastic, slightly sticky; abrupt, smooth to slightly wavy boundary; pH 4.7.
Bg	10 - 22	Light olive gray (5Y 6/2) loam; many, medium, prominent yellowish brown (10YR 5/6) mottles; some of these are concretions 2 to 4 mm; strong, coarse granular; slightly plastic, slightly sticky; clear, wavy boundary; pH 5.5.
Cg	22 - 32	Light olive gray (5Y 6/2) gravelly loam; common, medium, prominent brownish yellow (10YR 6/6) mottles; weak, platy; slightly plastic, slightly sticky; pH 5.4.
Cg2	32 - 42	Light olive gray (5Y 6/2) gravelly loam; few, medium, faint mottles; weak, coarse pseudoplaty; slightly plastic, slightly sticky; pH 5.5.
Cg3	42 - 54	Light olive gray (5Y 6/2) gravelly loam; few, fine, faint mottles; strong, coarse pseudoplaty; hard, compact, slightly plastic, slightly sticky; pH 5.5.

Cg4	54+	Light olive gray (5Y 6/2) sandy loam; few, fine, faint mottles; strong, coarse pseudoplaty; hard, compact, slightly plastic, slightly sticky; pH 5.6.

Variations. The organic horizons may vary from 2 to 6 inches in thickness and rarely to 12 inches. Although no Ah horizon was described, one is often present with a thickness of up to 4 inches and it is a dark brown (7.5YR 3/2) silty loam with strong, medium granular structure. An Ahe horizon is usually present along with the Ah and this varies in thickness from 1 to 7 inches. In the silty variant, the Bg is often absent and an Ahe and Cg type of profile is formed. The texture of the very poorly drained member of the catena may be somewhat finer than that of the well-drained member, especially in the upper horizons. The silt loam variant has more silt in the parent material and consequently the solum is finer textured. The pH is sometimes 6 to 6.4 and is probably caused by larger amounts of $CaCO_3$ in the surrounding bedrock, which influence the amount present in the runoff water from surrounding areas and in the groundwater.

Use. The Poitras soils are generally left in forest, but the trees do not grow very quickly. If cleared, the soils may be used for unimproved pasture. If drained, they may be used for growing grain, hay, and other crops. They will be somewhat late drying and warming up in the spring.

Siegas Catena

The Siegas catena is located in the southwest corner of the mapped area just north of Grand Falls and is associated with the Holmesville and Bellefleur catenas. The Siegas, Salmon, and Bourgoin series are the well-drained, imperfectly to poorly drained, and the very poorly drained catenary members. The Siegas catena has developed on a gravelly clay loam ground moraine derived from gray quartzite, sandstones, argillites, and shales of Silurian age. The parent material is usually calcareous between 3 and 5 ft from the surface. The topography is undulating to rolling with gentle slopes. Several small areas of Carleton catena were mapped in this area, but because it resembles the Siegas catena in many respects, it was included with the Siegas catena. The Siegas catena is generally not very stony.

Siegas Series (7,470 acres)

The Siegas soils have been placed in the Bisequa Gray Wooded (Gray Luvisol) Subgroup. The vegetation consists of balsam fir, spruce, red maple, yellow birch, trembling aspen, speckled alder, bunchberry, fern moss, spinulose wood-fern, aster, and hawkweed. A description of a moderately well drained virgin profile follows:

Horizon	*Depth inches*	
L	Trace	Brown litter; pH 5.4.
F	1 - ½	Brown felted partially decomposed organic matter; pH 5.4.
H	½ - 0	Black well-decomposed slightly greasy organic material; fine granular; pH 5.2.
Ae	0 - 1	Light gray (10YR 7/2) clay loam; moderate, fine platy breaking to moderate, medium granular; firm, plastic, slightly sticky; abrupt, wavy boundary; pH 5.1.
Bfh	1 - 2	Dark reddish brown (2.5YR 3/4) clay loam; strong, fine granular; soft, slightly plastic, slightly sticky; abrupt, broken boundary; pH 4.6.

Bf	2 - 4½	Strong brown (7.5YR 5/6) clay loam; strong, fine granular; friable, loose, plastic, sticky; clear, wavy boundary; pH 4.7.
Ae2	4½ - 7	Grayish brown (10YR 5/2) clay loam; strong, fine granular; friable, plastic, sticky; clear, wavy boundary; pH 5.3.
Bt	7 - 10	Grayish brown (2.5Y 5/2) gravelly clay loam; strong, fine platy breaking to medium granular; firm, plastic, sticky; pH 5.5.
Btgj	10 - 15	Pale olive (5Y 6/3) clay; common, medium, faint pale brown (10YR 7/4) mottles; coarse platy to blocky; very firm, plastic, sticky; common clay films and flows; pH 6.6.
Btg	15 - 36	Light olive brown (2.5Y 5/4) clay loam; common, fine, distinct dark yellowish brown (10YR 5/4) mottles; amorphous to weak subangular blocky; hard, plastic, sticky; common clay films and flows; pH 7.1.
Ckg	36 - 48	Light olive brown (2.5Y 5/4) gravelly loam; common, fine, distinct, light gray (2.5Y 7/2) and yellowish brown (10YR 5/6) mottles; amorphous to pseudoplaty; hard, plastic, slightly sticky; common clay films and flows; strongly effervescent; pH 8.0.
Cg	48 - 62+	Light olive brown (2.5Y 5.4) gravelly loam; common, fine, distinct light yellowish-brown (10YR 5.6) mottles; pseudoplaty; hard, plastic, slightly sticky; clay films are not as common as above; pH 6.3.

Variations. There is a slight variation in the thickness of the organic horizons from 1 to 2 inches. The Ae varies in thickness from 1 to 2 inches and in texture from a clay loam to a silty clay loam. There seems to be little variation in depth to the bottom of the podzol B horizons, 4 to 10 inches. In the analysis given in Table 19 there is an accumulation of clay in the Bfh horizon. Of the three profiles analyzed, this is the only occurrence of this observed. Clay films and flows are common from the top of the Btg to at least 5 ft. The pH increases with depth and usually below 3 ft the pH increases to nearly neutral and usually before 5 ft there are free carbonates. Occasionally, the soil remains weakly acid to depths of 7 or 8 ft. When this soil is plowed, a dark brown plow layer is formed and the horizons down to the Ael disappear.

Use. Very few of these soils are cleared in this area. In other areas where they are cleared and farmed, they have proved satisfactory for growing grain and grasses. They have been used sparingly for growing potatoes. These soils are not as easily cultivated as the other soils of the area because of the shallowness of the solum and slightly impeded drainage. They grow various tree species very well and are suitable for forestry. Approximately 93% of these soils are considered arable. The remainder are marginal.

Salmon Series (1,610 acres)

The Salmon soils are the imperfectly and poorly drained members of the Siegas catena. They have been placed in the Gleyed Gray Wooded (Gray Luvisol) Subgroup. The vegetation consists of red maple, trembling aspen, balsam fir, black ash, tamarack, beaked hazel, spinulose wood-fern, aster, and violet. A description of a moist poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	¼ - 0	Fallen leaves starting to decompose; pH 5.4.

Ah	0 - 3	Very dark gray (5YR 3/1) silt loam; moderate, coarse granular; friable, plastic, slightly sticky; abrupt, smooth boundary; pH 4.8.
Ahe	3 - 6	Grayish brown (10YR 5/2) silt loam; common, fine, faint mottling; weak, fine to medium platy; friable, plastic, slightly sticky; abrupt, smooth boundary; pH 4.8.
Aeg	6 - 11	Gray (5Y 6/1) gritty silt loam; many, coarse, prominent light yellowish brown (10YR 6/4) mottles; weak, fine platy; plastic, slightly sticky; abrupt, smooth boundary; pH 4.8.
ABg	11 - 15	Gray (10YR 6/1) clay loam; many, coarse, prominent light yellowish brown (10YR 6/4) mottles; fine subangular blocky; firm, hard, plastic, slightly sticky; few clay films; clear, smooth boundary; pH 4.8.
Btg	15 - 26	Olive brown (2.5Y 4/4) clay loam; common, fine, distinct light gray (2.5Y 7/0) mottles; weak, medium blocky to amorphous; hard, plastic, sticky; many clay films; pH 4.8.
Btg2	26 - 36	Olive brown (2.5Y 4/4) gravelly clay loam; common, medium, distinct light gray (2.5Y 7/0) mottles; moderate, fine blocky; few clay films; pH 6.4.
Cg	30 - 44	Grayish brown (2.5Y 5/2) gravelly clay loam; common, fine, faint streaky light gray (2.5Y 7/0) and brown (10YR 5/3) mottles; pseudoplaty; hard, plastic, sticky; pH 6.6.

Variations. The organic layers may vary in thickness from ¼ to 3 or more inches. Where earthworms have invaded an area, the organic layer may be only ¼ inch of leaf litter whereas 5 inches of Ah may be present and a grayish brown Ahe. The Aeg may be 5 inches thick as the drainage becomes poorer and the colors of the profile become faded. The soil may become neutral at 3 ft and very often has free carbonates between 3 and 4 ft. Sometimes a Bfhg and Bfg horizon are present and the soil is a Gleyed Bisequa Gray Wooded (Gray Luvisol) one. When cultivated a dark brown to black plow layer forms. The sample analyzed was not taken deep enough and the first Bt was taken as the parent material.

Use. Small tracts of these soils have been cleared when they occur in small areas within large areas of well-drained soils. Without drainage, they are only used for growing pasture. They are rather difficult to drain because of the impermeable horizons, but when drained, they may be used for growing hay and grain.

Bourgoin Series (810 acres)

The Bourgoin soils are the very poorly drained members of the Siegas catena. They are classified as Orthic Gleysols. The vegetation consists of white cedar, balsam fir, black spruce, tamarack, trembling aspen, speckled alder, red-osier dogwood, big-leaved aster, goldenrod, sedge, and mosses. A description of a very poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	3½ - 3	Brown needles, twigs, leaves, and moss; pH 5.2.
F	3 - 2	Dark brown semidecomposed organic material; felted; pH 4.8.
H	2 - 0	Black well-decomposed greasy organic material; strong, coarse granular; pH 4.5.
Ah	0 - 1	Dark grayish brown (10YR 4/2) clay loam; strong, coarse granular; friable, loose; very high organic content; pH 4.3.

Ahe	1 - 3	Grayish brown (10YR 5/2) clay; amorphous; plastic, sticky; abrupt, smooth boundary; pH 4.7.
Aeg	3 - 12	Light olive gray (5Y 6/2) clay; common, medium, faint light yellowish brown (2.5Y 6/4) mottles; amorphous; firm, plastic, nonsticky; pH 5.1.
Bg	12 - 16	Light olive brown (2.5Y 5/4) clay loam; many, medium, prominent yellowish brown (10YR 5/4) mottles; amorphous; firm, hard, plastic, nonsticky; pH 5.4.
Cg	16 - 36+	Dark grayish brown (2.5Y 4/2) silty clay; common, fine, distinct yellowish brown (10YR 5/6) mottles; amorphous; hard, plastic; pH 6.2.

Variations. The organic horizons may vary from 3 to 12 inches in thickness. Occasionally a profile with an Ah 3 to 9 inches thick occurs associated with the Poitras soils. The Ahe varies from 1 to 5 inches and Aeg from 3 to 10 inches. The pH is usually over 6 in the parent material and is often 6 or more throughout the profile. The parent material below 3 ft usually effervesces with acid. Occasionally the parent material is acid and will not start increasing in pH until a depth of 5 or 6 ft has been reached.

Use. Very few of these soils have been cleared. They are only suitable for unimproved pasture during the dry summer period. They require intensive drainage before they can be cultivated and are only suitable for growing grass or grain. At present, they are considered nonarable.

Kedgwick Series (390 acres)

The Kedgwick soils are not part of the Siegas catena and occur in the northwestern part of the county. They differ from the Siegas soils in the depth to free carbonates and the nature of the included stones and gravel. They have formed on calcareous, olive clay loam molded tills derived from calcareous shales cut by numerous stringers of calcite. In the nature of the rock materials, they are similar to the Jardine catena with which they are associated along with the Caribou catena and the Harquail soils. The poorly drained soils associated with the Kedgwick series appear to be the same as the poorly drained soils of the Jardine catena. The topography is gently rolling and differs from the Jardine catena, which occurs on smoother topography. The vegetation consists of balsam fir, white spruce, white birch, yellow birch, white cedar, striped maple, sugar maple, mountain ash, bunchberry, creeping snowberry, goldenrod, big-leaved aster, ground pine, and plume moss. Generally these soils are not very stony. The Kedgwick soils have been placed in the Bisequa Gray Wooded (Gray Luvisol) Subgroup. A description of a moist virgin profile is given below:

Horizon	*Depth inches*	
L-H	2 - 0	Brown litter overlying black (5YR 2/1) well-decomposed organic material; pH 4.6.
Ae	0 - 2	White (10YR 8/2) silt loam; moderate, fine platy; friable, firm, plastic, sticky; abrupt, wavy boundary; pH 3.8.
Bf	2 - 3½	Strong brown (7.5YR 5/6) clay loam; strong, medium granular; very friable, loose, plastic, sticky; abrupt, wavy boundary; pH 4.5.

Bf2	3½ - 7½	Yellowish brown (10YR 5/4) clay loam; strong, medium granular; loose, somewhat firmer than Bf horizon, slightly plastic, slightly sticky; some weathered brown shale (ghosts); clear, wavy boundary; pH 4.9.
Bt	7½ - 13	Light olive brown (2.5Y 5/4) clay loam; moderate, coarse granular; firm in situ, plastic, slightly sticky; clear boundary; pH 5.1.
Bt2	13 - 21	Light olive brown (2.5Y 5/4) clay; strong, subangular blocky; firm, hard, plastic, sticky; many clay films and flows; pH 5.3.
Bt3	21 - 36	Olive (5Y 5/3) clay; strong, subangular blocky; firm, hard, plastic, sticky; many clay films and flows; pH 5.3.
Bt4	36 - 48	Olive (5Y 5/3) gravelly clay; amorphous; hard, plastic, sticky; large amounts of shale; pH 6.8.
Ck	48 - 54+	Olive brown (2.5Y 4/4) clay loam; amorphous; plastic, sticky; some calcareous shale and calcite; moderately effervescent; pH 7.2.

Variations. The color of the Ae horizon varies from white to very pale brown and the pH from 3.8 to 4.4. The depth of the podzol profile varies from 7 to 18 inches. The thickness of the Bt also varies. In the profile described above, there are four Bt horizons that have a combined thickness of 40 inches, whereas in other profiles this may be only 6 inches. The most noticeable change is the sudden increase in the pH from about 5.3 to 6.8 in the Bt4 horizon and a further increase in the C.

Use. None of these soils have been cleared in the surveyed area. Most of them would be considered arable except for a few steep slopes. They should respond like the Jardine soils.

Long Lake Catena

The Long Lake catena is found in the northeastern part of the area, northwest of Long and Trouser lakes. It is associated with the Serpentine and Clearwater catenas. The catenary members are the Long Lake, Blue Mountain, and Colter Mountain series. These soils have developed on gravelly sandy loam ground moraine. They are derived primarily from strongly metamorphosed quartzites, slates, and volcanics of Silurian and Devonian age. The topography is strongly rolling to hilly with elevations from about 1,200 to 2,200 ft. The soils are usually stony and bouldery throughout the profile.

Long Lake Series (2,900 acres)

The Long Lake soils are the well-drained members of the Long Lake catena. They are classified as Ferro-Humic Podzols. The vegetation consists of spruce, balsam fir, yellow birch, white birch, striped maple, pin cherry, mountain ash, white pine, common wood-sorrel, spinulose wood-fern, haircap moss, bristly club moss, and bunchberry. A description of a well-drained virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1½	Freshly fallen leaves and moss; pH 4.3.
F	1½ - ½	Very dark brown, fibrous semidecomposed organic material; pH 4.0.
H	½ - 0	Black well-decomposed organic material; strong, fine granular; pH 3.5.
Ae	0 - 1½	Light gray (10YR 7/2) loam; platy breaking to medium granular; slightly plastic, slightly sticky; abrupt, wavy boundary; pH 3.2.

Bhf	1½ - 4	Reddish brown (5YR 4/4) silt loam; fine granular; loose, soft, slightly plastic; abrupt, wavy boundary; pH 4.0.
Bhf2	4 - 11	Strong brown (7.5YR 5/6) silt loam; granular; firm, loose, slightly plastic; diffuse boundary; pH 4.6.
Bfh	11 - 18	Yellowish brown (10YR 5/6) loam; moderate, fine granular; firm, slightly plastic; diffuse boundary; pH 4.8.
BC	18 - 21	Light olive brown (2.5Y 5/4) gravelly silt loam; weak, pseudoplaty; firm in situ, brittle, dense; pH 5.0.
C	21 - 38	Olive (5Y 5/3) gravelly loam; pseudoplaty; firm, hard, slightly plastic, dense; pH 5.1.

Variations. The depth of the organic layers varies from 1 to 5 inches and that of the Ae from 1 to 4 inches. The texture of the solum is much finer than that of the parent material because of weathering. The texture difference between horizons is not as great as it appears because the textures fall in the borderline area between these textural classes. The pH appears to vary very little between profiles. The depth of the solum varies from 18 to 28 inches, but is usually from 20 to 24 inches.

Use. These soils have never been cleared for agricultural use. They are very suitable for growing trees. The only limitations on the use of the soils for agriculture are stoniness and slope. The climate of the region would prevent the growing of all but the hardiest crops. The frost-free period is probably considerably less than 90 days and may be in the vicinity of 60 days.

Blue Mountain Series (720 acres)

The Blue Mountain soils are the imperfectly and poorly drained members of the Long Lake catena. They occur on the seepage slopes and around depressions. The vegetation consists of balsam fir, red maple, speckled alder, willows, wild raisin, interrupted fern, sedges, sensitive fern, and bunchberry. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	10 - 9	Dark reddish brown (5YR 2/2) roots, leaves, and grasses; pH 4.4.
F	9 - 8	Very dusky red (10R 2/2) partially decomposed organic material, somewhat felted; many roots; pH 4.6.
H	8 - 0	Black (10YR 2/1) well-decomposed greasy organic material; amorphous; pH 4.6.
Ahe	0 - 7	Very dark brown (10YR 2/2) gravelly silt loam; weak, medium granular; loose; pockets of Ae material; pH 5.0.
Aegj	7 - 10	Light brownish gray (2.5Y 6/2) gravelly loam; few, fine, faint mottles; weak, medium granular; slightly plastic, nonsticky; pH 5.0.
Aeg	10 - 12	Light gray (2.5Y 7/2) gravelly loam to silt loam; light olive brown (2.5Y 5/4) mottles; amorphous to weak, platy; hard, breaks easily on removal; perched water table on top of this; abrupt boundary; pH 5.0.
Bfg	12 - 22	Yellowish brown (10YR 5/4) gravelly sandy loam; common, medium, distinct light brownish gray (2.5Y 6/2) mottles; amorphous to weak, pseudoplaty; slightly plastic, slightly sticky; clear boundary; pH 4.8.

C	22 - 32+	Light olive brown (2.5Y 5/4) gravelly sandy loam; pseudoplaty; very firm, compact, slightly plastic, slightly sticky; pH 5.2.

Variations. The thickness of the organic material varies from 3 to 10 inches. The Ahe horizon is usually not as deep as this and may be absent if the soil is moderately well drained. The Aeg is often lighter colored and the B horizons are often much better differentiated than in the description given above. The texture of the B and C horizons varies from a gravelly loam to a gravelly sandy loam. No analyses were made on samples of these soils and we assume, from the appearance, that most of them are Gleyed Orthic Humo-Ferric Podzols. Some Gleyed Ferro-Humic Podzol profiles are associated with these soils.

Use. These soils have never been cleared and used for agriculture. They produce moderately good stands of timber and should be used for this purpose. They would be placed in Class 5PW in the soil capability classification for agriculture.

Colter Mountain Series (215 acres)

The Colter Mountain soils are the very poorly drained members of the Long Lake catena. They occur in depressional areas and are classified as the peaty phase, Orthic Gleysols. Tree vegetation consists of black spruce, balsam fir, yellow birch, white birch, and white cedar. The ground vegetation is predominately moss with bunchberry, hepatica, grasses, and sedges. A description of a typical very poorly drained profile follows:

Horizon	*Depth inches*	
L	6 - 5½	Undecomposed moss, needles, and twigs; pH 4.5.
F	5½ - 4	Partly decomposed leaves and moss; pH 4.3.
H	4 - 2	Dark reddish brown (5YR 2/2) well-decomposed greasy humus; pH 4.3.
H2	2 - 0	Black (5YR 2/1) very well decomposed greasy humus; pH 4.5.
Ae	0 - 2	Gray (2.5Y 6/0) very coarse subangular gravel, no fines. The gravel fragments are mostly slate and shales, with some granite; pH 4.5.
Bg	2 - 8	Very dark grayish brown (2.5Y 3/2) silt loam; common, fine, distinct mottles; weak, platy; firm in situ, slightly sticky; clear, smooth boundary; pH 4.6.
BCg	8 - 14	Olive gray (5Y 4/2) fine sandy loam; common, medium, distinct mottles; coarse blocky, platy; firm, slightly sticky; few, medium, subrounded fragments of shale and slate; clear boundary; pH 4.9.
Cg	14+	Olive (5Y 5/3) gravelly sandy loam; many, coarse, prominent mottles; pseudoplaty; firm, slightly sticky; few clay films; pH 5.2.

Variations. The depth of the organic horizons may vary from 6 to 12 inches. An Ah horizon, when present, varies from a trace to 4 to 5 inches. The Ae horizon, which is composed of stones and gravel, may be as much as 10 inches in depth and is found in many of the poorly drained soils of the eastern part of the mapped area. It is called an Ae for want of a better designation. The solum is considerably finer in texture than the Cg and contains fewer gravels. This may be caused by increased

weathering or siltation. The Bg1 has an accumulation of organic matter moved through the Ae horizon and might be considered an Aheg horizon.

Use. These soils have never been cleared and used for agriculture. They should be left in forest because of their stoniness and poor drainage. They are classified as 7PW in the soil capability classification for agriculture.

TUADOOK CATENA

The Tuadook catena is located in the eastern part of the county on the highland between the Tobique and Miramichi watersheds. It is associated with the Juniper, Irving, and Clearwater catenas. The various soils of this catena have developed on a ground moraine derived primarily from granites, basalts, felsites, volcanics, and gneiss. The topography is rolling to hilly. The soils of this catena are generally very stony. The catena consists of the well-drained Tuadook, the imperfectly and poorly drained Redstone, and the very poorly drained Lewis series.

Tuadook Series (4,190 acres)

The Tuadook soils are the well-drained members of the catena. They are classified as Orthic Ferro-Humic Podzols. The vegetation consists of yellow birch, white birch, sugar maple, red maple, striped maple, balsam fir, white spruce, hobblebush, spinulose wood-fern, haircap moss, cucumber root, serviceberry, plume moss, common wood-sorrel, and bunchberry. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	1½ - 1¼	Freshly fallen leaves, litter, and needles; pH 4.3.
F	1¼ - ½	Dark brown semidecomposed organic material; pH 4.4.
H	½ - 0	Black well-decomposed organic material; fine granular; pH 3.7.
Ae	0 - 2	White (10YR 8/1) gravelly loam; moderate, medium platy; firm, slightly hard, nonplastic, nonsticky; abrupt, wavy boundary; pH 3.6.
Bhf	2 - 4½	Reddish brown (5YR 4/4) gravelly loam to gravelly silt loam; fine granular; loose, slightly plastic, slightly sticky; clear, wavy boundary; pH 4.1.
Bhf2	4½ - 7	Strong brown (7.5YR 5/6) silt loam; moderate, fine granular; loose, slightly plastic, slightly sticky; wavy boundary; pH 4.6.
Bfh	7 - 9	Strong brown (7.5YR 5/6) loam; moderate, fine granular; loose, slightly plastic, slightly sticky; wavy boundary; pH 5.0.
Bf	9 - 14	Yellowish brown (10YR 5/6) gravelly loam; moderate, fine granular; firm in situ, friable, slightly plastic, slightly sticky; gradual, smooth boundary; pH 5.0.
BC	14 - 24	Brown (10YR 5/3) loam; moderate, medium granular to subangular blocky; firm, slightly hard, slightly plastic, slightly sticky; gradual, smooth boundary; pH 5.1.
C	24 - 36	Brown (10YR 5/3) gravelly silt loam; weak, medium pseudoplaty breaks to granular; firm, hard, slightly plastic, nonsticky; smooth boundary; pH 5.2.
Cgj	36 - 48+	Light grayish brown (10YR 6/2) gravelly gritty silt loam; common, medium, dark yellowish brown (10YR 4/4) mottles; coarse pseudoplaty; very firm, very hard, slightly plastic, slightly sticky; pH 5.0.

Variations. There are only slight variations in the depths of the organic horizons. The Ae horizon varies from 1 to 3 inches in thickness and the greatest variation is in the Bhf horizon, which varies in thickness from 2 to 6 inches. A Bh horizon occasionally occurs along with the Bhf and Bhfc horizons. They may have a combined depth of up to 14 inches and a Bfhc may occur below this. Because of the light colors in the B horizons, this soil was thought to be an Orthic Humo-Ferric Podzol and only the very dark soils were mapped as Orthic Ferro-Humic Podzols in the field. The thickness of the solum varies greatly and in some places is up to 40 inches. This may be caused by down hill creep or the solum may have been formed on ablation material and here a thicker solum can develop.

The texture varies from a gravelly sandy loam to a gravelly silt loam, but the actual percentage of variation of the primary particles is not more than 5% to 10%. There is only a slight variation in pH. Stoniness varies from 3 to 5 and there are occasional small areas of 2. The till is thin and rock outcrops occur frequently.

Use. These soils have never been cleared and are used exclusively for growing forest. They should be left in forest. They are limited for agricultural use by their stoniness and the climate and are classed as 7P.

Redstone Series (890 acres)

The Redstone soils are the imperfectly to poorly drained members of the Tuadook catena. They occur on the seepage slopes and depressional areas associated with the Tuadook catena. The vegetation consists of balsam fir, white and yellow birch, white spruce, aster, dwarf raspberry, spinulose wood-fern, beaked moss, bunchberry, and sedges. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2½	Brown leaves, twigs, and moss; pH 4.4.
F	2½ - 2	Very dusky red (2.5YR 2/2) semidecomposed litter; fibrous; pH 4.6.
H	2 - 0	Black (2.5YR 2/0) well-decomposed slightly greasy organic material; moderate, medium granular; stony; pH 4.2.
Ahegj	0 - 6	Grayish brown (10YR 5/2) gravelly and stony silt loam; many, medium, faint dark brown (7.5YR 4/2) mottles; weak, platy breaking to moderate, medium granular; friable, plastic, slightly sticky; clear, wavy boundary; pH 4.6.
Bfgj	6 - 13	Yellowish brown (10YR 5/6) gravelly and stony loam; common, medium, distinct dark yellowish brown (10YR 4/4) mottles; moderate, medium granular; friable, slightly plastic, nonsticky; pH 4.6.
Bfgj2	13 - 23	Brown (10YR 5/3) loam; many, medium, distinct dark brown (7.5YR 4/4) mottles; strong, fine pseudoplaty; slightly plastic, nonsticky; pH 4.6.
Cgj	23+	Dark yellowish brown (10YR 4/4) gravelly loam; common, fine, faint yellowish brown (10YR 5/6) mottles; weak, pseudoplaty; compact, hard, nonplastic, nonsticky; pH 4.6.

Variations. The depth of the organic horizons varies from 2 to 4 inches. An Aeg horizon of from 2 to 4 inches is often present and the Aheg horizon may occasionally be absent or be only 1 or 2 inches in thickness. A thin Ah horizon is sometimes present. Where the drainage is better, a Bfhg horizon takes the place of

the upper Bfgj horizon. A Gleyed Ferro-Humic Podzol profile does occur. It may have a Bhfg horizon between 4 and 7 inches thick. Usually this horizon is followed by a weakly cemented Bfhcg horizon, which is often 10 inches thick. This profile usually occurs half way down a north-facing slope.

Use. These soils have never been used for agriculture. They are growing good stands of merchantable timber and should be used for this purpose only. The principal limitations are stoniness and wetness.

Lewis Series

The Lewis soils are the very poorly drained members of the Tuadook catena. They occur in the depressional areas and often grade into organic soils. Although none of these soils were mapped, they occur mixed with the other two catenary members. The vegetation consists of black spruce, balsam fir, speckled alder, blueberry, bunchberry, fern moss, creeping snowberry, hobblebush, and goldthread. They are classified as Orthic Gleysols. A description of a typical wet virgin profile follows:

Horizon	*Depth inches*	
L	Trace	Freshly fallen leaves; pH 4.6.
F	5 - 3½	Dark reddish brown, matted, fibrous, semidecomposed organic matter; pH 4.0.
H	3½ - 0	Black partly decomposed slightly greasy organic matter; non-sticky; pH 3.8.
Aeg	0 - 12	Light gray (10YR 7/1) gravelly loam; common, medium, distinct pale brown (10YR 6/3) mottles; weak, medium granular; very stony; the fines are slightly plastic, nonsticky; clear boundary; pH 5.2.
Bg	12 - 18	Pale brown (10YR 6/3) loam; many, medium, distinct dark brown (10YR 4/3) mottles; weak, granular to structureless; slightly plastic, slightly sticky; pH 5.2.
Cg	18 - 28	Olive (5Y 5/3) gravelly sandy loam; many, medium, distinct dark brown (10YR 4/3) mottles; weak, pseudoplaty; compact; pH 5.2.
Cg2	28 - 35+	Light olive brown (2.5Y 5/4) gravelly loam; many, medium, distinct dark brown (10YR 4/3) mottles; pseudoplaty; compact, plastic, nonsticky; pH 5.2.

Variations. The depth of the organic horizons varies from about 3 to 12 inches and grades into a shallow peat. Where 6 inches of organic material has accumulated, the soil must be classified as a peaty phase, Orthic Gleysol. An Ah horizon is sometimes present, but usually is less than 3 inches thick. The texture varies from a gravelly sandy loam to a gravelly loam. The profile is usually very stony and a layer of stones and cobbles without fines often appears above the Aeg horizon, which is of varying thickness.

Use. These soils have never been used for agriculture. Trees grow slowly on them, but their best use is for forestry. If the water table could be lowered slightly, tree growth would problably improve.

Kingsclear Catena

The Kingsclear catena is found in the Tobique Valley as far north as Blue

Mountain Bend and extends around the base of the Blue Mountains to Stewart Brook. It is associated with the Parleeville catena and the Tobique, Riley Brook, Gulquac, and Kennebecasis series. It has formed from ground moraine derived primarily from red weakly calcareous shales and mudstones of Mississippian age. The topography is undulating to gently rolling. The catena consists of the well to moderately well drained Kingsclear, the imperfect to poorly drained Plaster Rock, and the very poorly drained Nackawic series.

Kingsclear Series (3,300 acres)

The Kingsclear soils are the well-drained to moderately well drained members of the catena of the same name. The vegetation consists of balsam fir, white spruce, red maple, trembling aspen, striped maple, white cedar, dwarf raspberry, bunchberry, creeping snowberry, bracken fern, and wintergreen. The soils have been placed in the Orthic Gray Wooded (Gray Luvisol) Subgroup. A description of a typical virgin profile follows:

Horizon	*Depth inches*	
L	1¼ - 1	Brown leaves, needles, and twigs, pH 5.8.
F	1 - ¾	Brown semidecomposed leaves; slightly matted; pH 5.0.
H	¾ - 0	Black well-decomposed slightly greasy organic matter; weak, granular; slightly matted; pH 3.8.
Ae	0 - 2	Pale red (10R 6/4) silt loam; weak, coarse platy breaking to strong, medium granular; firm, plastic, slightly sticky; abrupt boundary; pH 3.8.
AB	2 - 6	Reddish brown (2.5YR 5/4) silt loam; weak, platy breaking to medium granular; firm, plastic, slightly sticky; clear boundary; pH 4.8.
Bt	6 - 11	Weak red (10R 5/4) silty clay loam; moderate, medium blocky to moderate, fine blocky; firm, hard, plastic, sticky; clay films on peds; pH 4.8.
Bt2	11 - 24	Weak red (10R 4/4) clay loam; strong, coarse blocky; hard, plastic, sticky; common clay films and flows; clear boundary; pH 5.0.
C	24 - 36	Red (10R 4/6) clay loam; strong, medium and fine subangular blocky; plastic, slightly sticky; abrupt boundary; pH 5.2.
Ck	36 - 54	Red (10R 4/6) silty clay loam; strong, medium pseudoplaty; firm, hard, plastic, slightly sticky; weakly effervescent; pH 7.4.

Variations. There is some variation in the organic horizons, which are 1 to 3 inches in depth. The Ae varies from 1 to 3 inches in thickness and from a loam to a silt loam in texture. There is a definite increase in clay content below the upper B or AB horizon. The blocky structure is very pronounced. Free carbonates are usually present at a depth of 36 inches and always at greater depths. They are often present at 24 inches or less. These changes in the depths at which free carbonates occur sometimes take place over short horizontal distances of 4 or 5 ft. These variations in the depth to free carbonates and the discontinuous Bf horizons make these soils difficult to classify. Some of them belong to the Bisequa Gray Wooded (Gray Luvisol)Subgroup and others to the Orthic Gray Wooded (Gray Luvisol)Subgroup. The texture may vary to a clay in the parent material.

Use. These soils have been cleared in some areas and used for agriculture. They are suitable for growing grain and hay crops, but are not suitable for intertilled

crops because of their high clay content, which makes them difficult to manage for these crops. These soils are classified as 3s. They have the advantage of being nearly free from stones.

Plaster Rock Series (480 acres)

The Plaster Rock soils are the imperfectly and poorly drained members of the Kingsclear catena. They are found on seepage slopes, and level and depressional areas where surface drainage is slow. The vegetation consists of tamarack, black spruce, balsam fir, white cedar, gray birch, speckled alder, balsam poplar, red maple, American elm, bunchberry, wintergreen, and sheep laurel. The Plaster Rock clay loam is a Gleyed Gray Wooded (Gray Luvisol) soil. A description of a moist, undisturbed profile follows:

Horizon	*Depth inches*	
L	3 - 2½	Brown undecomposed needles, twigs, branches, cones, lichen (caribou moss), and sphagnum; pH 5.8.
F	2½ - 1	Black semidecomposed fibrous and matted organic matter with white filaments and undecomposed roots and branches; abrupt boundary; pH 5.0.
H	1 - 0	Black well-decomposed greasy organic matter; weak, granular; sticky; abrupt boundary; pH 4.0.
Ah	0 - 1	Dusky red (2.5YR 3/2) loam; specks of weak red granules, strong, granular; very hard when dry; clear boundary; pH 4.2.
Aeg	1 - 4	Pinkish white (5YR 8/2) loam; common, medium, prominent reddish yellow (5YR 6/8) mottles; moderate, coarse platy breaking to moderate, fine granular; firm, slowly permeable; common clay films; abrupt boundary; pH 4.2.
ABtgj	4 - 6	Reddish yellow (5YR 7/6) clay loam; common, fine, faint yellowish red (5YR 5/6) mottles; moderate, medium granular; firm, slowly permeable; common clay films; clear boundary; pH 4.2.
Btgj	6 - 8	Reddish brown (5YR 5/4) clay loam; common, fine, faint reddish yellow (5YR 6/6) mottles; weak, medium granular; firm, hard plastic, sticky; common clay films; clear boundary; pH 4.6.
Btgj2	8 - 11	Reddish brown (2.5YR 4/4) gritty clay; common, fine, faint mottles; strong, coarse subangular blocky when dry, amorphous when wet; plastic, sticky; common clay films; clear boundary; pH 5.0.
Btgj3	11 - 36	Weak red (10R 4/3) gritty clay; few, fine, faint mottles; strong, coarse pseudoplaty breaking to strong, coarse subangular blocky, amorphous when wet; plastic, sticky; common clay films; gradual boundary; pH 6.0.
Ck	36+	Dusky red (10R 3/4) clay loam; strong, coarse pseudoplaty; hard, plastic, sticky, impermeable; black specks of carbonaceous material; moderately effervescent at 91.4 cm (36 inches); few clay films and flows; pH 7.5.

Variations. There is a slight variation in the depth of the organic horizons. An Ah horizon may be present and may range in thickness from 0 to 2 inches. The AB cannot always have the 't' signifying an argillic horizon. The greatest variation is in the pH of the solum and the presence or absence of free carbonates in the parent

material. The free carbonates are probably present in pits that are dug deep enough, but sometimes they do not appear at 5 ft.

Use. Few of these soils are cleared and farmed. They may be used for permanent pasture and, if drained, for grain and grasses. They are classified as 5w and should be left in forest.

Nackawic Series (1,470 acres)

The Nackawic soils are the very poorly drained members of the Kingsclear catena. They occur on level or depressional areas where surface drainage is slow or impeded. The vegetation consists of black spruce, balsam fir, tamarack, speckled alder, and mosses. The soils are Orthic Humic Gleysols. A description of a wet, virgin profile follows:

Horizon	*Depth inches*	
L	6 – 5½	Brown undecomposed needles, sphagnum, branches, twigs, and cones; pH 6.6.
F	5½ – 2	Black semidecomposed fibrous and matted organic matter with white filaments and undecomposed roots, branches, and cones; abrupt boundary; pH 5.6.
H	Trace	Black well-decomposed greasy organic matter; moderate, medium granular; friable, nonplastic, sticky; pH 5.0.
H2	2 – 0	Very dark gray (5YR 3/1) silt loam; high in organic matter; weak, granular; pH 5.6.
Ahe	0 – 6	Dark gray (10YR 4/1) clay loam; lighter in color when rubbed; weak, granular, amorphous when wet; plastic, sticky; gradual boundary; pH 5.7.
Aeg	Trace	Pinkish gray (7.5YR 6/2) clay loam; common, coarse, prominent reddish yellow (7.5YR 6/6) mottles; amorphous; hard, plastic, sticky; few clay films; gradual boundary; pH 5.7.
Bg	6 – 11	Reddish brown (5YR 4/4) clay; common, fine, faint mottles; amorphous; hard, plastic, sticky; clear boundary; pH 6.7.
Ckg	11 – 21	Weak red (10R 4/4) clay loam; few, fine, faint mottles; moderate, coarse pseudoplaty breaking to moderate, coarse subangular blocky; very compact, impermeable, hard, plastic, sticky; common clay films; strongly effervescent; gradual boundary; pH 7.9.
Ckg2	21 – 32	Weak red (10R 4/4) clay loam; coarse pseudoplaty, breaking to moderate, coarse subangular blocky; very firm, hard, plastic, sticky; strongly effervescent; pH 8.1.
Ck	32 – 64+	Dusky red (10R 3/4) clay loam; strong, coarse pseudoplaty; compact, impermeable, firm, plastic, sticky; common clay films; black specks of carbonaceous material; strongly effervescent; pH 8.0.

Variations. The depth of the organic horizons ranges from 3 to 12 inches. The thickness of the Ah horizon varies from 1 to 6 inches and the Ahe varies inversely with it. The depth of the Aeg horizon may vary from 1 to 3 inches. Occasionally the Ckg horizons have enough gravel in them to warrant the term gravelly to describe texture. The variation in pH and the presence of free carbonates is the same as for the other members of the catena.

Use. These soils are very seldom used for agriculture. They must be drained before they can be used and even then are late drying and warming in the spring.

They are drained and farmed when they occur as small areas included in large areas of Kingsclear soils. Except in these cases, they are best left in forest. They are classified as 5w or 7w.

Soils Developed from Water Reworked or Colluvial Materials

Water reworked or colluvial materials are not stratified or only weakly stratified and are sometimes called "dirty gravels." They vary from material that is nearly pure gravel to material that appears to be ground moraine or till. Their origin is somewhat of a mystery. These soils may have been formed when the ice melted and all the material deposited on it was mixed or they may have been caused by weak water action on till, or by colluvial, or periglacial action. Probably all methods of deposition occurred. Four different geological sources have been identified and four catenas have been mapped. These soils usually occupy the sides of the valleys and the valley bottom in some instances.

Victoria Catena

The Victoria catena is found in the western part of the area. It is associated with the Holmesville, Caribou, Violet, and Thibault catenas. It is also associated with the outwash soils, namely, the Muniac and Grand Falls catenas. The parent material is primarily water-reworked till. The material appears to be derived mainly from Silurian shales, sandstones, and quartzites. The topography is undulating to steeply sloping. The catena consists of the rapidly drained to well-drained Victoria, the imperfectly to poorly drained McCluskery, and the very poorly drained Coté series.

Victoria Series (35,570 acres)

The Victoria soils are the well to rapidly drained members of the catena. They are usually found along the sides of valleys. The vegetation consists of spruce, balsam fir, white cedar, white birch, striped maple, mountain maple, honeysuckle, sarsaparilla, bunchberry, common wood-sorrel, plume moss, wild gooseberry, spinulose wood-fern, and haircap moss. The soils are classified as Orthic Humo-Ferric Podzols. Descriptions of two typical virgin profiles follow:

Profile No. 1

Horizon	*Depth inches*	
L	3 - 2½	Leaves, litter, and fallen needles; pH 5.2.
F	2½ - 1½	Dark reddish brown semidecomposed organic matter; felted; pH 4.6.
H	1½ - 0	Black well-decomposed organic material; fine granular; some fibers and roots; pH 4.2.
Ae	0 - 2	Pinkish gray (5YR 6/2) silt loam; weak, medium platy; loose, sticky; wavy boundary; pH 4.0.
Bhf	Trace	Very dusky red (10R 2/2) gravelly loam; strong, granular; loose, friable; broken boundary; pH 4.2.
Bfh	2 - 9	Strong brown (7.5YR 5/6) gravelly loam; strong, fine granular; loose, friable; wavy boundary; pH 4.6.

Bf	9 - 17	Yellowish brown (10YR 5/4) gravelly loam; weak, fine granular; friable; gravel is subangular; wavy boundary; pH 4.8.
Bf2	17 - 23	Yellowish brown (10YR 5/8) silt loam; moderate, fine granular; friable, soft, sticky; very pockety; pH 5.0.
Bf3	23 - 30	Yellowish brown (10YR 5/4) gravelly sandy loam; weak, fine granular and single grain; friable, nonsticky; pH 5.2.
IIC	30 - 42	Light olive brown (2.5Y 5/4) gravelly silt loam; weak, fine granular; friable; pH 5.2.
IIC2	42 - 64+	Olive brown (2.5Y 4/4) gravelly sandy loam; single grain; loose; pH 5.4.

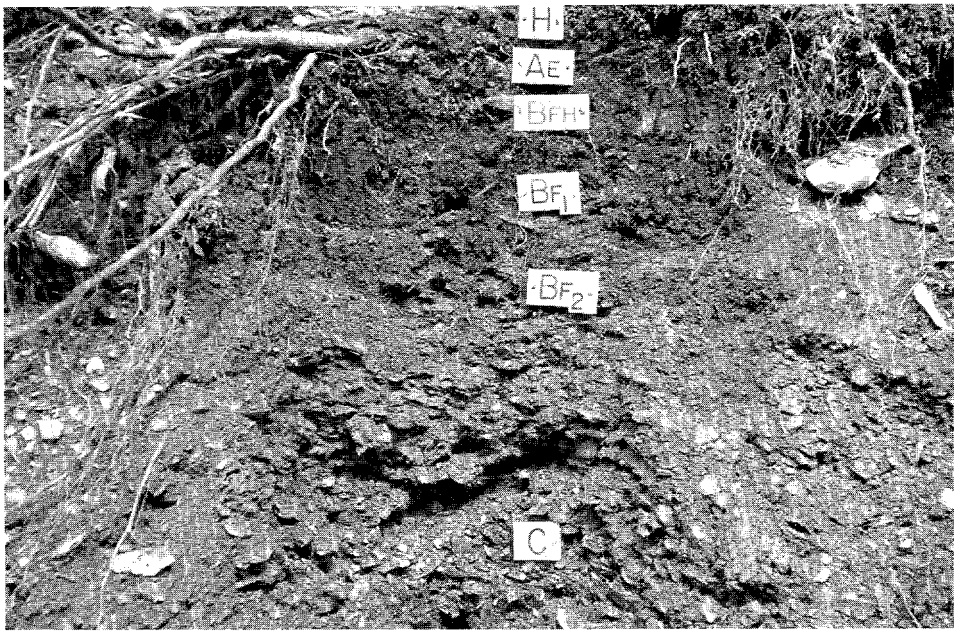

Fig. 32. Orthic Humo-Ferric Podzol, McGee soil.

Profile No. 2

Horizon	*Depth inches*	
L	1 - ¾	Freshly fallen leaves, twigs, and litter; pH 5.0.
F	¾ - ¼	Dark brown semidecomposed organic matter; slightly felted; pH 4.8.
H	¼ - 0	Black well-decomposed organic matter; fine granular; fibrous; pH 4.6.
Ae	0 - 3	Pinkish gray (7.5YR 7/2) silt loam; fine granular; slightly sticky, firm in situ; subangular rock fragments of sandstone and quartzite; wavy boundary; pH 4.6.

Bfh	3 - 4¼	Strong brown (7.5YR 5/8) gravelly silt loam to gravelly loam; granular; loose, very friable, firm in situ; wavy boundary; pH 4.8.
Bf	4½ - 6½	Brownish yellow (10YR 6/6) gravelly loam; strong, granular; rock fragments bigger than in the upper horizon; pH 4.8.
C	6½ - 14½	Olive brown (2.5Y 4/4) gravelly sandy loam; strong, granular; compact, very firm in situ; wavy boundary; pH 5.0.
C2	14½ - 22	Light olive brown (2.5Y 5/4) gravelly sandy silt loam to gravelly sandy loam; strong, granular; pH 5.0.
IIC	22 - 32	Light olive brown (2.5Y 5/4) gravelly clay loam; strong, granular; firm, sticky; common clay films; pH 5.0.
IIC2	32 - 44	Olive brown (2.5Y 4/4) silty clay loam; strong, blocky; plastic, sticky; pH 5.2.
IIIC	44 - 54+	Light olive gray (5Y 6/2) gravelly loam; strong, medium granular breaking to fine granular, compact; pH 5.4.

Rock fragments are sandstone, quartzite, and some slate. The size of the cobbles increases as the profile deepens. Roots penetrate down to 30 inches.

Variations. The variations are well shown by the two descriptions. The Bhf horizon may be nearly 2 inches and occasionally 3 inches in thickness or absent entirely. The Bhf occurs more frequently at higher altitudes. In some cases, notably between the Saint John River and the International Boundary, the gravel is mixed or layered with a compact till. In these cases, the solum is not as deep. The analysis shown in the appendix is for two different profiles.

Use. In the settled areas, these soils are widely used for agriculture. Although no official yields are available for these soils, the yields reported by farmers are excellent for grain, potatoes, peas, and hay. These soils should grow all crops climatically suited to the area. They grow good stands of timber and are good forest soils. These soils are classed as 2F in the soil capability classification for agriculture. Approximately 83% of these soils are considered arable and 10% are considered marginal. The limitations are slope and stoniness.

McCluskey Complex (4,820 acres)

The McCluskey soils are the imperfectly or poorly drained members of the Victoria catena. They are found on the lower seepage slopes and around depressional areas. The vegetation consists of white cedar, speckled alder, spruce (black and white), balsam fir, trembling aspen, mountain maple, white birch, spinulose wood-fern, dwarf raspberry, naked miterwort, tree moss, plume moss, bunchberry, gooseberry, common wood-sorrel, and sedges. The soils are classified as Gleyed Orthic Humo-Ferric Podzols and Gleyed Orthic Dystric Brunisols. A description of a poorly drained virgin profile of a Gleyed Orthic Dystric Brunisol follows:

Horizon	*Depth inches*	
L	¾ - 0	Slightly decomposed litter; pH 4.8.
Ah	0 - 2	Very dark brown (10YR 2/2) silty clay loam; strong, coarse granular due to worm action; some of the Aeg materials can still be seen; very friable, plastic, slightly sticky; abrupt, smooth boundary; pH 5.2.
Bmg	2 - 8	Pale olive (5Y 6/3) silty clay loam; many, coarse, distinct light olive brown (2.5Y 5/4) mottles; amorphous; friable to firm, plastic, sticky; abrupt boundary; pH 5.0.

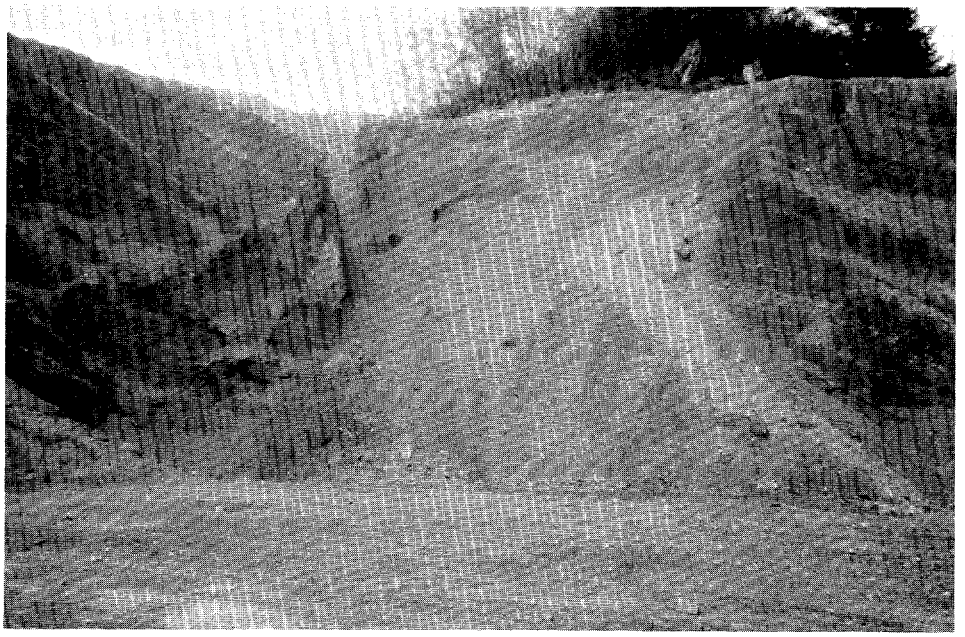

Fig. 33. Muniac gravel in Kame deposit.

Fig. 34. Landscape of Gulquac soil in the foreground. The hills are on the Glassville catena.

IICg	8 - 12	Light olive gray (5Y 6/2) gravelly sandy loam to sandy gravel; few, fine, faint mottles; single grain; slightly plastic, slightly sticky; considerable clay in fines but very few fines; irregular boundary; pH 5.0.
IIICg	12 - 30	Olive gray (5Y 5/2) gravelly clay loam; many, coarse, distinct light olive brown (2.5Y 5/4) mottles; amorphous; firm, plastic, sticky; common clay films and flows; pH 5.2.
IVCg	30 - 36+	Olive gray (5Y 5/2) gravelly sandy loam to sandy gravel; common, fine, distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; single grain; pH 5.4.

Variations. These soils are highly variable in texture within the profile and between profiles because of their mode of origin. The pH readings may vary from those given above to 6.2 to 6.8 in other profiles. An Aeg of 1 to 2 inches is usually present, but in the profile described above it has been destroyed by earthworm action. In the imperfectly drained profiles the B horizon is more pronounced and a Bfhg is common along with one or more Bfg horizons. In these instances, there may be a solum up to 30 inches in depth. The organic horizons may have a thickness of up to 6 inches. Horizons such as the IIICg have some of the characteristics of a Bt horizon, but are considered to be deposited in this form and are not pedogenic in origin.

Use. Where these soils can be drained, they can be used for growing most crops of the region. Ascertain the pH before trying to grow crops that may be injured by a high pH. Generally a good forest cover grows on these soils and they are profitable for forestry. They have been classed as 4w in the soil capability classification for agriculture.

Coté Series (5,260 acres)

The Coté soils are the very poorly drained members of the Victoria catena. They occur in depressional areas and along stream channels. The vegetation consists of speckled alders, willow, balsam fir, black spruce, beaked hazel, spinulose wood-fern, toothed and dotted mnium, northern bedstraw, three-flowered bedstraw, nodding wood grass, and Schreber's moss. The soils are classified as Orthic Humic Gleysols. A description of a very poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	Trace	Leaves and twigs; pH 6.0.
Ah	0 - 8	Dark reddish brown (5YR 2/2) silt loam; moderate, medium granular; soft, nonplastic, nonsticky; high in organic matter; pH 6.6.
Aheg	8 - 17	Dark gray (2.5Y 4/0) gravelly loam; common, fine, distinct greenish gray (5G 6/1) mottles; structureless to weak, platy; slightly plastic, sticky; pH 6.4.
Aeg	17 - 25	Gray (2.5Y 5/0) gravelly loam and gravelly sandy loam; common, distinct greenish gray (5G 6/1) mottles; structureless; slightly plastic, sticky; pH 6.8.
Bg	25 - 30	Olive (5Y 5/3) loamy fine gravel; many, large, prominent strong brown (7.5YR 5/6) mottles; structureless; slightly plastic, slightly sticky; pH 7.0.
C	30 - 36+	Pale olive (5Y 6/3) loamy gravel and gravel; mottles could not be observed because the material was semiliquid on removal from pit; structureless; pH 7.0.

Variations. The variations in texture are similar to those of the other two catenary members. The L, F, and H horizons are usually all present and may vary from 3 to 12 inches in thickness. The pH tends to be higher than in the well-drained member, but it is not always as high as in the profile described above. The high pH is related to the underlying limestone bedrock or to the bedrock in the drainage area. These soils may be classified as peaty phase Orthic Humic Gleysols.

Use. Very few of these soils are cleared and used for agriculture except where they occur as small areas included in larger areas of well-drained soil. They are usually difficult to drain because of their high permanent water tables and poor drainage outlets. These soils are only fair for growing forest and would be classified as 5w in the soil capability classification for agriculture.

McGee Catena

The McGee catena is found in two areas, one in a ridge of hills east of the Stewart Highway and the second in a ridge of hills along the Tobique River. It is associated with the Glassville soils. The catena is formed on colluvial or reworked till material. The parent material is derived mainly from metamorphosed gray slates, argillites, and quartizites. The texture is highly variable within a profile and between profiles because of the mixing action of the method of deposition. The topography is strongly rolling to hilly. The catena is frequently very stony and ledgy.

Fig. 35. Hay, potato, and grain rotation on Holmesville soil with gently undulating topography.

McGee Series (45,210 acres)

The McGee soils are the well to rapidly drained members of the McGee catena. They usually occur on the sides of the hills and extend into the valley bottoms. The vegetation consists of white birch, yellow birch, sugar maple, red and white spruce, balsam fir, trembling aspen, common wood-sorrel, haircap moss, hobblebush, bunchberry, and spinulose wood-fern. These soils are classified as Orthic Ferro-Humic Podzols. A description of a well-drained profile follows:

Horizon	*Depth inches*	
L	3 - 2¾	Freshly fallen leaves, needles, and twigs; pH 4.4.
F	2¾ - 2½	Partially decomposed organic material; fibrous; pH 4.4.
H	2½ - 0	Black well-decomposed somewhat greasy organic material; fine granular; pH 4.2.
Ae	0 - 1	Grayish brown (10YR 5/2) silt loam; strong, granular; firm, sticky; wavy boundary; pH 4.0.
Bhf	1 - 2½	Dark reddish brown (2.5YR 2/4) loam; weak, granular; loose, slightly plastic, slightly sticky; wavy boundary; pH 4.5.
Bhf2	2½ - 4½	Dark reddish brown (2.5YR 2/4) gravelly loam; fine granular; gravel flat to subangular, rock fragments mostly slates; pH 4.5.
Bfh	4½ - 9½	Dark brown (7.5YR 4/4) gravelly loam; granular; gravel flat to subangular; very little fines, gravel, stones, and rock fragments mostly slate; pH 4.5.
Bf	9½ - 22½	Dark grayish brown (2.5Y 4/2) gravelly sandy loam; single grain; gravel flat to subangular, rock fragments mostly slate; pH 4.6.
BC	22½ - 32½	Dark yellowish brown (10YR 4/4) gravelly sandy loam; weak, granular; loose; rock fragments flat to subangular; wavy boundary; pH 4.8.
C	32½ - 38½	Dark grayish brown (2.5Y 4/2) gravelly sandy loam; subangular blocky to pseudoplaty; compact in situ; rock fragments slightly more rounded than in the above horizons; pH 5.0.
IIC	38½ – 47½	Olive brown (2.5Y 4/4) gravelly silt loam; moderate, fine granular; slightly plastic, slightly sticky; rock fragments rounded containing slate and soft shale; pH 5.0.
IIC2	47½ - 53	Light olive brown (2.5Y 5/4) gravelly silt loam; pseudoplaty breaking to granular; slightly compact in situ; rocks predominantly slates; pH 4.8.

Variations. The variations are principally the depths of the organic layers, which vary from 1 to 3 inches, and the depth of the Ae, which varies from 1 to 2 inches. The Bhf sometimes does not meet the organic matter requirement for the soil to be classified as an Orthic Ferro-Humic Podzol. The solum is usually deep, but may be only 15 inches. The texture varies from a gravelly silt loam to a loamy gravel or gravelly sandy loam. The gravels are flat and angular to subangular, and may vary from unsorted to relatively well sorted. The pH is 5.0 to 5.6 in the parent material, and seldom over 6.

Use. Very few of these soils have been cultivated. They are usually somewhat stony and the soils associated with them are usually stony and often steep. If they were cleared and not too stony, they would be fair soils for most crops. They are classified as a 3FM. Approximately 56% of them are considered nonarable and 37% are marginal.

Nason Series (3,440 acres)

The Nason soils are the imperfectly to poorly drained members of the McGee catena. They occur on the lower seepage slopes and around depressional areas. The vegetation consists of red spruce, balsam fir, white birch, mountain maple, bunchberry, and mosses. The soils are classified as Gleyed Mini Humo-Ferric Podzols. A description of a poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2¾	Brown leaf litter and twigs; pH 5.4.
F	2¾ - 2½	Reddish brown semidecomposed organic material; fibrous, matted; pH 5.3.
H	2½ - 0	Reddish black (10R 2/1) well-decomposed greasy organic matter; fine granular; pH 5.3.
Ah	0 - 1	Reddish black (10R 2/1) silt loam; moderate, medium granular; plastic, nonsticky; high organic content; pH 5.4.
Ahe	1 - 2	Very dark gray (5YR 3/1) and very dark grayish brown (10YR 3/2) crushed; loam; moderate, fine granular; friable, slightly plastic; pH 5.4.
Bfhg	2 - 13	Dark grayish brown (10YR 4/2) very gravelly loam; common, medium, faint mottles; moderate, fine granular; friable, slightly plastic; clear, wavy boundary; pH 5.4.
BCg	13 - 26	Light olive brown (2.5Y 5/4) gravelly loam; common, medium, faint mottles; weak, medium granular; friable, loose; pH 5.4.
C	26 - 54	Light olive brown (2.5Y 5/4) very gravelly loam; weak, fine granular in fines; friable, loose; pH 5.4.

Variations. The variation in depth of the organic horizons is from 3 to 6 inches. An Aeg is often present and an Ahe may not be present if the drainage is slightly improved. The Bfhg and Bfg horizons are more distinct and brightly colored in profiles that are slightly better drained. The texture from profile to profile varies considerably, especially in the amount of sand and gravel present.

Use. Very few of these soils have been cleared and used for agriculture. If they were drained and not too stony, they could be used for growing hay, grain, and potatoes. They grow fair to good forest cover. About 80% of these soils are considered marginal.

Trafton Series (4,790 acres)

The Trafton soils are the very poorly drained members of the McGee catena. They occur in depressional areas and along brooks. The vegetation consists of spruce, balsam fir, speckled alder, pin cherry, starflower, bunchberry, dwarf raspberry, spinulose wood-fern, and aster. The soils are classified as Orthic Gleysols or peaty phase Orthic Gleysols, depending on the depth of organic material accumulated on the surface. A description of a peaty phase Orthic Gleysol follows:

Horizon	*Depth inches*	
L	8 - 7	Recent leaf litter; pH 5.0.
F	7 - 5	Semidecomposed fibrous matted organic material; pH 5.0.
H	5 - 0	Black well-decomposed organic material; varies considerably in depth, mixed with Ahe; fine granular; pH 5.0.
Ahe	0 - 2	Very dark gray (10YR 3/1) greasy organic silt loam; irregular boundary; pH 5.2.

Bg	2 - 8	Very dark grayish brown (10YR 3/2) silt loam; many, coarse, prominent yellowish brown (10YR 5/6) mottles; coarse blocky; firm, plastic; very few stones; pH 4.8.
Cgj	8 - 18	Olive brown (2.5Y 4.4) gravelly silt loam; many medium, distinct yellowish brown (10YR 5/6) mottles; weak, coarse blocky; nonplastic, sticky; pH 5.0.
Cgj2	18 - 34	Olive brown (2.5Y 4/4) gravelly sandy loam to silt loam, pockets scattered throughout; common, medium, distinct yellowish brown (10YR 5/6) mottles; pH 4.8.
Cgj3	34+	Same as above except more gravel; fines scattered throughout; pH 4.6.

Variations. The depth of the L, F, and H horizons varies from about 3 to 12 inches and sometimes grades into shallow and deep peat. The Ahe varies from 1 to 3 inches in thickness. The texture of the Cg horizon varies from a gravel to gravelly silt loam and often has pockets of these various materials in the same profile.

Use. These soils are not used for agriculture. If they were drained, they could be used for growing pasture, grass, and grain. They produce a slow-growing cover of commercial trees. They are classed as 5W or 7PW.

Britt Brook Catena

The Britt Brook catena occurs in the area between the Blue Mountains and Long and Trouser lakes. It is associated with the Serpentine and Long Lake catenas. The origin of the parent material is periglacial, colluvial, or water-reworked till. The material is derived from strongly metamorphosed slates, quartzites, and volcanics. The topography is rolling to hilly and these soils usually occur on the lower slopes. They are usually very stony.

Britt Brook Series (11,260 acres)

The Britt Brook soils are the well to rapidly drained members of the catena. They usually occur on the well-drained slopes of the valleys. They are classified as Orthic Ferro-Humic Podzols. The vegetation consists of white spruce, black spruce, balsam fir, red maple, yellow birch, white birch, pin cherry, beaked hazel, bunchberry, creeping snowberry, common wood-sorrel, spinulose wood-fern, *Dicranum fuscescens,* beaked moss, haircap moss, sphagnum, rose twisted-stalk, and yellow clintonia. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2¾	Brown recent litter; pH 4.4.
F	2¾ - 2¼	Dark reddish brown, semidecomposed, felty, fibrous organic material; pH 4.1.
H	2¼ - 0	Top 1 inch is black well-decomposed organic material; weak, granular; many root hairs, some fungi; bottom part is charcoal; pH 3.0.
Ae	0 - 3	Pinkish gray (7.4YR 6/2) silt loam; strong, fine granular; friable, plastic, slightly sticky; abrupt, wavy boundary; pH 3.4.
Bhf	3 - 5½	Dark reddish brown (2.5YR 2/4) silt loam; weak, coarse granular breaking to strong, fine granular; loose, slightly plastic, nonsticky; abrupt, wavy boundary; pH 3.9.

Bhf2	5½ - 8½	Yellowish red (5YR 4/8) gravelly loam; fine granular; loose, slightly plastic, slightly sticky; hard concretions about ½ inch long and ¼ inch thick; clear, wavy boundary; pH 4.8.
Bfh	8½ - 14½	Yellowish red (5YR 4/6) gravelly silt loam; fine granular; loose, nonplastic, nonsticky; clear boundary; pH 5.0.
Bf	14½ - 21½	Dark yellowish brown (10YR 4/4) gravelly loam; strong, fine granular; firm, loose, slightly plastic, slightly sticky; clear boundary; pH 5.1.
Bf2	21½ - 30	Dark yellowish brown (10YR 4/4) gravelly loam; weak, fine subangular blocky; firm, slightly plastic, slightly sticky; pH 5.1.
C	30 - 42	Dark olive brown (10YR 4/3) gravelly loam with pockets of gravelly sandy loam; coarse subangular blocky; hard, plastic, slightly sticky; pH 5.4.
IIC	42 - 54	Dark brown (10YR 5/3) clay loam; blocky; very firm, hard, plastic, very sticky; clear boundary; pH 5.3.

Variations. The organic material on these profiles varies from 2½ to 4 inches in depth. The Ae horizon is 2 to 3 inches in thickness with pockets to 5 inches. A brown AB horizon may be present and a Bhfc that is weakly cemented may also occur. The Bhf varies in depth and may be insufficiently developed for the soil to be classified as an Orthic Ferro-Humic Podzol, in which case, it would be classified as an Orthic Humo-Ferric Podzol. There is sometimes a tendency to compactness and brittleness in the C horizon, depending on the texture of the material and how much gravel is present. This may be residual ground moraine or a fragipan or the result of the movement of silt. Very often layers of loose gravelly sandy loam occur below the clay loam C. These may occur at various depths.

Use. These soils have never been cleared. Where they are not too stony, they could be used to grow the crops climatically suited to the region. Where these soils occur, there is a short frost-free period. These soils grow healthy fast-growing trees and are best left under forest cover. Approximately 95% of these soils are considered nonarable.

Portage Lake Series (3,940 acres)

The Portage Lake soils are the imperfectly and poorly drained members of the Britt Brook catena. They are found on the lower seepage slopes and around depressional areas. The vegetation consists of balsam fir, spruce, white birch, mountain maple, speckled alder, spinulose wood-fern, bunchberry, common wood-sorrel, wild raspberry, and fern moss. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of an imperfectly drained virgin profile follows:

Horizon	*Depth inches*	
L	4 - 3½	Brown litter, some moss; pH 5.4.
F	3½ - 3	Reddish black (10R 2/1) felty semidecomposed litter, considerable mycelium; pH 4.6.
H	3 - 0	Reddish black (10R 2/1) well-decomposed greasy organic material; weak, fine granular; pH 3.8.
Ahe	0 - 4	Dark brown (7.5YR 4/2) gravelly silt loam; pockets of stone with no fines; pH 5.8.

Bfgj	4 - 9	Dark grayish brown (10YR 4/2) stony gravelly silt loam; many, coarse, faint brown (10YR 5/3) mottles; no observable structure; slightly plastic, slightly sticky; clear to gradual boundary; pH 5.8.
Bfgj2	9 - 15	Dark brown (10YR 4/3) gravelly silt loam; common, fine, faint mottles; no observable structure; plastic, slightly sticky; pH 5.8.
Bfgj3	15 - 25	Pale brown (10YR 6/3) gravelly silt loam; many, medim, prominent dark gray (10YR 4/1) mottles; structureless; plastic, slightly sticky; not as gravelly as the above horizon; pH 5.8.
BCgj	25 - 30	Yellowish brown (10YR 5/4) silt loam; many, coarse, faint very pale brown (10YR 7/4) mottles; structureless to amorphous; plastic, slightly sticky; some clay and silt films; pH 5.8.
IICgj	30 - 45	Light olive brown (2.5Y 5/4) gravelly loamy fine sand; common, medium, faint olive (5Y 5/3) mottles; structureless; pH 5.8.

Variations. A distinct Ae 1 to 3 inches in thickness may be present. The colors of the Bfg horizons will be brighter and more distinct if the drainage improves slightly. These Bfg horizons may actually be Bfhg horizons because no analyses were made. A thin Bhfg may be present. The texture varies from a gravel to a silt loam because of deposition. The permeability varies with the texture and structure of the upper horizons.

Use. These soils have never been cleared and are best left in forest. They are usually too stony for economic cultivation. Where the soils are not so stony they would grow grass and grain if they were cleared and drained. The area has a short frost-free period, probably considerably less than 90 days. All these soils are considered to be nonarable.

Babbit Brook Series (1,640 acres)

The Babbit Brook soils are the very poorly drained members of the Britt Brook catena. They are found in the depressional areas and along streams. The vegetation consists of black spruce, balsam fir, white birch, speckled alder, pin cherry, honeysuckle, spinulose wood-fern, bunchberry, horsetail, Solomon's seal, common woodsorrel, and mosses. The soils are classified as Orthic Humic Gleysols. A description of a very poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	4 - 3½	Undecomposed litter and moss; pH 4.6.
F	3½ - 2½	Dark reddish brown fibrous felted partially decomposed organic matter; golden mycelium and root hairs; pH 4.0.
H	2½ - 0	Dark reddish brown to black well-decomposed organic material; weak, medium granular; pH 3.8.
Ahgj	0 - 6	Very dark grayish brown (10YR 3/2) stony gravelly silt loam; many, coarse, faint mottles; weak, fine granular; plastic, slightly sticky; pH 4.8.
Aeg	6 - 18	Dark gray (5Y 4/1) silt loam; many, coarse, faint mottles; amorphous breaking to weak, fine granular; slightly plastic, slightly sticky; pH 5.0.
Bgj	18 - 22	Dark brown (7.5YR 3/2) gravelly loam; many, coarse, faint mottles; structureless when wet; plastic, slightly sticky; pH 4.8.

Cgj	22+	Olive (5Y 5/3) gravelly sandy loam and loam; common, coarse, faint mottles; structureless when wet; friable, slightly plastic, slightly sticky; pH 5.0.

Variations. The depth of the organic horizon may vary from about 4 inches to 12 inches. If the organic horizon is over 6 inches deep, the soil is classified as a peaty phase Orthic Humic Gleysol. The texture varies as it does in the rest of the catena.

Use. These soils are best used for forestry. They support slow growth and are too stony to drain. They would only be suitable for growing grasses. These soils are considered nonarable and most of them would be classed as 7PW.

CLEARWATER CATENA

The Clearwater catena occurs in the eastern part of the area associated with the igneous rocks. It is associated with the Juniper, Irving, and Tuadook catenas. The parent material was deposited as water-reworked till, colluvial material, and a mixing of till by periglacial action. This caused a wide variation of texture between horizons in the same profile and between profiles. The topography is gently undulating to hilly. These soils usually occur on the sides and bottoms of the valleys and are often associated with well-sorted gravels in the lower areas and along the larger stream valleys. Five distinct types of profiles occur on this parent material: Ferro-Humic Podzols, Orthic Humo-Ferric Podzols, Gleyed Orthic Humo-Ferric Podzols, and Orthic Gleysols, or peaty Orthic Gleysols, or both.

Clearwater Series (23,630 acres)

The Clearwater soils are the well-drained members of the catena. They usually occur on the well-drained slopes. The vegetation consists of sugar maple, beech, yellow birch, balsam fir, white spruce, scattered white birch, mountain maple, common wood-sorrel, spinulose wood-fern, raspberry, bunchberry, hobblebush, running club moss, haircap moss, and fern moss. The soils are classified as Orthic Humo-Ferric Podzols. Descriptions of two virgin profiles follow:

Profile No. 1

Horizon	*Depth inches*	
L	1¾ - 1½	Freshly fallen litter; pH 5.0.
F	1½ - 1	Brown semidecomposed felty organic matter; pH 4.4.
H	1 - 0	Black well-decomposed organic matter; granular; pH 3.8.
Ae	0 - 3	Pinkish gray (5YR 7/2) gravelly loam to silt loam; weak, medium granular; friable, loose, slightly plastic, slightly sticky; wavy boundary; pH 4.2.
Bhf	3 - 5	Dark reddish brown (5YR 3/3) silt loam; moderate, medium to fine granular; friable, loose, slightly plastic, slightly sticky; abrupt, wavy boundary; pH 4.4.
Bfh	5 - 21	Red (2.5YR 4/6) gravelly loam to silt loam; loose, plastic, slightly sticky; gradual boundary; pH 5.0.
Bf	21 - 31	Reddish brown (5YR 4/3) gravel to gravelly sandy loam, pockets; loose, nonplastic, nonsticky; pH 5.0.
BCgj	31 - 34	Yellowish brown (10YR 5/4) gravelly very fine sandy loam to silt loam; common, faint to distinct mottles; platy; firm, very hard, brittle; broken boundary; pH 5.4.

C	34+	Brown (7.5YR 4/2) gravelly loam to gravelly sandy loam; friable, subangular gravel; pH 5.4.

Profile No. 2

Horizon	*Depth inches*	
L	Trace - ¼	Leaves and twigs; pH 4.3.
F	2½ - 1½	Brown partly decomposed organic matter; felted; pH 4.3.
H	1½ - 0	Black well-decomposed greasy organic matter; fine granular; pH 4.4.
Bhf	0 - 2	Dark reddish brown (5YR 3/2) silt loam; strong, fine granular; very friable, slightly plastic, slightly sticky; clear, wavy to broken boundary; pH 4.6.
Bfh	2 - 10	Dark reddish brown (5YR 3/4) gravelly loam; strong, fine granular; loose, nonplastic, nonsticky; clear boundary; pH 4.8.
Bf	10 - 27	Dark reddish brown (2.5YR 2/4) gravelly loam; single grain to medium granular; friable, loose, nonplastic except fines, which are slightly plastic; streaks of yellowish brown (10YR 5/4) material that do not seem coated or pieces of compact C moved up; wavy boundary; pH 5.0.
CBj	27 - 34	Olive brown (2.5Y 4/4) very fine sandy loam to sandy loam; common, medium, distinct yellowish brown (10YR 5/4) mottles; weak, pseudoplaty; firm, slightly plastic, slightly sticky; pH 5.2.
Cgj	34 - 41	Olive brown (2.5Y 4/4) stony gravelly sandy loam; common, medium, faint light olive brown (2.5Y 5/4) mottles; moderate, medium pseudoplaty; firm, hard, slightly plastic, slightly sticky; pH 5.4.
C	41 - 52	Olive brown (2.5Y 4/4) gravelly stony sandy loam; pseudoplaty; firm, hard, slightly plastic, slightly sticky; pH 5.4.

Variations. The organic horizons may have a thickness of up to 3 inches. A Bhf horizon is generally present, but varies from a trace to 20 inches thick. These soils are classified as Ferro-Humic Podzols when the Bhf horizons are sufficiently developed to meet the requirements. The Ferro-Humic Podzols were mapped in the field, but were placed in with the Orthic Humo-Ferric Podzols. On telluric sites on slopes, the Ae is sometimes absent as in the second profile description above. The analysis in the appendix indicates that this profile would be classified as a Mini Humo-Ferric Podzol. It is often impossible to separate these soils in this area without chemical analyses because some of the horizons have a high organic content but a light color. The Bfh may be somewhat shallower than indicated, but when this occurs another Bf horizon is usually present. The BCgj horizon has intermittent silt caps formed on the top of rocks. Where there is space between the rocks, the BC horizon does not form. The silt caps are thicker on the middle of the rock and taper off at the edges. The texture and depth of the material are quite variable. Sometimes the loose material is lying directly on the bedrock and at other times it is lying on compact ground moraine, which may be lying on bedrock or on other loose material. The depths to bedrock or compact material many vary from 2 to 3 ft and the thickness of the compact material from less than 1 to 2 or 3 ft. These soils are very stony.

Use. These soils have not been used for agriculture and should not be used for this purpose. They produce a good growth of commercial trees. The limitations for agriculture are stoniness and climate. Approximately 94% are considered nonarable.

Ogilvie Lake Series (8,010 acres)

The Ogilvie Lake soils are the imperfectly and poorly drained members of the catena. They occur on the seepage slopes and around depressional areas. The vegetation consists of sugar maple, yellow birch, white birch, spruce, mountain maple, pin cherry, speckled alder, balsam fir, hobblebush, spinulose wood-fern, sarsaparilla, grasses, raspberry, bunchberry, common wood-sorrel, and running club moss. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	2½ - 2	Undecomposed leaves, needles, and twigs; pH 4.8.
F	2 - 1½	Partially decomposed litter; fibrous; pH 4.8.
H	1½ - 0	Well-decomposed slightly greasy organic matter; granular; loose; pH 4.6.
Ahe	0 - 1	Very dark grayish brown (10YR 3/2) silt loam; moderate, medium granular; firm, sticky; broken boundary; pH 4.6.
Aeg	1 - 2	Gray (10YR 5/1) gravelly sandy loam; common, coarse, faint mottles; weak, platy and weak, fine granular; friable, nonplastic, nonsticky; pH 4.6.
Bfhgj	2 - 8	Dark yellowish brown (10YR 3/4) loam; many, fine, distinct mottles; moderate, medium granular breaking to fine granular; wavy boundary; pH 4.8.
Bfgj	8 - 14	Yellowish brown (10YR 5/6) silt loam; many, fine, distinct mottles; moderate, fine granular; firm, sticky; gravel fragments weathered rounded red and gray granites; wavy boundary; pH 4.8.
BCgj	14 - 24	Olive brown (2.5Y 4/4) gravelly silt loam; many, fine, distinct mottles; moderate, medium granular; firm, slightly sticky; silt caps common on large fragments; wavy boundary; pH 4.8.
Cgj	24 - 33	Dark grayish brown (2.5Y 4/2) gravelly loamy sand; common, medium, distinct mottles; single grain; wavy boundary; pH 4.6.
Cgj2	33 - 40	Dark grayish brown (2.5Y 4/2) gravelly sandy loam; common, fine, distinct mottles; single grain to weak, granular; friable, firm in situ; roots penetrate into this area; pockets of silt with silt caps common on gravel fragments; pH 4.8.
C	40 - 48	Dark yellowish brown (10YR 4/4) loamy gravel; firm in situ; gravel fragments rounded to subangular; common silt caps and pockets of silt scattered through this horizon; pH 4.8.
C2	48+	Dark yellowish brown (10YR 4/4) loamy gravel; firm in situ; some silt caps; pH 5.0.

*Variations.*The thicknesses of the organic horizons vary from 2 to 8 inches. The Aeg horizon is not always present and the Ahe varies from 1 to 3 inches in thickness. A Bhfgj horizon, 1 to 3 inches thick, may be present and Bfgj may replace the Bfhgj horizon. A Bfcg up to 10 inches thick may be present below the Bfg. This is only weakly cemented. There may be Gleyed Ferro-Humic Podzols associated with the Gleyed Orthic Humo-Ferric Podzols. The depth of the solum varies several inches. The texture is very variable because of the mode of deposition. A very noticeable feature is the presence of silt caps on the tops of rocks and gravels indicating a strong movement of silt-size particles in the profile.

Use. These soils have never been used for agricultural purposes. They are too stony to be economically used for anything but permanent pasture. They would require draining before they could be cultivated. These soils grow a good stand of commercial timber.

Yellow Lake Series (3,030 acres)

The Yellow Lake soils are the very poorly drained members of the Clearwater catena. They occur in depressional areas and along streams. The vegetation consists of red maple, black spruce, balsam fir, white birch, mountain ash, speckled alder, raspberry, aster, sphagnum mosses, spinulose wood-fern, and bunchberry. The soils are classified as Orthic Humic Gleysols, peaty phase. A description of a very poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	9 - 8½	Undecomposed litter; pH 5.2.
F	8½ - 6½	Brown partially decomposed felted organic material; pH 4.6.
H	6½ - 0	Black well-decomposed organic material; pH 5.6.
Ah	0 - 3	Black (2.5YR 2/0) silt loam; strong, medium granular; firm, slightly plastic, slightly sticky;. abrupt, smooth boundary; pH 5.6.
Aeg	3 - 13½	Gray (10YR 5/1) gravelly sandy loam to loamy sand; common, coarse, faint mottles; structureless; friable, nonplastic, nonsticky; abrupt, smooth boundary; pH 6.2.
Bgcj	13½ - 20½	Dark yellowish brown (10YR 4/4) gravelly sandy loam to loamy sand; common, coarse, dark reddish brown (10YR 3/3) mottles; weakly cemented, cementing not always present; pH 6.4.
Cgj	20½ - 40	Dark brown (10YR 4/3) gravelly loamy sand; mottles difficult to see because of coarse texture and variety of colors in rock fragments; single grain; loose; pH 6.4.

Variations. There is a slight variation in the thickness of the organic horizons from about 6 to 12 inches. The Ah horizon sometimes exceeds 3 inches. The pH is seldom higher than 6.4 and is more often 5.0 to 5.4 in the parent material. The presence of the weakly cemented Bg horizon is not common. The texture is coarser than in the better-drained soils and may be due to more intensive water reworking in the bottoms of the valleys. Deep layers of stone and coarse gravel often occur just under the L,F, and H horizons. These stone layers may vary in depth from a few inches to several feet. The water table is often in this layer.

Use. These soils are not suitable for agriculture. In the very wet areas they produce a slow-growing stand of black spruce, which becomes mixed with less water-tolerant species on the edges of the areas and on wind-throw mounds created by overturned trees.

Soils Developed from Reworked Glaciolacustrine Materials

Bellefleur Catena

The Bellefleur catena is found in the western part of the surveyed area and is more common in southern Madawaska County. It is associated with the Siegas, Holmesville, and Caribou catenas occurring on the plateau above the Saint John Valley. This catena is developed on reworked glaciolacustrine or ponded material. It is of varying thickness and often is only 3 or 4 ft over a clay till. The till is sometimes calcareous. The topography is undulating to gently rolling. There are three catenary members; the Bellefleur, St. Amand, and Rob, which are described in detail below. The soils are nearly free from stones and have very few small stones and gravels.

Bellefleur Series (550 acres)

The Bellefleur soils are the well to moderately well drained members of the catena. The vegetation consists of trembling aspen, red maple, balsam fir, mountain maple, mountain ash, bracken fern, aster, and ground pine. These soils are classified as Bisequa Gray Wooded (Gray Luvisol) ones. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	Trace	Brown loose leaves and needles.
F	1½ - ¼	Dark brown matted semidecomposed leaves and root hairs; pH 4.8.
H	¼ - 0	Dark reddish brown decomposed organic material; weak, fine granular; pH 3.9.
Ah	Trace	Very dusky red and black (2.5YR 2/2 and 2/0) silt loam; strong, coarse granular; broken boundary; pH 4.2.
Ae	0 - 1½	Light gray (10YR 7/2) silt loam; moderate, medium platy; friable, plastic, slightly sticky; abrupt, wavy boundary; pH 5.0.
Bfh	1½ - 8	Light yellowish brown (10YR 6/5) silt loam; strong, fine granular; very friable, plastic, slightly sticky; clear, wavy boundary; pH 5.0.
Bf	8 - 10	Light yellowish brown (10YR 6/4) silt loam; weak, fine subangular blocky breaking to moderate, fine granular; friable, slightly hard, plastic, slightly sticky; pH 5.2.
BC	10 - 11½	Light yellowish brown (2.5Y 6/4) silt loam to silt; few, weak, faint mottles; fine subangular blocky breaking to very fine subangular blocky; firm, plastic, slightly sticky; pH 5.2.
Btj	11½ - 28	Light olive brown (2.5Y 5/4) clay loam; light olive gray (5Y 6/2) streaks occur either horizontally or vertically along laminations, penetrate peds, and may be slightly lighter in texture; there is more streaking than mottling and the brown is more intense next to these streaks; medium blocky and laminated; firm, plastic, sticky; pH 6.6.

Bt	28 - 48+	Light olive brown (2.5Y 5/4) silty clay loam; streaky light olive gray (5Y 6/2) mottles, not as plentiful as in the horizon above; coarse platy or laminated; very firm, plastic, sticky; very few pebbles; common clay flows; pH 6.6.

Variations. There is little variation in the depth of the solum. The Ah horizon may be absent or may be 1 inch thick. The depth of lacustrine material ranges from 2 to 6 ft and is underlain by a gravelly clay loam till. The pH is usually above 6.0 below the podzol B horizon. The color of the parent material varies from light olive brown to gray brown. One of the samples analyzed was from a different site and the other was from the same site as the profile described, but sampled several feet from where it was described. The variations in texture between the horizons were probably caused by the mode of deposition and not entirely by clay movement.

Use. These soils are cultivated quite extensively and are used primarily for growing hay and grain. Potatoes are also grown, but the soils are slow to dry out and warm up in the spring and this presents problems for early cultivation. They have few stones and this is an important factor in mechanical harvesting. No mature stands of trees were observed on these soils and the areas in forest have been heavily cut. The soils were placed in Class 3 of the soil capability classification for agriculture. Approximately 97% of the soils are considered arable.

St. Amand Series (64 acres)

The St. Amand soils are the imperfectly to poorly drained members of the Bellefleur catena. They are found in areas where the surface drainage is not adequate and around depressional areas and lower slopes. The vegetation consists of balsam fir, white cedar, willow, speckled alder, red-osier dogwood, toothed mnium, Schreber's moss, raspberry, spinulose wood-fern, and flat-topped aster. The soils are classified as Orthic Gleysols. A description of a poorly drained virgin profile follows:

Horizon	*Depth inches*	
L	6 - 5½	Brown litter and moss; pH 4.8.
F	5½ - 4½	Brown partially decomposed organic material; loose; pH 5.0.
H	4½ - 0	Black well-decomposed greasy organic material; strong, granular; pH 6.4.
Aeg	0 - 3	Dark grayish brown (2.5Y 4/2) fine gravelly loam; many, coarse, distinct mottles; weak, medium platy breaking to moderate, medium granular; slightly plastic, slightly sticky; abrupt boundary; pH 5.4.
Bg	3 - 8	Very dark gray (5YR 3/1) silt loam; many, coarse, faint mottles; coarse platy; plastic, slightly sticky; pH 5.4.
Bg2	8 - 10	Dark gray (10YR 4/1) silt loam; many, coarse, faint mottles; coarse laminated, tendency to blocky; plastic , slightly sticky; thin gravel lines between laminations; abrupt boundary; pH 5.0.
Cg	10 - 17	Gray (5Y 6/1) silt loam; many, coarse, prominent light olive brown (2.5Y 5/4) mottles; coarse platy to fine blocky; slightly plastic, slightly sticky; abrupt boundary; pH 4.8.
IICg	17 - 19	Olive (5Y 5/4) coarse sandy loam; common, fine, distinct gray (5Y 5/1) mottles; medium platy; nonplastic, slightly sticky; abrupt boundary; pH 5.2.

Cg2	19 - 28	Gray (5Y 5/1) silty clay loam; common, coarse, prominent olive (5Y 5/3) mottles; laminated, medium blocky; plastic, sticky; some gravels; pH 5.2.
Cg3	28 - 30	Gray (5Y 5/1) silty clay loam; common coarse, prominent brownish yellow (10YR 6/6) mottles; platy; very plastic, sticky; pH 5.4.
IIICg	30 - 52+	Grayish brown (2.5Y 5/2) heavy silt loam; few, fine, faint mottles; weak, platy; plastic, sticky; considerable gravel consisting of 50% weathered soft shale; pH 7.2.

Variations. The organic matter varies from 3 to 5 inches in depth. When the drainage is somewhat better, the colors become brighter and the horizons more distinct. Although the coarse sandy loam IICg horizon was not always present, it was found over a large area and was of uniform thickness. The thickness of the lacustrine material varies from that given above and may be 5 ft or more. The gravel that does occur in the lacustrine material is oriented between the laminae. The IIICg material appears to be a ground moraine similar to the Siegas material.

Use. These soils are used for permanent pasture, or where they occur in small areas mixed with the well-drained Bellefleur they are drained and farmed in the same way. They produce a relatively slow growing forest cover.

Rob Series (24 acres)

The Rob soils are the very poorly drained members of the Bellefleur catena. They occur in depressional areas associated with the Bellefleur and St. Amand soils. The vegetation consists of balsam fir, white cedar, black spruce, speckled alder, red-oiser dogwood, ribbed bog moss, Schreber's moss, flat-topped aster, naked miterwort, spinulose wood-fern, bunchberry, violet, and gooseberry. These soils are classified as peaty phase Rego Humic Gleysols. A description of a very poorly drained virgin profile follows:

Horizon	*Depth inches*	
L-H	8 - 0	Black semiliquid organic material; pH 6.6.
Ahg	0 - 12	Black (5Y 2/1) silt loam; laminated; plastic, slightly sticky; pH 6.6.
Cg	12 - 30	Light gray (2.5Y 7/0) silt loam; many, coarse, distinct light gray (5Y 7/2) mottles and few, medium, distinct strong brown (7.5YR 5/8) mottles; amorphous, some laminae and conchoidal fracture; pH 6.6.

Variations. The variations in depth of the organic material are from 8 to 24 inches where it grades into a peat. The depth of the Ah horizon may vary from 6 to 12 inches and an Ahe may sometimes be present. The pH may be above 7. The underlying ground moraine may be within 2 ft of the surface.

Use. These soils are not suited to agriculture without intensive drainage. If they were drained, they would grow hay or grain. They produce a slow-growing forest cover.

Soils Developed from Outwash Materials

Outwash materials are generally stratified, that is, deposited in layers of varying thickness and texture. Their particles and rock fragments are smooth and rounded. The moisture regime of each soil is governed by the depth of the layer

with the finest texture. Outwash materials in the surveyed area have smoother topography and are less erodible than till soils. The outwash materials are separated, on the basis of their texture, into gravel and sand.

Outwash gravel in the surveyed area occurs in the form of terraces, small plains, and eskers. The terraces and the plains are smooth whereas the eskers are steep sided and winding. Soils on outwash gravel have high permeability and generally lack moisture during the growing season unless they receive seepage water from neighboring hills.

Outwash sands in the surveyed area consist of stone-free, stratified deposits of medium and coarse sand of varying thickness that may contain some lenses of fine gravel. Their topography varies from level to undulating and drainage and erosion may become serious problems. The soils on these deposits are generally productive and respond readily to liming and fertilization. In general, they retain moisture and fertility longer than soils on outwash gravel.

Muniac Catena

The Muniac catena is found along the Tobique, St. John, and Salmon rivers. In this area, it generally occurs in old river terraces. It is confined to the area from which the parent material was derived from calcareous shales and slates, or to areas where the groundwater is high in calcium carbonate. It is associated with the Caribou, Holmesville, Jardine, and Maliseet catenas. It has developed on outwash or glaciofluvial gravels, which are coated with calcium carbonate below the weathered zone. The topography varies from knob and kettle, to eskers or level terraces separated by steep slopes of valley train deposits.

Muniac Series (14,370 acres)

The Muniac soils are the well to rapidly drained members of the catena. The vegetation consists of spruce, balsam fir, white birch, white pine, trembling aspen, red maple, yellow birch, bunchberry, goldenrod, fireweed, raspberry, and running club moss. The soils are classified as Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1¾	Brown undecomposed leaves, needles, mosses, branches, and cones.
F	1¾ - ½	Dark reddish brown semidecomposed matted and foliated organic matter with white and yellow filaments, undecomposed roots, branches, and cones; abrupt boundary; pH 4.7.
H	½ - 0	Black well-decomposed organic matter; strong, granular; friable; abrupt boundary; pH 4.2.
Ae	0 - 3	Light brownish gray (10YR 6/2) gravelly loam; moderate, medium platy; friable, loose; abrupt boundary; pH 4.2.
Bfh	3 - 7	Dark brown (7.5YR 4/4) gravelly sandy loam; moderate, fine granular; friable, loose; clear boundary; pH 4.6.
Bf	7 - 13	Strong brown (7.5YR 5/8) gravelly sandy loam; weak, fine granular; very friable, loose; gradual boundary; pH 4.9.
BC	13 - 20	Brownish yellow (10YR 6/6) very gravelly sandy loam; weak, fine granular; loose; diffuse boundary; pH 5.0.

C	20 – 48	Light olive brown (2.5Y 5/4) loamy gravel or gravelly sandy loam; single grained; loose; clear boundary; pH 5.3.
Ck	48+	Light olive brown (2.5Y 5/4) loamy gravel; single grained; loose; moderately effervescent; pH 7.7.

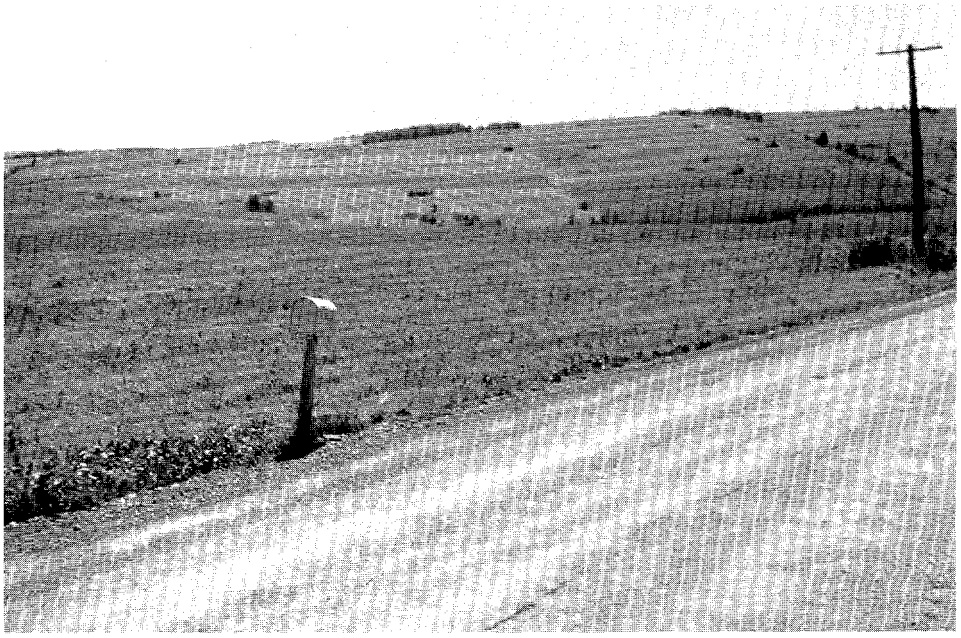

Fig. 36. Farming on rolling topography near Drummond.

Variations. The principal variation is in the depth of the solum, which is from 20 to 30 inches. The pH is variable and although free carbonates are present in all cases at depths below 48 inches, they may be found at 36 inches. The pH may remain below 5.6 to a depth of 4 ft before abruptly rising above pH 7, or it may gradually build up to pH 7.

Use. Where these soils occur in settled areas, they are cleared and farmed. The limiting factors are low water storage and low fertility retention. The soils warm up early in the spring and are excellent for early small fruits, vegetables, and pasture. They are only fair for forestry, but sugar maple and certain other hardwoods may do very well.

Ennishore Complex (4,740 acres)

The Ennishore soils are the imperfectly to poorly drained members of the catena and occur on the edges of depressional areas. The vegetation consists of larch, black spruce, balsam fir, willow, speckled alder, princes's pine, bunchberry, bristly club moss, running club moss, Schreber's moss, and sedges. The soils are classified as Gleyed Sombric Humo-Ferric Podzols and Gleyed Orthic Humo-Ferric

Podzols. A description of an imperfectly drained virgin profile of the Gleyed Sombric Humo-Ferric Podzol Subgroup follows:

Horizon	*Depth inches*	
L	1¼ - ¾	Brown fresh material, needles, and moss; loose; pH 3.8.
F-H	¾ - 0	Black (5YR 2/1) well-decomposed organic material; moderate, fine granular; felted; abrupt boundary; pH 4.4.
Ah	0 - 5	Very dark brown (10YR 2/2) gravelly silt loam; indistinct mottles because of earthworm action; coarse granular; slightly plastic, slightly sticky; pH 4.4.
Aeg	Trace	Light gray (2.5Y 7/2) gravelly silt loam; many, medium to fine, distinct yellowish brown (10YR 5/4) mottles; strong, fine platy; slightly plastic, slightly sticky; broken boundary partially destroyed by earthworms; pH 4.2.
Bfhgj	5 - 11	Strong brown (7.5YR 5/6) gravelly loam to loamy gravel; common, medium, faint reddish brown (5YR 4/4) mottles; weak, fine granular to single grain; friable; gravel 40% to 70% and cobbles 20%; clear boundary; pH 5.0.
Bfgj	11 - 16	Yellowish brown (10YR 5/4) gravel; common, fine, distinct brownish yellow (10YR 6/6) mottles; single grain; loose; cobbles 20% and gravel 70% to 90%; clear boundary; pH 5.0.
Cgj	16 - 36	Olive (5Y 5/3) gravel and loamy fine sand; common, fine, faint brownish yellow (10YR 6/6) mottles; single grain; loose; stones 5%; pH 4.8.
Ck	36+	Olive (5Y 5/3) gravel and loamy sand; single grain; loose; strongly effervescent; pH 7+.

Variations. The organic horizons may be considerably thicker than indicated above. An Ah horizon is caused by earthworm action and if worms are not present, the horizon is not formed. The Aeg may be up to 4 or 5 inches thick. The B horizons may be stronger developed if the drainage is improved, but they are much weaker if the drainage becomes poorer. The Bfhg will disappear and a weak Bfg will be all that is present. This horizon in turn grades into a Bgf with increasing wetness. Where the soils have not been disturbed by earthworms, they are classified as Gleyed Humo-Ferric Podzols.

Use. Only a small area of these soils is cleared for agriculture. It can be used for growing pasture or hay, but must be drained to grow other crops. When this is done, it would have the same use as the Muniac soils. This land is all considered marginal in its present condition.

Cyr Complex (150 acres)

The Cyr soils are the very poorly drained members of the Muniac and Grand Falls catenas. They occur in depressional areas. The vegetation consists of white cedar, tamarack, black spruce, willow, balsam fir, speckled alder, raspberry, crested wood-fern, woodland strawberry, hawkweed, creeping snowberry, and toothed mnium. The soils are classified as Rego Humic Gleysols, peaty phase. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	7 - 6½	Undecomposed leaf litter; pH 7.2.
F	6½ - 4	Brown fibrous material; somewhat raw; pH 6.4.
H	4 - 0	Black fibrous muck; strong, granular; no worms; pH 6.0.
Ah	0 - 7	Dark reddish brown (5YR 3/2) silty gravel; very faint mottles; structureless and some weak, granular; loose, nonplastic, slightly sticky; clear boundary; pH 6.4.
IICg	7 - 16	Light yellowish brown (10YR 6/4) gravelly silty clay loam; many, medium, prominent yellowish red (5YR 4/6) mottles; amorphous; hard, plastic, sticky; pH 6.4.
IIICg	16+	Light olive brown (2.5Y 5/4) gravelly sandy loam and sandy gravel; no mottles clearly seen; structureless; nonplastic, non-sticky; pH 6.6.

Variations. The organic horizons vary in depth from 6 to 12 inches and grade into peat. The pH may be 4.5 to 5.0, especially where the profile is associated with the Grand Falls and Sirois soils. An Aeg may be present when the soil is more acid. The IICg horizon appears to be typical of the very poorly drained position. This may be caused by siltation rather than development. Because of the high water table, the characteristics of the IIICg horizon are hard to observe. These soils show strong effervescence with depth.

Use. These soils are not suitable for agriculture because of the difficulty of draining them. They produce a slow-growing forest cover.

Grand Falls Catena

The Grand Falls catena occurs predominantly north of Grand Falls and is associated with the noncalcareous slates and quartzites. It is associated with the Holmesville, Thibault, and Maliseet catenas. The catena has formed on acid outwash or glaciofluvial gravels and is usually deposited as river terraces or outwash plains. The topography is knob and kettle or sink hole from material deposited on stagnant ice or as level terraces usually separated by steep terrace slopes.

Grand Falls Series (8,710 acres)

The Grand Falls soils are the well to rapidly drained members of the catena. The vegetation consists of spruce, balsam fir, balsam poplar, yellow birch, white birch, pin cherry, haircap moss, plume moss, bunchberry, white birch, spinulose wood-fern, and creeping snowberry. The soils are classified as Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1¾	Twigs, needles, and leaves; pH 4.8.
F	1¾ - 1	Fibrous and matted semidecomposed organic material; pH 4.4
H	1 - 0	Dark brown to dark gray well-decomposed organic matter; granular; pH 4.4.
Ae	0 - 1	Pinkish gray (7.5YR 7/2) sandy loam; pockets to 4 inches; strong, fine granular; irregular boundary; pH 4.0.
Bfh	1 - 7	Strong brown (7.5YR 5/6) gravelly sandy loam; fine granular; friable, slightly hard; wavy boundary; pH 4.6.

Bf	7 - 13	Yellowish brown (10YR 5/8) gravelly sandy loam; fine granular; loose; wavy boundary; pH 4.8.
C	13 - 24	Olive gray (5Y 4/2) sandy gravel; loose; pH 5.0.
C2	24 - 40	Olive gray (5Y 4/2) very fine gravel; pH 5.0.
C3	40+	Light olive brown (2.5Y 5/4) very sandy gravel; pH 5.0.

Variations. The thickness of the L, F, and H horizons varies from 1 to 3 inches. The Ae horizon has a thickness of 1 to 4 inches and in pockets to 6 inches. The depth of the solum varies from 13 to 26 inches. A thin Bhf horizon sometimes occurs, and sometimes at higher elevations a Ferro-Humic Podzol profile develops. The profile analyzed was taken from a different site than the profile described above.

Use. These soils are cleared and used for agriculture in the settled areas. They are used for growing most of the crops suited to the area, but normally the yields are lower than from soils with finer textures. They have a low water-holding capacity and low fertility retention. These soils are used extensively for road metal. Approximately 93% of them are considered marginal and 7% are considered nonarable.

Sirois Series (2,420 acres)

The Sirois soils are the imperfectly to poorly drained members of the Grand Falls catena. They occur on lower slopes and depressional areas. The vegetation consists of larch, black spruce, balsam fir, willow, speckled alder, bunchberry, Schreber's moss, running club moss, and sedges. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	2 1¾	Leaves, needles, and moss; pH 3.8.
F	1¾ - 1	Dark brown to black semidecomposed organic material; felted; pH 4.2.
H	1 - 0	Black (5YR 2/1) well-decomposed greasy organic material; strong, granular; pH 4.2.
Aeg	0 - 4	Light gray (2.5Y 7/2) gravelly silt loam; many, fine, distinct yellowish brown (10YR 5/4) mottles; strong, fine platy; firm, slightly sticky; abrupt, wavy boundary; pH 4.2.
Bfhgj	4 - 13	Brown (10YR 5/3) gravelly sandy loam; many, medium, distinct mottles; weak, fine granular; loose, nonplastic, nonsticky; clear, wavy boundary; pH 4.6.
Bfgj	13 - 18	Yellowish brown (10YR 5/6) gravelly loamy sand; common, fine, distinct brownish yellow (10YR 6/6) mottles; single grain; loose, nonplastic, nonsticky; pH 4.8.
Cgj	18 - 24	Olive gray (5Y 4/2) sandy gravel; common, fine, faint brownish yellow (10YR 6/6) mottles; single grain; loose; pH 5.0.
Cgj2	24 - 38+	Olive gray (5Y 4/2) very fine gravel; common, fine, faint mottles; single grain; loose; pH 5.0.

Variations. The L, F, and H horizons may be up to 6 inches thick. If earthworms are present, an Ah up to 5 inches thick may be formed. The soil would then be classified as a Sombric Humo-Ferric Podzol, but this occurred only occasionally in the area. When this happens, the Aeg disappears and most, if not all, of the organic horizons. The same thing happens when the soils are plowed. With increased wetness, the Bfh disappears and a weak Bfg is the only sign that a B is

present. The depth of the solum varies from about 14 inches to 24 inches. The texture varies similarly to the well-drained members of the catena because of the mode of deposition. These soils differ from the Ennishore soils in not becoming calcareous within a reasonable depth from the surface.

Use. These soils may be used for permanent pasture and hay when cleared. To be used efficiently, they must be drained and then they will grow most of the crops suitable for the region. They are limited by low fertility retention and low water-holding capacity after drainage.

Gagetown Catena

The Gagetown catena is in the eastern part of the area along the Renous Highway. It is associated with the soils formed from the igneous rocks, such as those of the Juniper, Irving, Tuadook, and Clearwater catenas. The Gagetown catena has formed on glacial outwash and glaciofluvial material derived primarily from the igneous and highly metamorphous rocks of the area. The topography is undulating to gently rolling with some knob and kettle depending on the mode of deposition. Where the material was deposited as valley train terraces, the slopes between successive terraces are steep. The soils are usually gravelly loams in the upper solum, but change to well-stratified gravels, sands, and loamy gravels in the parent material. The texture is often stony and cobbly throughout the profile.

Gagetown Series (7,790 acres)

The Gagetown soils are the well to rapidly drained members of the catena. The vegetation consists of balsam fir, spruce, white birch, haircap and fern moss, bunchberry, and common wood-sorrel. The soils are classified as Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	2½ - 2	Freshly fallen litter, leaves, and twigs; pH 5.4.
F	2 - 1	Semidecomposed organic material; fibrous; pH 5.0.
H	1 - 0	Black well-decomposed organic material; strong, granular; pH 4.2.
Ae	0 - 4	Light gray (10YR 7/1) gravelly silt loam; medium to fine granular; soft, slightly plastic, slightly sticky; abrupt, wavy boundary; pH 4.2.
Bfh	4 - 10	Dark reddish brown (5YR 3/4) gravelly loam; weak, fine granular; loose, slightly plastic, slightly sticky; pH 5.4.
Bf	10 - 15	Reddish brown (5YR 4/4) gravelly sandy loam; weak, fine granular; firm, soft, slightly plastic, slightly sticky; pH 5.6.
Bf2	15 - 17	Reddish yellow (5YR 7/6) fine gravel to gravelly loamy sand; single grain; loose; pH 5.6.
BC	17 - 30	Dark yellowish brown (10YR 4/4) gravelly loamy sand to fine gravel; single grain; firm, weakly cemented layers; pH 5.6.
C	30 - 84	Light olive brown (2.5Y 5/4) stratified gravel; coarse to fine, some layers of sand; pH 5.6.

Variations. The principal variation is in the depth of the organic matter, which varies from 1 to 3 inches. The thickness of the solum ranges from 20 to 30 inches. Because of the stratified nature of the parent material, the texture varies widely. The pH does not always reach as high a value as in the description given above.

Use. These soils have not been cleared and used for agriculture in this area. They have been used for agriculture in other areas and are suitable for the production of early vegetables and small fruits. They are limited by their low water-holding capacity and low fertility retention.

Geary Series (4,440 acres)

The Geary soils are the imperfectly to poorly drained members of the Gagetown catena. They are found in depressional or level areas that have impeded drainage or high water tables. The vegetation consists of spruce, balsam fir, gray birch, pin cherry, and mosses. The soils are classified as Gleyed Orthic Humo-Ferric Podzols. A description of an imperfectly drained virgin profile follows:

Horizon	*Depth inches*	
L	2 - 1¾	Brown undecomposed leaf litter, twigs, and needles; pH 4.5.
F	1¾ - 1	Very dark gray (5Y 3/1) semidecomposed organic material; felted; pH 4.0.
H	1 - 0	Dark reddish brown (5YR 2/2) well-decomposed greasy organic matter; strong, medium granular; pH 3.8.
Aeg	0 - 4	White (2.5Y 8/2) gravelly sandy loam; common, medium, distinct mottles; weak, platy to single grain; friable; clear, wavy boundary; pH 4.6.
Bfhgj	4 - 9	Reddish brown (5YR 4/4) gravelly sandy loam; common, medium, distinct mottles; moderate, fine granular; friable; clear, wavy boundary; pH 4.6.
Bfgj	9 - 14	Brown (7.5YR 5/4) gravelly sandy loam; common, coarse, distinct mottles; moderate, fine granular; clear, wavy boundary; pH 4.6.
Bfjgj	14 - 24	Dark brown (7.5YR 4/4) gravelly loamy sand; common, medium, distinct mottles; single grain; very firm, weakly cemented; pH 4.8.
Cgj	24+	Dark brown (7.5YR 4/4) gravelly loamy sand; common, medium, distinct mottles; single grain; loose; pH 4.8.

Variations. As the soils become more poorly drained, the colors become less bright and the mottling more prominent, and the organic horizons increase in thickness to about 6 inches. The Bfjgj horizon may become strongly cemented. Although these soils occurred in the area, they were scattered, of small area, and were not mapped.

Use. These soils are not used for agriculture in the surveyed area. If cleared, they could be used for permanent pasture, and if drained, they could be used for growing hay and grain. They are limited by their low fertility retention and low water-holding capacity after drainage. There is a risk of summer frost in this area especially in the valleys.

Penobsquis Series (1,130 acres)

The Penobsquis soils are the very poorly drained members of the Gagetown catena. They are found in the depressional areas associated with the Gagetown and Geary soils. The vegetation consists of black spruce, white cedar, balsam fir, bunchberry, spinulose wood-fern, twinflower, creeping snowberry, one-flowered pyrola, goldthread, Schreber's moss, and bristly club moss. The soils are classified as Orthic Gleysols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	3 - 2¾	Brown leaves and needles; pH 4.4.
F	2¾ - 2	Reddish black (10R 2/1) semidecomposed organic material; matted; abrupt boundary; pH 5.4.
H	2 - 0	Black (5YR 2/1) well-decomposed greasy organic material; strong, fine granular; abrupt boundary; pH 5.4.
Bg	0 - 10	Pale olive (5Y 6/3) gravelly loam; few, fine, faint mottles; moderate, fine granular; slightly plastic, slightly sticky; gradual boundary; pH 5.4.
Cg	10 - 21	Gray (5Y 6/1) loamy gravel; few, coarse, faint mottles; single grain; loose; gradual boundary; pH 5.4.
Cg2	21 - 32	Dark gray (N4) gravel; faint mottles; single grain; loose; pH 5.4.

Variations. There may be a considerable variation in the depth of the organic accumulation, which may reach a thickness of 12 inches or more. An Ah and an Aeg horizon may be present. In some places, a Bgf horizon may be found, and the soils would be classified as Fera Gleysols. There are the usual variations in texture caused by the mode of deposition. A heavier material is sometimes found at the surface of the mineral soil, probably because of siltation.

Use. These soils have not been used for agriculture and probably should be left in forest. They are often very stony as well as being very poorly drained. They would require drainage before they could be used for agriculture. The soils produce a slow-growing forest, which would probably be improved by drainage. They are considered to be nonarable at the present time.

Gulquac Series (1,420 acres)

The Gulquac soils are found along the Tobique River and its tributaries below Riley Brook. They are associated with the Parleeville, Kingsclear, and Muniac catenas and the Kennebecasis, Tobique, and Riley Brook soils. They have been formed on outwash and glaciofluvial gravels in the form of small plains and valley trains. Some have been formed from red gravels derived from red Mississippian deposits. The topography is usually level terraces with steep slopes between them or eskers and kames.

The drainage is good to excessive. The vegetation consists of white spruce, balsam fir seedlings, red pine, balsam fir, bunchberry, beaked hazel, wild strawberry, wild raisin, and bastard toadflax. These soils are classified as Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	1½ - 1¼	Newly fallen litter; pH 5.0.
F	1¼ - ¾	Brown matted semidecomposed organic matter; pH 4.6.
H	¾ - 0	Dark brown to black well-decomposed organic matter; fine granular; pH 4.6.
Ae	0 - 5	Very pale brown (10YR 7/3) gravelly loam; strong, fine granular; friable, soft; wavy boundary; pH 4.6.
Bfh	5 10	Reddish brown (5YR 4/4) gravelly sandy loam; weak, medium granular; friable, loose; gradual boundary; pH 4.6.
Bf	10 - 18	Reddish brown (5YR 4/3) gravelly sandy loam; weak, granular; loose; gradual boundary; pH 4.8.
C	18+	Weak red (10R 4/3) gravel; loose; gravel stones, well rounded; pH 4.6.

Fig. 37. Certified seed potato field in southern section of the area.

Variations. The depth of organic material varies from 1 to 3 inches. The depths of the individual horizons vary considerably and the thickness of the solum varies from 12 to 20 inches. The color of the parent material masks the colors of the B horizon. The Ae and Bfh horizons may be loams or silt loams.

Use. These soils are farmed quite extensively in the county. They are used for growing potatoes, hay, and grain. They appear to be slightly better than the brown gravels, but are droughty and have low fertility retention.

Maliseet Catena

The Maliseet catena is found along the Saint John, Tobique, and Salmon rivers. It is associated with the Muniac, Holmesville, Caribou, Jardine, Grand Falls, and Interval catenas. The soils have formed on olive brown outwash and alluvial sands derived from shales, argillites, and quartzites. They are usually deposited as river terraces and are level to gently undulating with steep slopes between terraces. They are usually stone-free.

Maliseet Series (4,580 acres)

The Maliseet soils are the well-drained members of the Maliseet catena and are classified as Orthic Humo-Ferric Podzols. The vegetation consists of balsam fir,

spruce, white pine, white birch, trembling aspen, white elm, and white ash. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	1¼ - 1	Brown needles, leaves, and twigs; pH 4.6.
F	1 - ½	Dark reddish brown semidecomposed organic material; felted; pH 4.3.
H	½ - 0	Black well-decomposed organic material; strong, medium granular; pH 3.9.
Ae	0 - 2	Light gray (10YR 7/2) fine sandy loam; weak, fine platy; friable, loose; abrupt, wavy boundary; pH 3.9.
Bfh	2 - 4	Yellowish red (5YR 4/8) sandy loam; strong, fine granular; firm, weakly cemented; abrupt, wavy boundary; pH 4.9.
Bf	4 - 7	Dark brown (7.5YR 4/4) sandy loam; weak, fine granular; friable, loose; clear, wavy boundary; pH 5.4.
BC	7 - 11	Yellowish brown (10YR 5/6) sandy loam; weak, fine granular; friable, loose; pH 5.4.
C	11 - 24	Light olive brown (2.5Y 5/4) sandy loam; weak, granular and single grain; friable, loose; pH 5.9.
C2	24+	Olive gray (5Y 5/2) loamy sand; single grain; friable, loose; pH 5.4.

The C horizon is made up of layers of sandy loam, loamy sand, fine gravel, and silt.

Variations. The L, F, and H horizons vary in thickness from 1 to 3 inches. The Ae varies in thickness from 1 to 4 inches and more in pockets. The depth of the solum varies from 15 to about 30 inches. The texture of the upper solum Ae, Bfh, and Bf, frequently varies and is a loam or a very fine sandy loam whereas lower in the profile, some gravel may appear. The particles of sand vary in size from fine to medium.

Use. In the settled part of the area, these soils are all cleared and used for agriculture. They are used to grow all the crops climatically suited to the area. Generally the texture is fine enough to give them an adequate water-holding capacity and they respond readily to proper fertilizer treatments. They are classed as 2F in the soil capability classification for agriculture. These soils produce good fast-growing stands of timber, but stands of balsam fir seem to deteriorate rapidly after about 50 years.

Wapske Complex (210 acres)

The Wapske soils are the imperfectly to very poorly drained members of the Maliseet catena. They occur in the depressional areas or at the contact of the terraces and the till soils of the higher elevations. The vegetation consists of white cedar, white spruce, black spruce, larch, red maple, white elm, speckled alder, black ash, beaked hazel, moss (*Hylocomium splendens*), and interrupted fern. Two types of profiles are common to the soils mapped as Wapske, a Gleyed Orthic Humo-Ferric Podzol and a Rego Humic Gleysol. Descriptions of these two types of profiles follow:

Horizon	*Depth inches*	
L	3 - 2¾	Brown needles, leaves, and twigs; pH 5.4.
F	2¾ - 1¾	Reddish brown semidecomposed organic material, roots, and mycelium; matted; pH 5.0.
H	1¾ - 0	Black well-decomposed organic material; strong, medium granular; pH 4.0.
Aeg	0 - 3	Light gray (10YR 7/2) fine sandy loam; many, medium, prominent mottles; weak, fine platy; friable; abrupt, wavy boundary; pH 4.2.
Bfg	3 - 11	Yellowish brown (10YR 5/6) fine sandy loam; common, medium, distinct mottles; weak, fine granular; friable, loose; clear, wavy boundary; pH 4.4.
BCg	11 - 24	Light olive brown (2.5Y 5/4) sandy loam; common, medium, distinct mottles; weak, fine granular and single grain; friable, loose; clear, wavy boundary; pH 4.4
Cg	24 - 36	Olive gray (5Y 5/2) loamy sand; common, fine, distinct mottles; single grain; loose; pH 4.8.
C	36+	Olive gray (5Y 5/2) loamy sand; single grain; loose; pH 4.8.

Rego Humic Gleysol

L	Trace	Freshly fallen leaves; pH 7.6.
Ah	0 - 8	Very dark gray (7.5YR 3/0) silt loam; strong, coarse granular; friable, plastic, slightly sticky; abrupt, smooth boundary; pH 7.2.
ACg	8 - 12	Olive gray (5Y 5/2) very fine sandy loam and dark gray (7.5YR 3/0) silt loam; strong, coarse granular (a mixture of Ah and Cg by worm action); friable, slightly plastic, slightly sticky; pH 7.2.
Cg	12 - 40	Olive gray (5Y 4/2) loamy sand; few, coarse, faint olive (5Y 5/4) mottles; single grain; stratified; loose, nonplastic, nonsticky; pH 7.2. The water table was at 21 inches.

Variations. Because the Maliseet catena has only two members, the Wapske Complex includes the imperfectly to very poorly drained members. The first profile described takes care of the imperfectly drained soils, and the second description covers the very poorly drained soils. The soils falling in between these drainage classes have profiles intermediate to these. As the drainage becomes poorer, the soils become duller in color and the number and character of the horizons change. The Bfg horizons may become Bgf and finally no B horizon is present. The pH of the Rego Humic Gleysol may be as low as that in the Gleyed Orthic Humo-Ferric Podzol.

Use. These soils may be used for growing pasture or hay after they are cleared, but require drainage before they can be used for other crops.

Benedict Series (510 acres)

The Benedict soils are not a part of the Maliseet catena and are found along Portage Brook. They are associated with the Serpentine, Long Lake, and Britt Brook catenas. They have formed on alluvial sands that are laminated or varved. In the top 2 ft, there are numerous angular stones, which must have been deposited by ice rafting. The topography is gently undulating. The vegetation consists of balsam fir, red spruce, sphagnum moss, bunchberry, creeping snowberry, spinulose wood-fern,

roundleaf habenaria, and common wood-sorrel. The soils are classified as Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	1½ - 1	Freshly fallen leaves and litter; pH 4.6.
F	1 - ½	Dark grayish brown semidecomposed organic material; felted; pH 4.4.
H	½ - 0	Black well-decomposed slightly greasy organic material; fine granular; pH 3.8.
Ae	0 - 1½	Gray (10YR 6/1) silt loam; weak, fine platy; firm, soft, slightly plastic, nonsticky; abrupt, wavy boundary; pH 3.8.
Bhf	1½ - 2½	Dark reddish brown (2.5YR 3/4) very fine sandy loam to silt loam; weak, fine granular; loose, slightly plastic, nonsticky; abrupt, wavy boundary; pH 4.0.
Bfh	2½ - 4	Yellowish red (5YR 4/6) very fine sandy loam; weak, fine granular; friable, soft, slightly plastic, nonsticky; gradual, wavy boundary; pH 4.6.
Bf	4 - 9	Yellowish brown (10YR 5/6) very fine sandy loam; weak, medium granular; friable, soft, slightly plastic, nonsticky; gradual, wavy boundary; pH 4.6.
BC	9 - 11	Light reddish brown (5YR 6/4) fine sandy loam; weak, medium granular; friable, soft, slightly plastic, nonsticky; gradual, smooth boundary; pH 5.0.
C	11 - 24	Pale olive (5Y 6/3) fine sandy loam; laminated and weak, granular; firm, loose, nonplastic, nonsticky; pH 5.4.
C2	24 - 44	Pale olive (5Y 6/3) fine sandy loam; shows distinct laminations and varves; friable, loose, nonplastic; pH 6.0.

Variations. The thickness of the organic horizons varies from 1 to 4 inches. The thickness of the Bhf horizon varies from a trace to 3 inches and is correspondingly darker. Occasionally they will reach the limits set for an Orthic Ferro-Humic Podzol, but this only occurs in very small areas.

Use. These soils have not been cleared and used for agriculture. They could be cleared and used if required and would grow most plants climatically suited to the area. The area usually has a frost-free period of less than 90 days. The probability of a killing frost in any month is high.

Island Lake Series (1,010 acres)

The Island Lake soils are found along the shore at the east end of Long Lake. Very small areas, too small to map, occur to the south of this. These soils are associated with the Juniper, Irving, Tuadook, and Clearwater catenas. They have been deposited as outwash made up of gravelly coarse sand and rounded cobbles and stones derived from granites. The cobbles and stones occur in pockets or lenses. The topography is gently rolling. The vegetation consists of balsam fir, red spruce, white birch, mountain ash, and haircap moss. The soils are classified as Orthic Humo-Ferric Podzols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	1½ - 1	Brown newly fallen litter; pH 4.2.
F	1 - ½	Dark brown semidecomposed fibrous organic material; pH 4.2.

H	½ - 0	Black well-decomposed organic material; medium granular; pH 3.8.
Ae	0 - 2	Light brownish gray (10YR 6/2) coarse sandy loam; single grain; firm, loose, nonplastic, nonsticky; abrupt, wavy boundary; pH 3.8.
AB	2 - 3	Grayish brown (10YR 5/2) same as above; broken boundary; pH 4.0.
Bhf	3 - 4	Dark reddish brown (2.5YR 2/4) sandy loam; weak, medium granular; friable, nonsticky; abrupt, wavy boundary; pH 4.2.
Bfh	4 - 11	Yellowish red (5YR 4/8) gravelly loamy sand; single grain; loose; clear, wavy boundary; pH 4.6.
Bf	11 - 17	Yellowish red (5YR 5/6) gravelly loamy sand; single grain; loose; gradual, wavy boundary; pH 4.8.
BC	17 - 26	Brown (7.5YR 5/4) gravelly loamy sand; single grain; loose; pH 5.0.
C	26 - 48	Light brown (7.5YR 6/4) gravelly loamy sand; single grain; loose; pH 5.0.

Variations. Only limited observations were made on these soils because of their inaccessible location. The Ae may be up to 5 inches thick and the AB may be absent. The Bhf horizon may be darker in color and somewhat thicker than the one in the profile described above.

Use. These soils have not been cleared for agriculture. They would be droughty, and low in fertility and fertility retention. They are best left in forest. They are generally classed as 5P and 7PT.

Flemming Catena

The Flemming catena is found along the Salmon and Little rivers and their tributaries in the western part of the surveyed area. It is associated with the Maliseet, Muniac, Grand Falls, and Interval catenas. The soils appear to have been deposited as alluvial floodplain terraces that have since been elevated and ceased to flood. They are similar in texture to the present floodplains and are composed of laminated fine sands and silts. The topography is level to gently undulating.

Flemming Series (250 acres)

The Flemming soils are the well-drained members of the catena. They are classified as Degraded Dystric Brunisols. The vegetation consists of white cedar, white spruce, black spruce, white birch, speckled alder, white ash, striped maple, balsam fir, raspberry, aster, ferns, haircap moss, and sphagnum moss. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	5 - 4½	Brown leaves, needles, and twigs; pH 5.4.
F	4½ - 3	Dark reddish brown (2.5YR 2/4) semidecomposed organic material, matted or felted; fibrous with roots and mycelium; pH 4.3.
H	3 - 0	Reddish black (10R 2/1) well-decomposed organic material; strong, medium granular; pH 3.9.
Ae	0 - 1	Light gray (10YR 7/2) silt loam; platy breaking to fine granular; firm; abrupt, wavy boundary; pH 4.3.

Bf	1 - 2	Dark reddish brown (5YR 3/4) silty clay loam; fine granular; friable, soft; abrupt, wavy boundary; pH 4.9.
Bm	2 - 10	Yellowish brown (10YR 5/4) silt loam; strong, fine granular; friable, soft; pockets of light olive brown (2.5Y 5/4); pH 5.4.
Cgj	10 - 19	Light olive brown (2.5Y 5/4) silt loam; faint mottles; moderate, fine granular; pH 5.4.
IIC	19+	Light olive brown (2.5Y 5/4) loamy fine sand; single grain; loose; pH 5.4.

Variations. The organic horizons vary from 1 to 6 inches in thickness. The Ae horizon is seldom more than 1 inch thick except in pockets, but occasionally in very fine sandy loam it has a thickness of 8 inches. The texture of the solum varies from silt loam to very fine sandy loam and the depth to the loamy sand varies from 17 to 30 inches. Sometimes the sand is underlain by gravel.

Use. Most of these soils are cleared and farmed where they occur in settled areas. They grow all the crops that are climatically suited to the area. In some places they can be improved by under drainage. They are classed as 2F.

Martial Series (100 acres)

The Martial soils are the imperfectly and poorly drained members of the Flemming catena. They occur in depressional areas or in seepage areas near the upland. The vegetation consists of balsam fir, black ash, white birch, speckled alder, hop-hornbeam, trembling aspen, gray birch, ferns, and mosses. The soils are classified as Gleyed Eutric Brunisols. A description of a virgin profile follows:

Horizon	*Depth inches*	
L	½ - 0	Leaves, needles, twigs, and moss; pH 6.8.
Ahgj	0 - 4½	Very dark brown (10YR 2/2) silt loam to silty clay loam; few, faint mottles; strong, coarse granular created by worms; friable, plastic, slightly sticky; clear, wavy boundary; pH 6.8.
Bmg	4½ - 10	Brown (10YR 5/3) silt loam; few, fine, faint mottles; weak, medium granular, evidence of lamination; slightly plastic, slightly sticky; clear, wavy boundary; pH 6.4.
Bmg2	10 - 17	Grayish brown (2.5Y 5/2) silt loam; many, medium, distinct mottles; weak, medium granular; laminated; friable, slightly plastic, slightly sticky; pH 6.2.
Cg	17 - 30	Light olive gray (5Y 6/2) silt loam; many, coarse, prominent strong brown (7.5YR 5/6) mottles; structureless, some lamination; firm, slightly plastic, slightly sticky; pH 6.2.
Cg2	30 - 34	Dark gray (5Y 4/1) fine sandy loam; many, medium, distinct strong brown (7.5YR 5/8) mottles; structureless; laminated, firm, slightly plastic, nonsticky; pH 6.2.
IIC	34+	Gravel; pH 6.2.

Variations. The Ah horizon described above may be replaced by F and H horizons of several inches or more in depth, a thin Aeg horizon from 1 to 2 inches in thickness, and a thin Bfgh horizon. The pH of the Ah may be as low as 4, gradually increasing with depth to a pH of 5.6, or it may be as described. The soils are free from stones.

Use. Some of these soils are cleared and drained and have the same land use as the Flemming soils. If they are not drained, they can only be used for growing hay and pasture.

Kelly Series

The Kelly soils are the very poorly drained members of the Flemming catena and occur in the depressional areas. None of these soils have been mapped. They occur in association with the Martial soils. The vegetation consists of balsam fir, trembling aspen, speckled alder, mosses, red-osier dogwood, and fern moss. The soils are classified as Orthic Humic Gleysols. A description of a virgin profile follows:

Horizon	*Depth inches*	
Ah	0 - 4	Black (5YR 2/1) silt loam; strong, medium granular; friable, slightly plastic, slightly sticky; clear, smooth boundary; worms; pH 6.8.
Ah2	4 - 17	Black (5YR 2/1) silt loam; structureless; firm, slightly plastic, slightly sticky; clear, smooth boundary; pH 6.8.
Bg	17 - 25	Dark gray (10YR 4/1) silt loam; many, coarse, prominent pale brown (10YR 6/3) mottles; structureless; firm, slightly plastic, slightly sticky; black material from the horizon above has infiltrated along cracks in this horizon; gradual, smooth boundary; pH 6.8.
Cg	25+	Gray (5Y 6/1) silt loam to very fine sandy loam; many, fine, distinct light yellowish brown (5Y 6/4) mottles; amorphous; firm, slightly plastic, slightly sticky; pH 7.2.

Variations. There is some variation in the depth of the Ah horizons and if worms are not present, L, F, and H horizons may be up to 12 inches thick. The pH may be considerably lower than in the description above and may be 6.0 or lower in the Cg horizon.

Use. Only small areas of these soils have been cleared and farmed. These areas were included with the Martial soils. They must be drained if they are to be used for anything except permanent summer pasture.

Soils Formed from Recent Alluvial Materials

These are immature soils that are actively in the process of being deposited on low terraces and flood plains.

Interval Catena

The Interval catena is found on the low terraces along the Tobique River and its tributaries, the Saint John, Salmon, and Little rivers. The material consists of silts and fine sands deposited by the rivers in flood stage. Increments of soil are added yearly and the time factor is so short that no profile development has taken place.

Interval Series (1,660 acres)

The Interval soils are the well-drained members of the catena. The vegetation consists of various grasses, herbaceous weeds, and occasional elms. The soils are classified as Orthic Regosols. A description of a typical profile follows:

Horizon	*Depth inches*	
Ap	0 - 12	Dark brown (10YR 3/3) silt loam; strong, coarse granular; worms present; pH 6.0.
C	12 - 26	Brown (10YR 5/3) silt loam; weak, fine blocky; friable, slightly plastic, slightly sticky; pH 6.4.
Cgj	26 - 30	Brown (10YR 5/3) silt loam; many, medium, faint strong brown (7.5YR 5/6) and light olive gray (5Y 6/2) mottles; laminated; friable, slightly plastic, slightly sticky; pH 6.6.
Cgj2	30 - 48	Brown (10YR 5/3) silt loam varved with very fine sandy loam; many, fine, faint brownish yellow (10YR 6/6) mottles; laminated and amorphous; plastic, slightly sticky; pH 6.6.

Variations. There are some slight variations in color from one profile to another and in the depth at which mottling occurs. The pH is usually quite uniform within the profile, but varies from about 4.8 to nearly 7 from profile to profile.

Use. These are some of the best agricultural soils of the surveyed area. They are suitable for growing all crops climatically suited to the area. The fertility is somewhat higher than for the other soils and they retain their fertility very well. The chief limitation is the susceptibility to flooding, but this usually occurs in early May and lasts only a few days to a week.

Waasis Series (90 acres)

The Waasis soils are the imperfectly to poorly drained members of the catena and occur in the depressional areas and on the edge of the terraces next to the upland. The vegetation consists of herbaceous plants, aster, and goldenrod. The soils are classified as Gleyed Orthic Regosols. A description of a typical profile follows:

Horizon	*Depth inches*	
Ap	0 - 3	Dark grayish brown (10YR 4/2) silt loam; moderate, medium granular; worms; fibrous sod; firm, plastic, slightly sticky; thin layers of charcoal; smooth boundary; pH 6.8.
Cg	3 - 7	Grayish brown (2.5Y 5/2) silt loam to silty clay loam; many, fine, distinct light yellowish brown (10YR 6/4) mottles; moderate, medium granular to fine blocky; firm, plastic, slightly sticky; pH 6.8.
Cg2	7 - 16	Grayish brown (2.5Y 5/2) silt loam to very fine sandy loam; many, medium, distinct dark yellowish brown (10YR 4/4) mottles; weak, subangular blocky, weak laminations; firm, slightly plastic, nonsticky; pH 6.8.
Cg3	16 - 27	Grayish brown (2.5Y 5/2) silt loam; many, medium, distinct dark yellowish brown (10YR 4/4) mottles; laminated; structureless; very friable, slightly plastic, slightly sticky; pH 6.8.

Cg4	27 - 33	Grayish brown (2.5Y 5/2) silt loam; many, coarse, distinct dark yellowish brown (10YR 4/4) mottles; laminated; structureless; firm, slightly plastic, sticky; common, moderately thick clay films along root channels; pH 6.8.
Cg5	33 - 48+	Grayish brown (2.5Y 5/2) silt loam; many, coarse, distinct dark yellowish brown (10YR 4/4) mottles; laminated; firm, slightly plastic, sticky; few clay films along channels; roots penetrate to bottom; pH 6.8.

Variations. These soils differ from the Interval soils in that the mottling occurs higher in the profile and the color is grayer. They may have a peaty layer on the surface, if they have not been cultivated. The pH may be as low as 4.9 and as high as 7.

Use. These soils are used for pasture and if drained, they will produce the same crops as the Interval soils.

Organic Soils

Organic soils in the mapped area occur in depressions and have more than 12 inches of organic material at the surface. The depth of the organic layer varies considerably and in places reaches 10 ft. The drainage is alwasy very poor.

According to the state of decomposition of the organic layer, the organic soils are classified as peat (almost undecomposed) or muck (well decomposed). The average peat deposits in the surveyed area are twice as deep as the average muck deposits.

Peat (19,890 acres)

Peat soils consist of brown, partly decomposed organic matter. They have been formed from the accumulation of materials from white cedar, stunted black spruce, white birch, balsam fir, tamarack, sphagnum moss, Labrador tea, and sheep-laurel. Most of the peat occurs as small tracts in the eastern half of the mapped area. In the western part of the area, Typic Mesisols occur such as the one described below.

Horizon	*Depth inches*	
OL	0 - 1¾	Very dusky red (10R 2/2, wet) and very dusky red (2.5YR 2/2 pressed and rubbed wet); moss, twigs, and needles; pH 4.35.
Of	1¾ - 12	Reddish black (10R 2/1, wet) and very dusky red (2.5YR 2/2, pressed and rubbed wet); partially decomposed moss and litter; pH 4.20.
Oh	12 - 15	Dusky red (10R¾, wet), dark reddish brown (2.5YR¾, pressed), and very dusky red (2.5YR 2/2, rubbed wet) rotten wood and moss; pH 4.20.
Oh2	15 - 22	Reddish black (10R 2/1, wet), very dusky red (10R 2/2, pressed), and reddish black (10R 2/1, rubbed wet) well-decomposed moss and fine rotten wood; pH 4.20.
Of2	22 - 26	Fairly sound white wood.
Oh3	26 - 47	Reddish black (10R 2/1, wet, pressed, and rubbed) moderately decomposed moss and wood fibers; layers of undecomposed wood at 37 to 38 inches and 47 to 48 inches; pH 4.70.

Oh4	47 - 64	Very dusky red (2.5YR 2/2, wet), reddish black (10R 2/1, pressed), and black (5YR 2/1, rubbed wet) well-decomposed moss and wood; pH 5.70.

The vegetation is more rapid growing than in the southeastern part of the area. The pH is less than 3.8 in the southeastern part and about 6.0 in the western part of the area. These soils are not used for agriculture and their potential productivity is unknown. In other parts of the world, these soils are used intensively for agriculture. They are classified as Fibrisols in the eastern part of the area.

Muck (2,780 acres)

Muck in this area, as a rule, is shallow (1 to 3 ft) and consists of well-decomposed, black organic matter in which plant remains are not identifiable. Some of the muck areas are shallow over peat that occurs at 18 to 24 inches below the surface. Muck is very poorly drained and is usually underlain by gray mineral material, but may also be underlain by marl. A few samples of marls from New Brunswick were analyzed and showed a content of 95% calcium carbonate and 2% magnesium carbonate. Muck is found in low-lying, wet areas and occasionally on hillsides that receive considerable seepage usually with a vegetative cover of cedar. The pH ranges between 5 and 7. The vegetation is made up of white cedar, speckled alder, and some red maple.

Muck soils are generally low in fertility, but are productive when properly managed. They are high in C and N, but deficient in P and K. Furthermore, muck soils have a high exchange capacity with a large buffering effect and their acidity cannot easily be altered. They have a very high moisture-holding capacity. The limiting factors to high productivity are drainage, fertility, and the hazard of early frost. They would generally be classified as Terric Humisols. At the time of mapping the minimum depth for organic soils was 12 inches.

St. Quentin Peat (10,970 acres)

St. Quentin peat occurs in the northwestern section of the surveyed area. It occurs in depressional areas and is associated with the Caribou and Jardine catenas. It is relatively shallow, has a nearly neutral pH, and is classed as a Terric Mesisol. The vegetation consists of balsam fir, white cedar, black spruce, hepatica, sedges, creeping snowberry, and plume moss. A description of a typical profile follows:

Horizon	*Depth inches*	
Of1	0 - 3	Reddish black (10R 2/1, wet), weak red (2.5YR 5/2, pressed), and very dark grayish brown (10YR 3/2, rubbed wet) moss and tree litter; pH 6.30.
Of2	3 - 14	Reddish black (10R 2/1, wet), dusky red (10R 3/2, pressed), and dusky red (10R 3/3, rubbed wet) partially decomposed litter, moss, and dead wood; pH 6.40.
Oh1	14 - 27	Black (2.5YR 2/0, wet), very dusky red (10R 2/2, pressed), and very dusky red (10R 2/2, rubbed wet) well-decomposed moss and wood; pH 6.50.
Oh2	27 - 37	Reddish black (10R 2/1, wet), very dusky red (10R 2/2, pressed), and very dusky red (10R 2/2, rubbed wet) decomposed moss and wood; pH 6.40.

Of3	37 - 46	Dark reddish brown (5YR 3/2, wet), dark brown (7.5YR 3/2, pressed), and dark reddish brown (5YR 3/3, rubbed wet) fibrous slightly decomposed sphagnum moss; pH 6.70.
Oh3	37 - 49	Reddish black (10R 2/1, wet, pressed and rubbed wet) well-decomposed organic matter appears to be colloidal; pH 6.95. It occurs on the opposite side of pit (4 ft) from Of2 horizon and underlies this horizon.
Aeg	49 - 50	Gray (5Y 6/1, dry) and Gray (5Y 5/1, wet) gravelly clay loam; many, medium, distinct mottles; weak, platy to amorphous; firm, hard, plastic, sticky; pH 6.60.
Aeg2	50 - 54	Gray (5Y 6/1, dry) and olive gray (5Y 5/2, wet) gravelly clay loam; many, medium, distinct mottles; weak, platy to amorphous; firm, hard, plastic, sticky; pH 6.40.
Cgl	54 - 57	Light olive gray (5Y 6/2, dry) and olive gray (5Y 5/2, wet) gravelly clay loam; many, coarse, distinct mottles; weak, subangular blocky to amorphous; very firm, hard, plastic, sticky; strongly effervescent; pH 7.80
Cg2	57 - 60+	Pale yellow (5Y 7/4, dry) and grayish brown to light olive brown (2.5Y 5/3, wet) gravelly clay loam; weak, subangular blocky to amorphous; very firm, hard, plastic, sticky; strongly effervescent; pH 8.00.

Variations. The depth of the organic material may vary from 12 inches to 7 or 8 ft. When these soils were mapped, the minimum depth of organic soils was 12 inches. The old tree trunks vary in the depth at which they occur. There was considerable hydraulic pressure between the organic material and the till.

Use. These soils have not been used for agriculture in the area. They occur in low-lying areas that may be susceptible to frost.

Land Types

Kintore (1,180 acres)

The Kintore land type consists mainly of eroded rock escarpments, the colluvial material accumulated below them, and eroded phases of the soil in the area. This is wasteland and occurs along certain of the streams.

Bottomland (4,020 acres)

The Bottomland is a complex of alluvial and colluvial material often found along brooks. It varies greatly in texture, drainage, stoniness, and pH. It is chiefly used for pasture. It usually has 6 to 12 inches of silt loam high in organic material underlain by coarse sand and gravel. The soils are classified as Orthic and Cumulic Regosols and the poorly drained members would be in the gleyed subgroups.

LAND USE

History and Development

The Saint John River and its tributaries were the early transportation routes of western New Brunswick. The Saint John River was part of the communications route between Quebec and the French settlements at Chignecto and in Nova Scotia. A French fort was located at Grand Falls and an English military post was established there in 1790. It was later settled by English, Irish, and French people.

About 1819, soldiers from the West Indian Rangers settled along the river in what is now Drummond Parish. The inland areas of the parish were settled after 1850 by French people from Quebec and by Danish folk about 1880. The Tobique River settlements of Oxbow, Riley Brook, and Nictau were started in 1864 by settlers from other parts of New Brunswick.

Agriculture

Because the survey area does not correspond to parish boundaries, the statistical data must be estimated. The agriculture of the area occurs in the parishes of Drummond, Grand Falls, and Lorne. In the parish of Lorne, agriculture is in a narrow strip in the Tobique Valley and is different from the other two parishes in that the farms are smaller and cannot be expanded greatly without leaving the valley. Some farmers specialize in growing potatoes, but most of them do general farming and have lumbering as a sideline.

The Parish of Drummond is probably typical of the three parishes and statistics that apply to this parish would hold for the other two. From 1951 to 1961, the total number of farms decreased from 234 to 171. The number of farms in the 10- to 129-acre category declined from 114 to 70, the 130- to 179-acre farms increased from 36 to 40, the 180- to 399-acre farms increased from 43 to 47 and those over 400 acres from 1 to 3.

The total area in farms declined in this period in each parish, but the average area per farm increased from 124 to 159 acres in Drummond Parish and the acreage under crops from 12,400 to 17,060 acres.

The acreages in various crops and the number of animals in Drummond Parish are as follows:

	Hay	*Grain*	*Potatoes*	*Horses*	*Cattle*
1951	5,743	4,356	2,264	293	1,832
1961	2,373	2,513	8,087	40	1,834

These figures show the heavy mechanization in the area and the shift from hay and grain to potatoes. With the increased yields obtained by proper fertilization for grain, the next census will probably show a decided swing to grain, particularly barley, which has given farmers average yields of over 70 bu/acre and wheat, which gave average yields of over 40 bu/acre during the 1965 season. In the Drummond – Grand Falls area, large acreages of peas for freezing are being grown.

The problems have been primarily those of management. The practice has been to grow potatoes continuously for periods of up to 25 years. Very few farmers use any conservation practices, and erosion has been severe on the stronger slopes. Slopes of up to 15% or more have been farmed using this practice. When a scab-resistant potato is developed and the pH of the soil can be increased to the optimum for plant growth, the change to potato-grain rotation will be enhanced. With the increased use of the potato combine and the necessity of picking stones, other problems will appear. Preliminary experiments at the Research Station in Fredericton (4) have shown that yields have decreased with stone removal because compaction takes place. This practice will also increase the danger of erosion because the small stones at present act as check dams to slow up the flow of water and reduce its erodibility. The other main problem is obtaining optimum fertility for high-quality produce on the various soils of the area.

When the total acreage is broken down into the various classes and the cleared

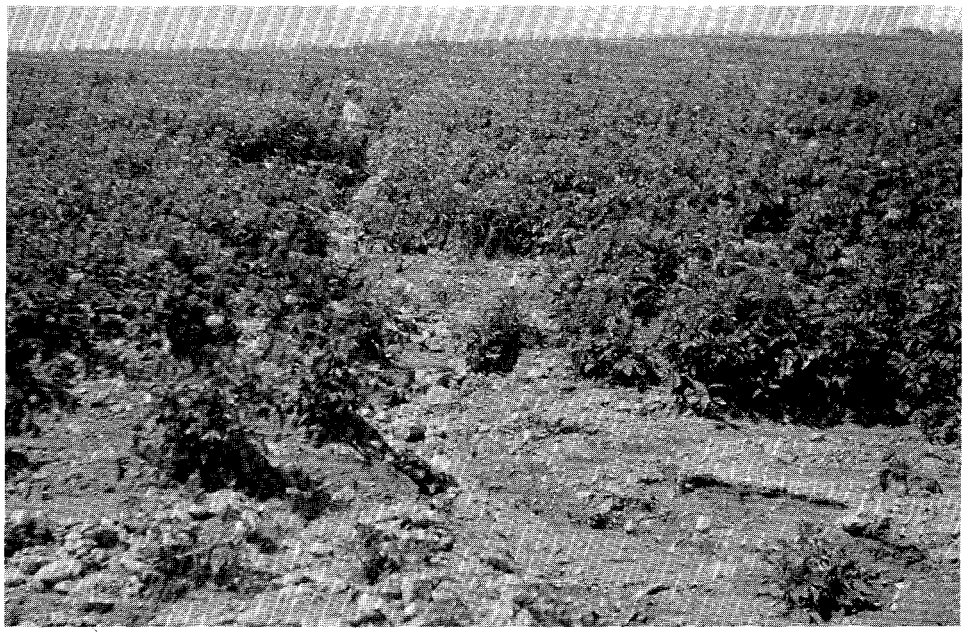

Fig. 38. Effects of erosion cutting across potato rows, Monquart soil.

Fig. 39. Siltation in potato rows after rain. One of the hazards of planting up and down the slope.

Fig. 40. Gully erosion on Caribou soil in pasture. Potato rows are running up and down the slope above the pasture.

acreages subtracted, it will be seen that 160,800 acres of arable soil remains under forest in the area. The acreages of cleared land were obtained from the topographic maps prepared from 1945 photographs and these do not take into account the acreages cleared since that time or reverted to forest. Some of the areas that the authors knew to be cleared at present were included in the cleared area as listed below:

	Class 2	*Class 3*	*Class 4*	*Class 5&7*	*Organic*
Total area	58,300	129,500	180,600	401,100	33,650
Cleared	17,700	9,300	4,600	4,200	
Not cleared	40,600	120,200	176,000	396,900	33,650

There is a total of 160,800 acres of arable soil and 176,000 acres of marginal soil that can be used for growing agricultural crops when necessary. The 33,000 acres of organic soils have a potential for vegetable crops where the climate is suitable.

Soil Capability Ratings

The following part of the report contains sections on the interpretation of the report for various uses. These are generalized statements and further studies in the field would be required for specific projects.

In both agriculture and forestry ratings, good management is assumed and in

Fig. 41. Severe erosion on Caribou soil. Fifteen to 25% slope. Water running out of potato rows onto the road created this gully.

Fig. 42. Erosion on Undine soil. Bedrock is showing in rows between potato hills.

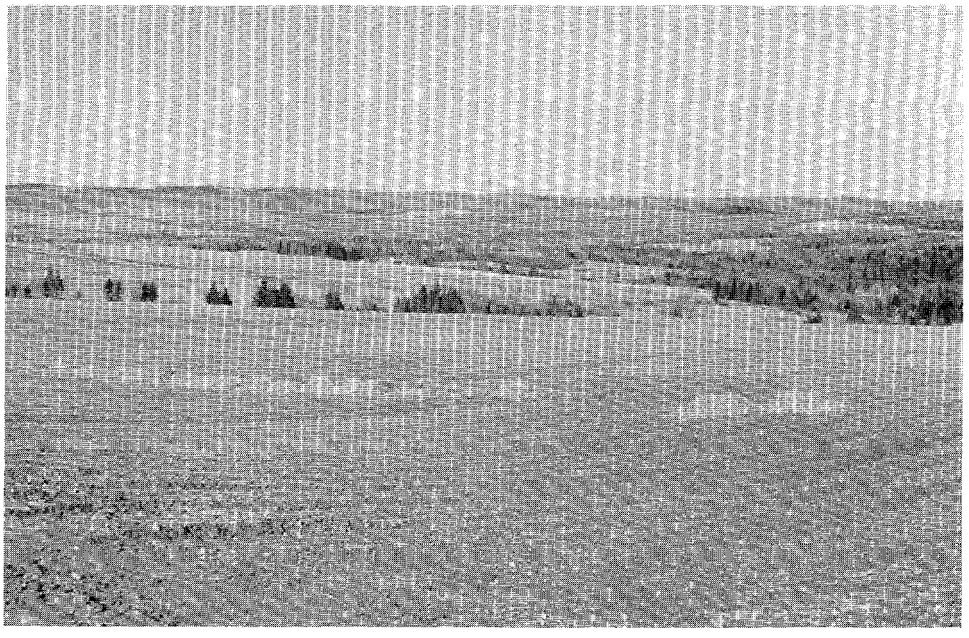

Fig. 43. Stones gathered by a mechanical stone picker ready for removal from the field.

Fig. 44. Land ready for reforestation.

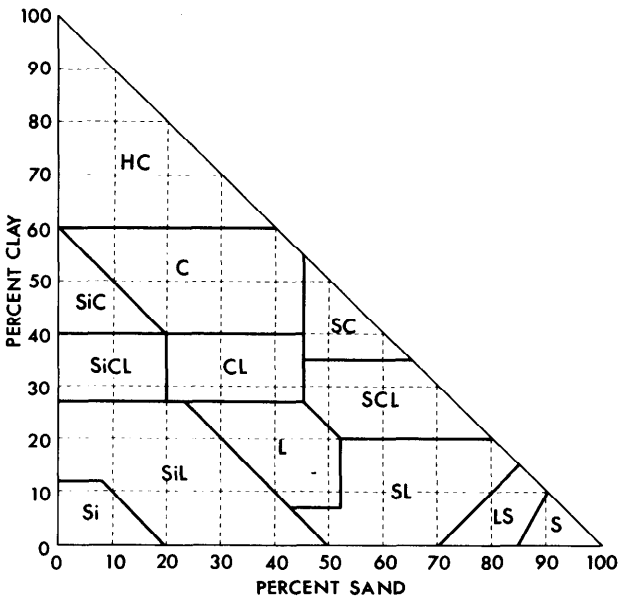

Fig. 45. Diagram of textural classes of soils.

forestry the rating is based on optimum stocking with the most favorable species. In the interpretation of the material in this report for other phases of land use, the work done by the USDA Soil Conservation Service and the College of Life Sciences and Agriculture, University of Maine, was used as a guide (3, 6, and 7). The data in tables 12, 13, 14, 15, and 18 must not be considered as the final word in land use, but should serve as a guide for workers in these fields.

A soil capability classification for agriculture was set up in 1963 and revised in 1964 and 1965 as experience brought out its defects. The soils have been classified as to their potential for field crops assuming good management under present conditions. Seven classes from one to seven were established with a number of subclasses indicating the limiting factors that place them in each class. The limitations were fertility, climate, stoniness, depth to bedrock, drainage, depth of rooting zone, flooding, droughtiness, and topography. One soil could theoretically be in a number of classes depending on the number and degree of limitations involved. The first three classes are considered to be arable soils for all crops adapted to the area and Class 4 is marginal except for specialized crops. Class 5 is pastureland that can be improved and Class 6 is natural pasture that cannot be improved by present mechanical means. Class 7 is unsuited to any agriculture. The organic soils, unless cultivated, were designated as 0.

It was decided that because of the acidity and low natural fertility of the soils, no soils in the Atlantic region would be placed in Class 1. It was also agreed that

Class 6 soil did not occur except in isolated areas, because the forest soon replaced the grass vegetation if it was not kept cleared.

Table 11 shows each series, the number of acres in each class, and the limiting factors that placed them in these classes. It is assumed that Class 2 land has the limiting factor of fertility, which keeps it out of Class 1 and although subclass F is not shown, it is implied in all soils in this area and only those soils where it is a severe limiting factor will have it indicated and the soils will then be placed in Class 3 or 4. Where the limiting factor is W for wetness, this can be changed by artificial drainage. Some areas of poorly drained soils are enclosed by steeply sloping areas. In mapping, these were not separated because of the small scale, but were mapped as complexes. In other cases, seepage on steep slopes is the cause of this apparent anomaly.

Soil Suitability for Various Agricultural Crops

A rating of the soils for various agricultural crops is given in Table 12. There is no data of crop yields on the soils in the area and only meager information in other areas. Many of the soils have never been cleared and there was no chance of seeing the soils under cultivation. The soils were rated by observing the crops growing on the cultivated soils and by estimating how the virgin soils with similar physical characteristics would react to cultivation.

Many of the soils were downgraded because of excessive stoniness and steep topography. In many instances, a soil was rated very high, but has three limitations with degrees listed as (a-c). This means that the limiting factor varies from slight to severe and in this case the rating was made where the limitation is slight. When the limitation becomes 'c' or severe, the rating goes down and the soil may be unsuited to agriculture.

Because of the great interest today in organic soils, particularly for horticultural crops, we rated them. The only disadvantage is that they may occur in frost pockets and must be drained.

Soil Suitability for Forestry

An attempt was made to make a productivity rating for tree growth on the various soils, (Table 13). Four degrees of potential were recognized, good, fair, poor, and not suitable. It was assumed that there was optimum stocking and pure stands. Very little data is available, but the information from the permanent plots of the Inventory Division of the N.B. Department of Natural Resources was made available. These plots were visited, where possible, during the survey and the soil was checked at the center of each plot. Information obtained from these plots was used to rate similar soils on which plots had not been established. Since the plots were in natural forest, the stocking was varied as to density and species, and was often random aged. The maximum yields in cubic feet per acre per year were used where there was more than one plot on a series. The plots are being rescaled at 5-or 6-year intervals. Where no data were available, ratings were placed on the soils by relating the observable physical properties with those of soils for which information was available. This was coupled with observations made during the survey, but the ratings must be regarded as estimations at the best.

The ratings in cubic feet per acre per year are Good (75–140), Fair (35–75), Poor (10–35), and N.S. (not suitable). The inability to see pure stands on these soils made them difficult to rate. The effect of exposure and excessive wetness, which cuts

down the growth rate very rapidly, would possibly tend to make our ratings too high for certain areas of these soils.

Soil Suitability for Recreation Use

This guide was prepared to give a general idea of the suitability of the soils in the area for recreation use. Many factors have an important function. For example, a soil on a gentle slope may be given an 'A' rating for cottage development, but if it is not near water or another aesthetic interest people will not be interested in using it as a cottage site. The same is true for the other uses. Table 14 gives an idea of the suitability of an area for this type of development. The table for New Brunswick soils was developed from one prepared for the soils of Maine and the Maine criteria were used. A number of the soils have been correlated along the Maine - New Brunswick border and it is fairly simple to use the same standards.

Soil Suitability for Urban and Industrial Uses

This guide was prepared to give a general idea of the suitability of the different soils in the area for the various phases of urban and industrial development. These ratings are based on the average soil characteristics. They will indicate what can be expected in any given area and form a basis for further study. Table 15 was developed in the same manner as Table 14.

Engineering Use and Interpretations

Although the soils of this area have been classified from a pedological viewpoint, a great deal of the information will be of use to engineers. The accompanying soil maps designate the areas occupied by these soils, the slope, the degree of stoniness, and the occurrence of bedrock at the surface. The description of the soils given in the earlier parts of the report provide further information on the physical characteristics. The analytical data in the appendix gives more details.

Physical properties on only six soils were determined for engineering purposes and the results from these tests are given in Tables 16 and 17. The engineering interpretations of the soils (Table 18) were obtained by using similar tables developed by the United States Soil Survey for Aroostook County, Maine. During a correlation tour in Maine and New Brunswick, a number of soils were observed that were similar, but had been given different names. Twenty of the soils included in this report have counterparts in Maine. The recommendations given for these soils in Maine would be valid in New Brunswick. The approximately 80 series that did not occur in Maine could be rated by extrapolating from known soils to unknown soils with similar characteristics.

These extrapolations are generalizations and although they can be used for preliminary planning, further field examination and laboratory work would be necessary for anything more than a small structure.

Up to 15% of the other soils may be included in a mapping unit without being named and small variations or pockets may be overlooked in the sampling procedures used for mapping.

In the data given in Tables 19 and 20, the plastic limits were done on soil finer than 2 mm and the stone fraction greater than 3 inches was ignored.

APPENDIX 1

Analytical Methods

Because the methods of analysis changed during the study, more than one procedure is mentioned for some determinations.

Absolute specific gravity of total soil. Calculated from weight of known volume of soil in cores.

Available water. Calculated from moisture equivalent and wilting point using volume weight of fines and volume of gravel and depths of the various horizons.

Bulk density. Calculated from weight of known volume of soil in cores.

Exchangeable calcium, magnesium, and potassium. Chemistry Division, Science Service, Canada Department of Agriculture. 1949. Chemical methods of soil analysis. p. 53-59.

Exchange capacity. A 2-g sample was placed in a 15-ml centrifuge tube with 4 ml of normal ammonium acetate solution, pH 7. Adsorbed ammonia was displaced with NaCl solution and the extract was steam-distilled with 1 N NaOH in micro-Kjeldahl distilling apparatus. Ammonia was collected in boric acid and titrated with standard acid.

Free iron and aluminum. McKeague, J.A., and J.H. Day. 1966. Dithionite- and oxalate-extractable Fe and Al as aids in differentiating various classes of soils. Can. J. Soil Sci. 46:13-22. Schwertmann. 1964. Z Pflanzenerhakr. Dung. Bodenkunde 105:194-201.

HF-extractable carbon. Schnitzer, M., and J.R. Wright. 1957. Can. J. Soil Sci. 37:89-95.

Hygroscopic moisture. Heating at 105 C until the weight remained constant.

Loss on ignition at 450 C. Chemistry Division, Science Service, Canada Department of Agriculture. 1949. Chemical methods of soil analysis, p. 17.

Maximum water-holding capacity. Samples taken with a Uhland core sampler and pF measured by the method of R.W. Leamer and B. Shaw. 1941. Amer. Soc. Agron. 33:1003.

Mechanical analysis. Hydrometer method. Bouyoucos, G.G. 1936. Soil Sci. 42:225-230.

Mineral indentification. Sand grains were mounted in gelatin on slides by the method of C.E. Marshall and C.D. Jeffries. 1945. Soil Sci. Soc. Amer. Proc. 10:397-405. The fraction with specific gravity higher than 2.95 was identified by the petrographic methods of W.H. Fry. 1933. USDA Tech. Bull. 344, and H.B. Milner. 1952. Sedimentary Petrology, 3rd ed., Thomas Murby and Co., London, England. The minerals of the light specific gravity fraction (less than 2.70) were identified by the staining technique of S.W. Reeder and A.L. McAllister. 1957. Can. J. Soil Sci. 37:57-59, which was modified as follows: the minerals were treated with a 3:1 mixture of 48% hydrofluoric acid and distilled water in a lead crucible for 30 sec. The minerals of the medium specific gravity fraction were treated with 3:1 hydrofluoric acid solution like the light fraction and the grains stained with murexide powder in ammoniacal ethanol. Differences in the color of the grains were caused by differences in the composition of the minerals.

Moisture equivalent. Briggs, L.J., and J.W. MacLane. 1907. USDA Bur. Soils Bull. 45.

Reaction (pH). Beckman glass electrode. Thick paste method. McGeorge, W.T. 1945. Soil Sci. 59:231-237.

Readily available phosphorus. Truog, E. 1930. J. Amer. Soc. Agron. 22:874-882.

Specific gravity fractions of sand. Separated by the method of N.J. Volk. 1933. Amer. J. Sci. 226:114-129.

Total aluminum. Colorimetric determination. Robertson, G. 1950. J. Sci. Food Agr. 1:59-63.

Total calcium and magnesium. Chemistry Division, Science Service, Canada Department of Agriculture. 1949. Chemical methods of soil analysis, p. 72-73.

Total carbon. Schollenberger, C.J. 1945. Soil Sci. 29:53-56. Walkley, A., and J.A. Black. 1934. Soil Sci. 27:29.

Total iron. Colorimetric determination. Houlihan, J.E., and P.E.L. Farina. 1953. Analyst 78:559.

Total nitrogen. Association of Official Agricultural Chemists. 1955. 8th ed., p. 12. Metallic mercury alone was the catalyst and the ammonia was collected in boric acid.

Total phosphorus. Yuen, S.H., and A.G. Pollard. 1955. Soc. Chem. Ind. 6:225. Digestion was made with perchloric acid and a colorimetric determination was made.

Total potassium. Association of Official Agricultural Chemists. 1955. 8th ed., p. 35.

Total silica and sesquioxides. Association of Official Agricultural Chemists. 1955. 8th ed., p. 31.

Total volume of pores. Cores were saturated and then oven dried. The difference gave total pore space. Upper plastic limit. Atterberg, A. 1911. Int. Mitt. Bodenk. 1:10-43.

Volume of gravel and sand. Measured by the volume of displaced water.

Wilting point. Pressure membrane method.

Discussion of Analytical Data

A discussion of the general trends observed in the analytical data accumulated during the studies made on the soils of the area is given below. For more detailed information on these results, refer to the tables.

Mechanical Composition and Use

The results of the mechanical analysis are given in Table 19. In the well-drained profiles, the silt content is usually highest in the Ae or first B horizon. The clay may be highest in the Ae or B as in Boston Brook, Grand Falls, Holmesville, Long Lake, McGee, Monquart, Quisibis, and Thibault, or it may be highest in the C as in the Britt Brook, Holmesville, Serpentine, Tuadook, and Victoria. The soils that are formed on a water-deposited parent material are highly variable due to the mode of deposition. The presence of fine-textured materials in the upper part of the solum is a distinct advantage in these soils. They usually have a good structure,

which gives them good aeration and the higher content of silt and clay increases their water-holding and exchange capacity, whereas the coarser texture in the parent material assures the rapid removal of excess water. Where stones and topography are not limiting factors, these soils are the most productive ones of the area.

The imperfectly drained profiles generally have the clay highest in the C horizon. The Carlingford is the exception and has the highest clay in the Bg horizon. This is one of the contributing factors causing or aggravating the imperfect drainage, but usually the clay content does not increase enough to interfer with artificial drainage. Soils such as the Kingsclear, Nackawic, Siegas, Bellefleur, Jardine, and Kedgwick, which have Bt horizons, have the highest clay content in these horizons. The silt is highest in the Ae horizons of these soils except the Kingsclear where it is highest in the C horizon. This high content of clay in the solum impedes the drainage and prevents leaching. Generally, these soils are not adapted to intertilled crops because of impeded drainage and the clay content, which provides poor traction in wet weather.

In the very poorly drained soils, the silt is highest in the Ae or Aeh horizon and the clay generally in the Cg horizons. This increase in silt on the surface may be caused by location or by increased weathering at the surface or both. Very often there is a stone pavement on the surface of these soils and the soil is nearly free from stones immediately below. This appears to be caused by frost action with the stones being elevated by ice crystals and silt flowing in under them.

Physical Analysis

The results of the physical analysis are given in Table 20. The pore space, volume of gravel, and bulk density were all determined on undisturbed cores. The remainder of the determinations were made on the material that passed the 2-mm sieve. Because of the stony nature of many of the soils, it was difficult to obtain undisturbed cores. The cores with stones protruding from the top were leveled in the laboratory and the stones marked. After the determinations were made, the stones were removed, cleaned, and cut along the marks with a diamond saw and the weight of the excess subtracted from the weight of the soil in the core. This gave an approximation of the true weight of the soil and gravel.

The available water was determined from the moisture equivalent and wilting point and calculated on a true volume of fines per cubic inch from the volume of gravel and the bulk density. The stones larger than approximately 2.5 inches were ignored in these profiles. The available water is the difference between the moisture equivalent (approximates the field capacity) and the 15-atmosphere moisture (wilting point). The volume of gravel and bulk density of fines was used to obtain a realistic figure. The maximum water-holding capacity was done on 2-mm soil by the Briggs and MacLean method and was different from the total pore space. More soil water relationships are given in Table 20.

The volume of fines and total solids can be easily calculated from the figures given.

The total pore space is of interest in separating the ground moraine from the ablation moraine and water-deposited soils. The pore space was of the same order in the upper part of the solum, but in the C of the true moraine or till the total pore space was usually below 35%, whereas the others were above 37% and generally considerably higher than this. This decrease is mainly in the large or noncapillary pores. The soil water relationships follow closely the organic matter content. The

available water is, however, dependent on the amount of gravel present because the higher the gravel and stone content the less fines are present to control the water.

The plastic limits are reported here for several soils. These were determined on the material passing a 2-mm sieve, whereas those reported in the table of engineering properties were done on soil passing a no. 40 sieve.

The accumulated available water is given in Table 9 for various depths of the soil. The maximum water-holding capacity of water per inch of soil was not calculated, but this may be done from the figures given in Table 20.

The absolute specific gravity shows some anomalies with absurdly high results.

Mineralogical Composition

The mineralogical composition of the Caribou and Holmesville catenas, the Jardine series, and the first two specific gravity fractions of a McGee profile are given in Table 21. The high quartz content of the Ae horizons, the decrease in quartz and the increase in plagioclase feldspar with depth, appears to be the norm in the well-drained and imperfectly drained soils. In the very poorly drained Poitras, the quartz remains fairly uniform in the light fraction, but builds up with depth in the medium specific-gravity fraction. The medium fraction of the Washburn behaves the same way, but the light fractions follow the pattern of the well-drained soils. This concentration of the quartz in the Ae is probably caused by the more intense weathering at the surface of the soil.

In the Bisequa Gray Wooded (Gray Luvisol) Jardine soils, the quartz remains relatively high throughout the profiles.

Brydon (1) has reported on the mineralogy of the coarse silt and clay fractions of a number of the soils of this report. These soils are the Caribou, Jardine (S), Jardine (D), Violette (since changed to Holmesville), Glassville, Holmesville, Siegas, and Juniper. The Jardine (S) is a surface sample.

The coarse silt fractions contained large amounts of quartz and feldspar except the Violette (Holmesville), which had a strong chlorite and feldspar pattern. The Caribou, Siegas, and Juniper soils showed a large amount of quartz but small amounts of feldspar and chlorite. The remainder of the samples showed low chlorite and mica.

The clays showed significant amounts of illite and chlorite excepting the Siegas, which showed no chlorite. The Holmesville and Siegas soils showed significant amounts of vermiculite and the Caribou and Juniper showed traces. The Caribou, Holmesville, and Siegas soils have significant amounts of kaolinite, whereas the other soils except Violette showed traces. The Holmesville showed traces of montmorillonite. The Jardine surface sample and the Holmesville and Siegas had significant amounts of mixed layer minerals.

Chemical Composition

The Ferro-Humic Podzols have high oxalate-extractable iron, aluminum, hydrofluoric acid soluble carbon, and high total carbon in the B horizons. The Long Lake, Serpentine, Tuadook, Britt Brook, and one of the McGee samples fall into this category. In the field, the B horizons did not have the dark color generally associated with this subgroup, or the dark-colored part of the Bhf horizon was thin, but the lighter-colored horizons had sufficient organic matter to be called Bhf horizons and fitted the Ferro-Humic Podzol Subgroup.

The Orthic Humo-Ferric Podzols have a range of extractable iron, aluminum,

carbon, and total carbon within the limits of the requirements for the subgroup. Generally speaking, the parent material of these soils have only 25% to 50% of the total Fe found in soils of the Ferro-Humic Podzol Subgroup. This may be one reason for the smaller amount of extractable Fe in these soils. There seems to be no relationship in the ratio of extractable to total C in the Orthic Humo-Ferric Podzols and Ferro-Humic Podzols.

The Bellefleur, Harquail, Jardine, Kedgwick, Siegas, and Kingsclear soils have a horizon of clay accumulation. They are all well to moderately well drained and have developed on tills high in carbonates. The first five are Bisequa Gray Wooded because they have sufficient soluble Fe and Al to make podzol B horizons, but are shallow to the Bt horizon typical of this Gray Wooded subgroup. The Kingsclear profile does not have these strongly developed podzol characteristics and is an Orthic Gray Wooded soil.

The analyzed Clearwater soil is a Mini Humo-Ferric Podzol. It has no Ae horizon and a very deep solum. The Bhf is thin but strongly developed, especially with the free Al and total and soluble C. The free Fe is relatively low, and drops sharply in the Bfh and declines to the C. The soluble Al decreases slightly in the Bf, and then declines to the C. The total and soluble carbon decreases to the C. The total Fe in the parent material is high. It appears from the soluble Fe and the amount and position of the soluble Al, that the spodic B horizons are just forming, but it may be because the lateral water movement is more prevalent than the vertical movement.

In the Gleysolic Order, the degree of base saturation is of particular interest. Of the seven profiles, three are saturated in the profile or the top of the C, whereas the Bourgoin is 80% saturated in the C. One of the Poitras profiles has 62% saturation in the C and the others are 43% and 15% saturated. This may indicate a need for further separation in the field when more work is done in this area.

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SCIENTIFIC NAMES OF THE FLORA

Common name	*Scientific name*
Acutcleaf sphagnum moss	*Sphagnum capillaceum* (Weiss) Schrank.
Aster	*Aster umbellatus* Mill.
Balsam fir	*Abies balsamea* (L.) Mill.
Balsam poplar	*Populus balsamifera* L.
Bastard toadflax	*Comandra umbellata* (L.) Nutt.
Beaked hazel	*Corylus cornuta* Marsh.
Beaked moss	*Eurhynchium pulchellum* (Hedw) Jenn.
Beech	*Fagus grandifolia* Ehrh.
Big-leaved aster	*Aster macrophyllus* L.
Black ash	*Fraxinus nigra* Marsh.
Black spruce	*Picea mariana* (Mill.) BSP.
Blueberry (low bush)	*Vaccinium angustifolium* Ait.
Blue violet	*Viola septentrionalis* Greene V. cucullata Ait.
Bracken fern	*Pteridium aquilinum* (L.) Kuhn
Bristly club moss	*Lycopodium annotinum* L.
Broom moss	*Dicranum scoparium* Hedw.
Bunchberry	*Cornus canadensis* L.
Canada yew	*Taxus canadensis* Marsh.
Common wood-sorrel	*Oxalis montana* Raf.
Creeping snowberry	*Gaultheria hispidula* (L.) Bigel.
Crested wood-fern	*Dryopteris cristata* (L.) Gray
Cucumber root	*Medeola virginiana* L.
	Dicranum fuscescens Turn.
Dotted mnium	*Mnium punctatum* Hedw.
Dwarf raspberry	*Rubus pubescens* Raf.
Eastern hemlock	*Tsuga canadensis* (L.) Carr.
Fall dandelion	*Leontodon autumnalis* L.
Fern moss	*Thuidium delicatulum* (Hedw.) Mitt.
Fireweed	*Epilobium angustifolium* L.
Goldenrod	*Solidago* spp.
Goldthread	*Coptis groenlandica* (Oeder) Fern.
Gooseberry and currant	*Ribes* spp.
Gray birch	*Betula populifolia* Marsh.
Ground cedar	*Lycopodium complanatum* L.
Ground pine	*Lycopodium obscurum*, L.
Haircap moss	*Polytrichum commune* Hedw.
Hawkweed	*Hieracium canadense* Michx.
Hepatica	*Hepatica americana* (DC.) Ker.
Highbush cranberry	*Viburnum trilobum* Marsh.
Hobblebush	*Viburnum alnifolium* March.
Honeysuckle	*Lonicera canadensis* Bartr.
Hop-hornbeam	*Ostrya virginiana* (Mill.) K. Koch
Horsetail	*Equisetum sylvaticum* L.
Hylocomium splendens	*Hylocomium splendens* (Hedw.) B.S.G.
Interrupted fern	*Osmunda claytoniana* L.
Lambkill (see sheep laurel)	
Larch (hackmatack, tamarack)	*Larix laricina* (Du Roi) K. Koch
Labrador tea	*Ledum groenlandicum* Oeder
Large-toothed aspen	*Populus grandidentata* Michx.
Lichen (caribou moss)	*Cladonia* spp.
Maple-leaved viburnum	*Viburnum acerifolium* L.
Moccasin flower	*Cypripedium acaule* Ait.
Moss (feather moss)	*Hylocomium splendens* (Hedw.) B.S.G.
Mountain ash	*Sorbus americana* Marsh.
Mountain maple	*Acer spicatum* Lam.

Naked miterwort	*Mitella nuda* L.
Nodding wood grass	*Cinna latifolia* (Trev.) Griseb.
Northern bedstraw	*Galium boreale* L.
Northern white violet	*Viola pallens* (Banks) Brainerd
One-flowered pyrola	*Moneses uniflora* (L.) Gray
One-sided pyrola	*Pyrola secunda* L.
Ostrich fern	*Matteuccia nodulosa* (Michx.) Fern.
Pearly everlasting	*Anaphalis margaritacea* (L.) C. B. Clarke
Pin cherry	*Prunus pensylvanica* L.f.
Plume moss	*Hypnum crista-castrensis* Hedw.
Prince's pine	*Chimaphila umbellata* (L.) Bart.
Raspberry	*Rubus strigosus* Michx.
Red maple	*Acer rubrum* L.
Red-osier dogwood	*Cornus stolonifera* Michx.
Red pine	*Pinus resinosa* Ait.
Red spruce	*Picea rubens* Sarg.
Ribbed bog moss	*Aulacomnium palustre* (Web. & Mohr) Schwaegr.
Rose twisted-stalk	*Streptopus roseus* Michx.
Roundleaf habenaria	*Habenaria orbiculata* (Pursh) Torr.
Roundleaf pyrola	*Pyrola rotundifolia* L.
Running club moss	*Lycopodium clavatum* L.
Sarsaparilla	*Aralia nudicaulis* L.
Schreber's moss	*Pleurozium schreberi* (BSG.) Mitt.
Sensitive fern	*Onoclea sensibilis* L.
Sedges	*Carex* spp.
Serviceberry	*Amalanchier* spp.
Sheep-laurel (lambkill)	*Kalmia angustifolia* L.
Solomon's seal	*Polygonatum pubescens* (Willd.) Pursh
Speckled alder	*Alnus rugosa* (Du Roi) Spreng. var. *americana* (Regel) Fern.
Spinulose wood-fern	*Dryopteris spinulosa* (O. F. Muell.) Watt.
Spoonleaf sphagnum	*Sphagnum palustre* L.
Squarrose sphagnum	*Sphagnum squarrosum* Crome
Starflower	*Trientalis borealis* Raf.
Striped maple	*Acer pensylvanicum* L.
Sugar maple	*Acer saccharum* Marsh.
Sweet-scented bedstraw	*Galium triflorum* Michx.
Tamarack	*Larix laricina* (Du Roi) K. Koch
Toothed mnium	*Mnium affine* Bland.
Tree moss	*Climacium dendroides* (Hedw.) Web. & Mohr.
Trembling aspen	*Populus tremuloides* Michx.
Twin flower	*Linnaea borealis* L.
Violet	*Viola*
Wavy dicranum	*Dicranum rugosum* Brid.
White ash	*Fraxinus americana* L.
White birch	*Betula papyrifera* Marsh.
White cedar	*Thuja occidentalis* L.
White elm	*Ulmus americana* L.
White pine	*Pinus strobus* L.
White spruce	*Picea glauca* (Moench) Voss
Wild raisin	*Viburnum cassinoides* L.
Wild red raspberry	*Rubus idaeus* L. var. *strigosus* (Michx.) Maxim
Willows	*Salix* spp.
Wild strawberry	*Fragaria* spp.
Wintergreen	*Gaultheria procumbens* L.
Woodland strawberry	*Fragaria vesca* L.
Yellow birch	*Betula alleghaniensis* Britton
Yellow clintonia	*Clintonia borealis* (Ait.) Raf.
Yellow lady-slipper	*Cypripedium calceolus* L.

ALPHABETICAL LIST OF SOILS