SOIL SURVEY

of the

PEACE RIVER AREA IN BRITISH COLUMBIA

L. FARSTAD, T. M. LORD, A. J. GREEN
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Canada Department of Agriculture
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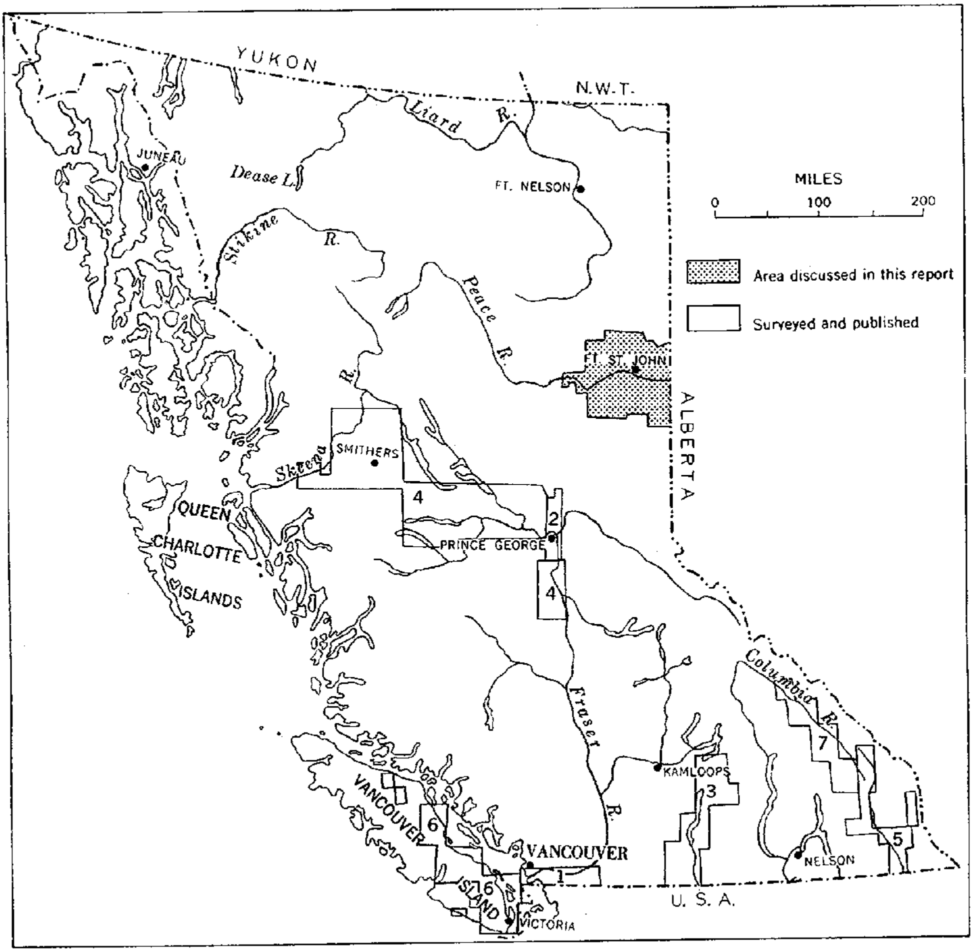

Figure 1.—Areas in British Columbia for which soil survey reports and maps have been published. 1. Lower Fraser Valley. 2. Prince George area. 3. Okanagan and Similkameen valleys. 4. Quesnel, Nechako, Francois Lake and Bulkley-Terrace areas. 5. Upper Kootenay and Elk River valleys. 6. Southeast Vancouver Island and Gulf Islands. 7. Upper Columbia River valley.

CONTENTS

INTRODUCTION

This report deals with the soils of the Peace River area in British Columbia and is the eighth in a series on the soils of the province. The survey involved a detailed reconnaissance of the settled areas and a broad reconnaissance of the areas beyond the fringes of settlement. The publication consists of two parts: a colored map and a report.

The soil map indicates the distributions and areas of the soil series, types and complexes. The map, on a scale of one inch to two miles, indicates the locations and extents of the different soils. The soil areas are identified by colors and letters. Topography is shown by hatching. A key to the colors, letters, symbols and hatching is given in the legend.

The report is concerned mainly with classification and descriptions of the soils. It also gives general information on the area: Early history, natural resources, industries, transportation, social services, geology, physiography, relief, drainage, climate, native vegetation and other factors that affect soil development, crop production and settlement.

The greater part of the report concerns the physical, chemical and agronomic features of the soils. In the final section the soils are rated for agricultural and other uses on the basis of physical and chemical characteristics. These ratings are tentative and are averages for the soil series rather than ratings of the soils on particular farms.

Problems concerning the soils are discussed. These include lack of fertility, susceptibility to erosion, and need for drainage. Other problems concern land clearing, hazard of frost, and water supply for livestock and household use.

The report and the map supplement each other and both should be consulted for information on the soils.

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DESCRIPTION OF THE AREA

Location and Extent

The surveyed area (Figure 1) is in the northeastern part of British Columbia and comprises part of the Peace River drainage basin lying west of Alberta. The area extends from north latitude 55°30′ in the south to 57°15′ in the north, and from 120°00′ (British Columbia–Alberta boundary) west longitude in the east to 122°00′ west longitude in the west. The upper reaches, or intermountain valleys, of the Pine, Peace and Halfway rivers are also included. The total area is 4,363,105 acres.

History and Early Settlement

The early history of the Great Plains area of Western Canada is largely a history of the fur trade, and the development of the Peace River country is no exception. Although the area has been recently settled, its history dates back to 1792. In that year Sir Alexander MacKenzie of the North West Fur Company set out from Fort Chipewyan on his great journey to the Pacific coast. He ascended the Peace River in 1792 and the next year found his way through the Rocky Mountains by way of the Peace River pass. As a result of this trip, the fur trade expanded rapidly and new trading posts were established along the Peace and in New Caledonia. One of these, Fort St. John, was established in 1805.

In 1873 Charles Horetzky was commissioned to survey the Peace River country and the Peace River pass to determine its suitability as a route for the Canadian Pacific Railway. One of the strongest arguments he advanced in support of the pass for the railway was that a line built by this route would open up a vast fertile region for agriculture.

John Macoun was the first scientist to focus attention on the agricultural possibilities of the area. He reported that the arable land extended from Hudson Hope through the surveyed area into Alberta.

Before 1910, settlement was insignificant, largely because the area was not readily accessible. Settlers entered from Alberta, commonly by stage to Athabaska Landing, by boat to Lesser Slave Lake, overland to Peace River Landing and thence into the "Block".

Settlers first came in appreciable numbers during 1911-15, largely because of the opening of the Edson Trail and the prospect of a railway, which reached the Peace River townsite in Alberta in 1916. This, however, was still over 100 miles in a direct line from the surveyed area. More settlers came after the First World War, this movement being stimulated by soldier settlement assistance. Another influx of settlers occurred during the 1930's as a result of the economic depression and improved transportation facilities. For instance, a highway from Edmonton to MacLennan was completed in 1928 and the railroad was extended into Dawson Creek in 1931.

In 1939 the CPR Colonization Board established 1,000 Sudetan settlers in the Tupper Creek district in the southeast corner of the surveyed area.

Completion of the Alcan and Hart highways and extension of the Pacific Great Eastern Railway into Fort St. John and Dawson Creek have done much during recent years to stimulate settlement.

Natural Resources

The economy of the area is based mainly on three primary industries: agriculture, forestry, and production of gas and oil.

Agriculture

The total area of improved land has increased from 75,801 in 1931 to 368,795 in 1961 (Table 1). The latter figure represents about 28 percent of all the improved land in British Columbia. Though the number of farms decreased from 1,666 in 1941 to 1,407 in 1961, the average size of farm unit increased from 270 to 614 acres. The percentage of improved land also increased markedly.

The population increased from 7,013 in 1931 to 8,481 in 1941. In 1961 the total population was 31,061, of which 5,160 lived on farms.

Table 1.—Numbers of Farms, Acreages Occupied and Acres of Improved Land in the Peace River Area, 1931-1961

Year	Number of farms	Acres occupied	Acres improved	Percentage of land improved
1931	1,115	303,120	75,801	25
1941	1,666	585,884	167,182	29
1951	1,589	708,154	285,686	40
1961	1,407	864,561	368,795	43

The acreage sown to field crops increased (Table 2) as more land was improved. Wheat, oats and barley are grown on the larger part of the cultivated land. The acreage of grasses and legumes increased from more than 22,000 in 1951 to over 77,000 in 1961. These changes, resulting from changing economic conditions, indicate a shift from cereal crops to forage crops. This is considered a desirable trend in the region.

Table 2.—Total Acreages Cropped, and Acreages of Main Crops Grown in the Peace River Area, 1931-1961

Year	Total Field crops	Wheat	Oats	Barley	Rye	Flax	Forage crops[1]
1931	56,952	23,783	25,620	1,271	196	150	1,866
1941	104,659	44,728	33,366	6,231	284	2,587	8,696
1951	166,934	77,358	38,949	13,310	734	2,346	22,505
1961	245,601	61,230	52,312	51,457	344	3,099	77,038

[1]Cultivated grasses, clover and alfalfa, including seed.

Forage-crop seeds produced include creeping red fescue, meadow fescue, brome grass, alfalfa, red clover, sweet clover and alsike clover. In 1960 the total seed production exceeded 6 million pounds.

Appreciable numbers of livestock are kept on many farms (Table 3). The increase in livestock, especially cattle and sheep, is closely related to the shift from cereal crops to forage crops.

Table 3.—Numbers of Livestock in the Peace River Area, 1931-1961

Year	Horses	Cattle	Swine	Sheep	Poultry
1931	5,774	5,329	5,550	339	39,196
1941	9,638	11,200	21,512	3,524	57,764
1951	5,986	10,260	10,117	1,352	77,044
1961	3,600	26,205	9,169	6,476	116,485

Most of the farms are well equipped with modern machinery. In 1961, the farmers used 1,612 tractors, 1,136 trucks, 562 grain combines, and 208 threshers. About half of the farms are equipped with electric power.

Forestry

Forestry is an important industry since practically all the timber cut in or near the area contributes to the economy.

Spruce is the main commercial tree and is common in the many valleys. Lodgepole pine is important in burned-over areas, where it readily establishes itself; it is suitable for pulp, general construction and is excellent for ties, poles, fencing and fuel.

Transportation

Difficulty of access has retarded development of the Peace River area in British Columbia. Completion of the Northern Alberta Railway to Dawson Creek in 1931 provided the first direct rail connection with the outside world. In 1958 the Pacific Great Eastern Railway was extended to Dawson Creek and Fort St. John, providing direct contact with tide water at Vancouver.

Two main highways service the area from the south. One from Edmonton to Dawson Creek, a distance of 380 miles, enters British Columbia near Tupper in the southeast corner of the area. The second major access road is the Hart Highway, completed in 1952; it connects Dawson Creek with Prince George, 255 miles distant.

The Alcan Highway, completed in 1944, extends from Dawson Creek to Fairbanks in Alaska, a distance of 1,523 miles. It traverses the surveyed area more or less diagonally.

Secondary roads are adequate in the settled areas, but few are gravelled. On the fringe of settlement, roads are few and unsuitable for travel during wet weather.

Social Services

The surveyed area is well supplied with schools, churches and other services recognized as essential. Elementary schools are well distributed and meet the needs of the population. Junior and senior high schools are located at Dawson Creek and Fort St. John and there are a number of well-established parochial schools.

The main centers of population are well supplied with electric power and natural gas. These services are being rapidly extended to rural areas.

There are hospitals at Fort St. John, Dawson Creek and Pouce Coupe. Welfare workers and nurses are available throughout the area.

Agricultural Services

Agriculture is served by experimental project farms at representative points throughout the area. These are directed by the Experimental Farm, Canada Department of Agriculture, Beaverlodge, Alberta. District agriculturists are stationed at Fort St. John and Pouce Coupe.

Physiography, Relief and Drainage

The surveyed areas lies partly in the Rocky Mountain foothills and partly in the high plains division of the Great Plains of North America.

The plains section consists of undulating and rolling till plain interspersed with glacial lake basins. The main rivers have cut deep post glacial channels as much as 700 feet deep, which in places expose the underlying Upper Cretaceous bedrock. Elsewhere rock outcrops are widely scattered. Agricultural interest centres mainly on the broad platform, or basin, that borders the Peace River (Figure 2).

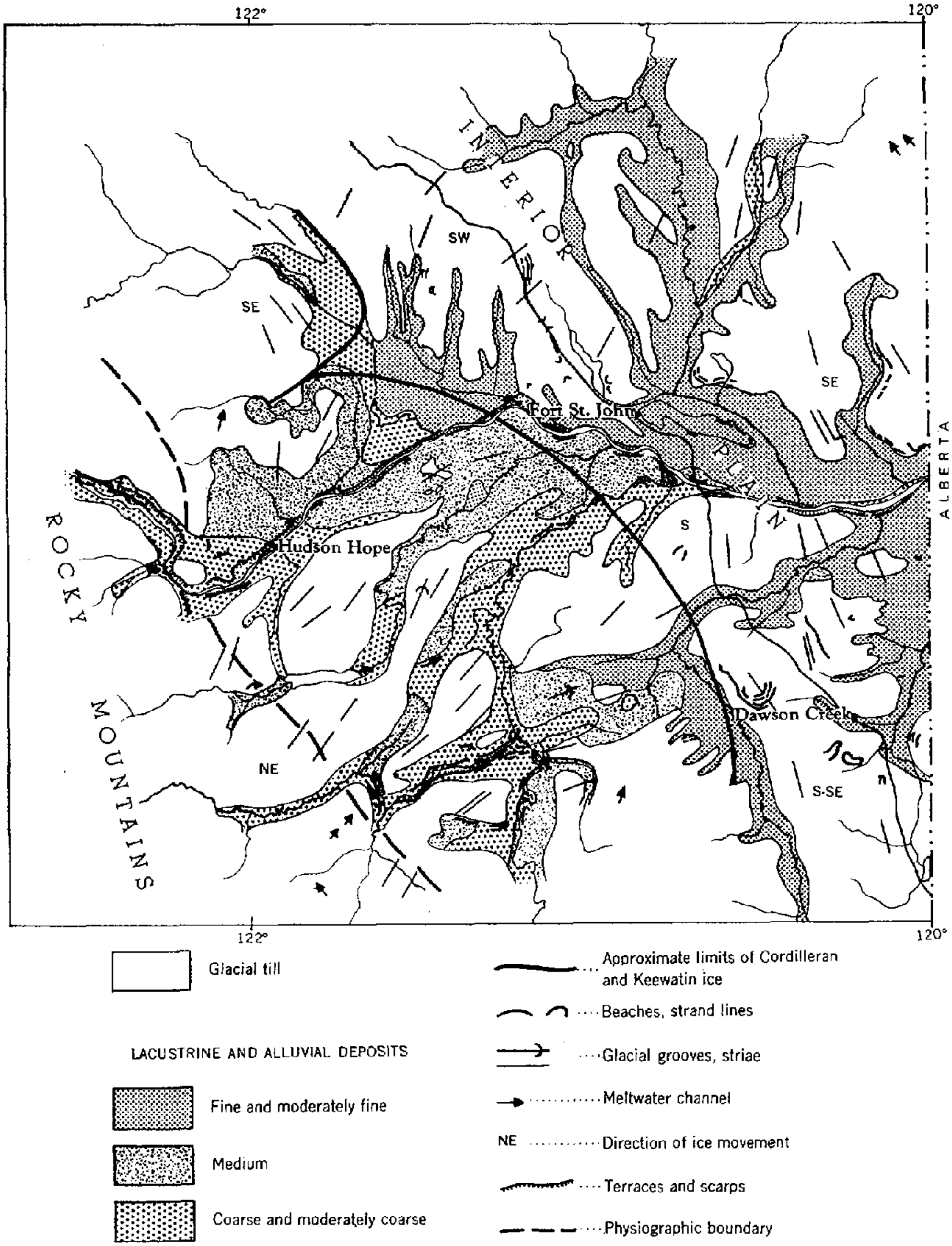

Figure 2.—Surface deposits and physiographic areas in the surveyed area.

The foothills section, along the lee of the Rocky Mountains, is characterized by rolling and hilly land, mainly long ridges of broken and folded strata. The hills and isolated mountains range up to 2,000 feet above the valley floor and attain elevations of 4,000 to 5,000 feet. Many of the hills are flat-topped or mesa-like and are generally covered with glacial till. The higher parts are rugged and rocky.

The Peace River, formed by the confluence of the Finlay and Parsnip rivers, receives most of its water before it enters the area. It is less than 1,600 feet above sea level at Hudson Hope and occupies a valley area some 600 to 800 feet deep and two to four miles wide. The banks are steep, and badland topography has developed in the soft Cretaceous shale. Tributary streams such as the Beatton, Kiskatinaw, Pine, Moberly and Halfway also have deeply incised valleys. These steep-walled valleys create many problems for the road builder as well as the farmer (Figure 3).

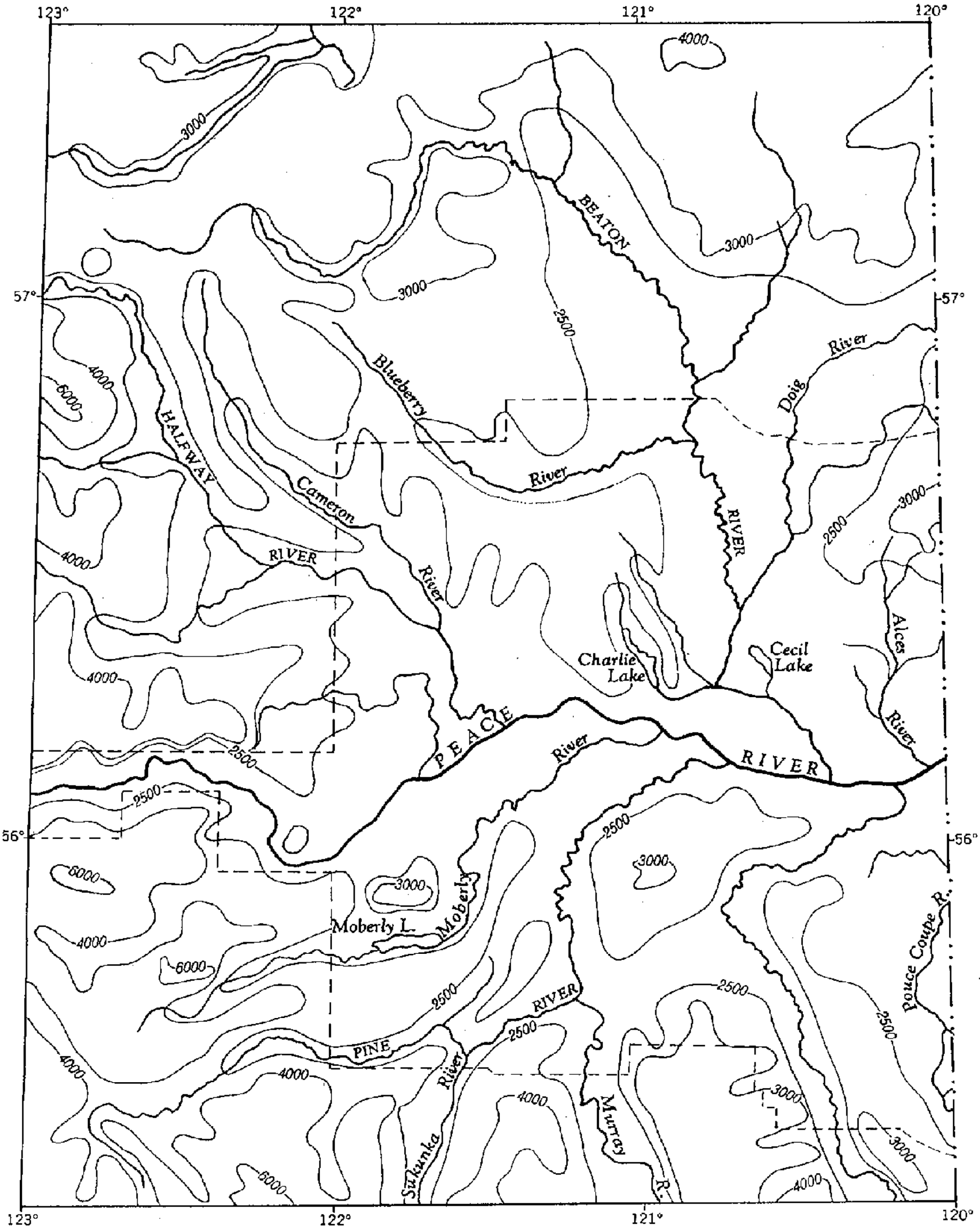

Figure 3.—Drainage systems of the surveyed area.

There are a number of lakes in the surveyed area. The most important ones are: Charlie, Cecil, Boundary, Swan and Moberly. Of these, Moberly only is fed by glacial waters from the Cordillera, the remainder being replenished mainly by runoff waters from the surrounding uplands (Figure 4).

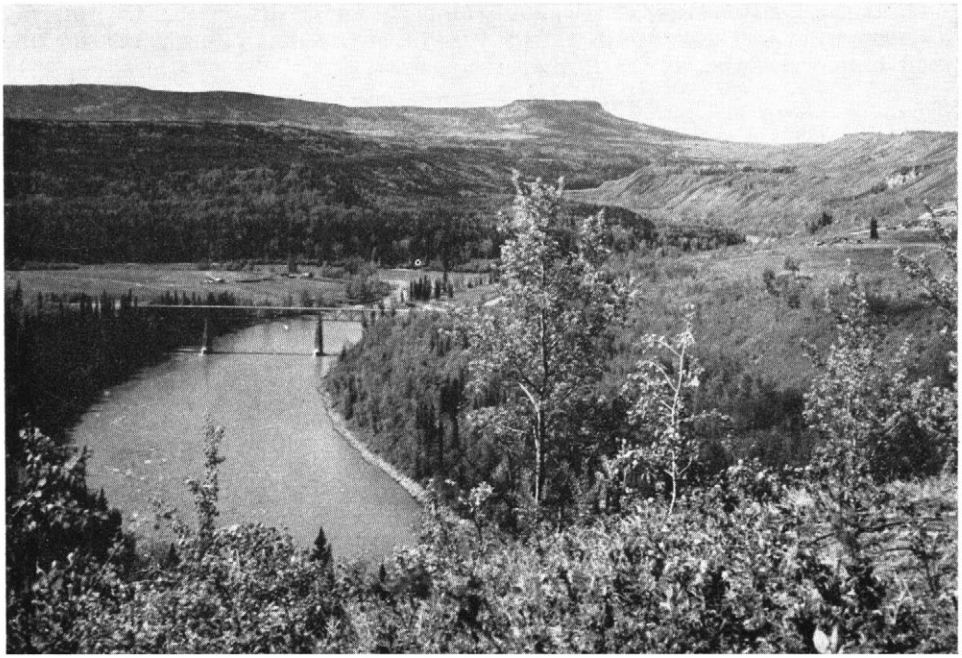

Figure 4.—Upstream view of the Pine River valley. High uplands and deep valleys separate the country into districts. The mesa in the background is mantled with Cordilleran till. (British Columbia Government photograph)

Surface and soil drainage varies greatly throughout the area. The most satisfactory drainage conditions, from the standpoint of agriculture, are found on long, gentle slopes in the Peace River basin. Near the headwaters of and on the low divides between the Beatton, Doig and Osborne rivers, runoff is slow and the soil is inadequately drained. This is shown by the presence of undrained lakes, meadows and extensive peat deposits. In the southwestern part of the area, much of the rolling and hilly land is excessively drained through loss of water by runoff. Low-lying areas and depressions are characterized by varying degrees of flooding as the result of restricted drainage. The intermediate slopes are usually well drained.

Climate

The surveyed area has a moderate, continental climate.[1] The summers are moderately warm and the winters relatively cold.

Weather data compiled from the Department of Transport and Department of Agriculture records are given in Tables 4 to 6. Records for Beatton River, B.C., and Beaverlodge, Alta., are included for comparison. The station at Beatton River, north of the surveyed area, is representative of the semi-continuous uplands dividing the Peace River and Nelson basins. The station at Beaverlodge is some 30 miles east of the southeast portion of the surveyed area.

[1] Chapman, J. D. The climate of British Columbia. 5th British Columbia Natural Resources Conference, 1952.

The annual precipitation varies from 16 to 18 inches (Table 4). About 40 to 50 percent of this falls during the growing season, June and July being the wettest months. During the growing season, the rains come mostly in local thunderstorms of short duration, so that runoff is high.

Table 4.—Precipitation in Inches at Selected Stations

	Altitude Feet	Years observed	Jan.-Dec.	May-Aug.	July-Aug.
Beatton River (airport)	2755	11	16.6	8.4	4.5
Dawson Creek	2200	4	17.3	8.3	4.4
Ft. St. John (airport)	2275	13	16.4	7.8	4.5
Baldonnel	2250	29	17.0	8.5	4.2
Pouce Coupe	2140	14	18.0	8.0	3.8
Progress	2380	6	15.5	6.6	2.9
Hudson Hope	1670	32	17.0	8.2	4.9
Beaverlodge (Alberta)	2500	36	17.6	7.9	4.4

The annual snowfall averages about 72 inches at Dawson Creek, 69 inches at Fort St. John and 59 inches at Hudson Hope. Much of this moisture is lost in the spring runoff, particularly on cultivated land.

The mean annual temperature appears to be about 35°F for the agriculturally developed portions of the area (Table 5).

Table 5.—Mean Monthly and Annual Temperatures (°F) at Stations in or near the Surveyed Area

	Beatton River	Dawson Creek	Fort St. John	Baldonnell	Pouce Coupe	Hudson Hope	Beaverlodge Alberta
Years observed	11	4	13	29	14	29	36
January	−3	−4	2	5	6	5	10
February	4	12	10	12	11	11	12
March	16	17	20	22	20	19	23
April	28	32	35	37	37	37	38
May	46	49	50	50	49	48	50
June	53	55	56	56	54	56	56
July	57	58	60	61	58	60	60
August	54	57	58	58	57	58	58
September	46	48	50	50	48	50	50
October	35	39	40	39	38	39	40
November	14	25	21	22	23	23	24
December	1	11	8	9	9	8	13
Year	29	33	34	35	34	35	36

The dates of the last frost in spring and the first in the fall vary considerably from season to season at each station as well as from station to station (Table 6). The frost-free period averages 123 days at Fort St. John, 106 days at Baldonnel, 66 days at Pouce Coupe, and 68 days at Hudson Hope. Local topographic variations may cause even greater differences. For example, in a study[2] at two sites less than a mile apart, and differing in elevation by only 134 feet, the frost-free period at the higher position ranged from 66 to 129 days and at the lower position from 10 to 76 days.

Sunshine is a significant feature of the Peace River climate. At Fort St. John the hours of bright sunshine averaged 2,055 hours over a 17-year period. Only two areas in British Columbia are reported to have more. These are the

[2] Albright, W. D., and J. G. Stoker. Topography and minimum temperature. Sci. Agr. 25: 146-155. 1944.

Table 6.—Records at Selected Stations on Climatic Factors Affecting Plant Growth

	Beatton River (airport)	Dawson Creek	Fort St. John (airport)	Baldonnell	Pouce Coupe	Hudson Hope	Progress	Rolla
Feet above sea level	2755	2186	2278	2250	2140	1606	2380	2150
Mean annual temperature, °F	29	33	35	35	34	34	34	
Yearly precipitation, inches	16.6	17.3	16.4	17.0	18.0	17.0	15.5	
Last frost[1] in spring								
Average	June 10	June 4	May 19	May 25	June 15	June 15	June 30	June 11
Earliest	May 4	May 30	May 3	Apr. 29	June 3	May 23	June 7	May 29
Latest	July 2	June 6	June 25	June 28	July 6	July 10	July 13	June 23
First frost in fall								
Average	Sept. 2	Sept. 6	Sept. 5	Sept. 1	Aug. 20	Aug. 22	July 20	Aug. 18
Earliest	July 21	July 17	Aug. 15	Aug. 5	July 19	July 17	July 16	Aug. 3
Latest	Sept. 9	Aug. 14	Sept. 28	Sept. 30	Sept. 10	Sept. 13	July 26	Sept. 2
Frost-free period								
Days	82	94	123	106	66	48	20	68
Years averaged	10	10	9	24	14	28	5	3
Growing period[2]								
Dates	May 7–Oct. 5	May 4–Oct. 9	Apr. 27–Oct. 5	Apr. 26–Oct. 8	Apr. 30–Sept. 27	Apr. 30–Oct. 4	Apr. 30–Oct. 4	—
Duration, days	151	158	161	165	151	157	157	—

[1]32° F or lower.
[2]Mean temperature 43° F or higher.

southern tip of Vancouver Island and the Williams Lake district. The large quota at Fort St. John is due to the long summer days common to northern regions.

Native Vegetation

The surveyed area is in the Boreal Forest Region of Canada. This region is made up of the Aspen Grove Section, the Mixedwood Section, and the Lower Foothills Section.

The Aspen Grove Section occurs along the southwestern and central parts of the area in the Dawson Creek and Fort St. John–North Pine districts. The native vegetation consists of open grasslands interspersed with groves of trees and shrubs. The grassland vegetation includes northern wheatgrass, bluegrass, wild ryegrass and a number of sedges. Aspen is abundant on north slopes and balsam poplar is common on moist lowlands. The shrubs are mainly willows, saskatoon, chokecherry and rose and there are various wild flowers and perennial herbs.

The Mixedwood Section is that part of the area east of the Rocky Mountain foothills. The characteristic forest vegetation is a mixture in varying proportions of aspen, balsam poplar, white birch and lodgepole pine. White spruce and balsam fir, though common, occur mainly in old stands. In poorly drained sites, black spruce and tamarack are common.

The Lower Foothills Section, in the western part of the area, in a narrow strip of forest land paralleling the Rocky Mountains. Dense stands of lodgepole pine, spruce, fir and poplar make up a large part of the forest cover. Balsam poplar and white birch are minor components. Lodgepole pine is the dominant species on light-textured soil. Larch, black spruce and willows are common in poorly drained areas.

GEOLOGY OF THE AREA[3]

The surveyed area is underlain by a succession of Cretaceous shales and sandstones that have been tilted gently to the northeast, east and southeast. These sediments, after being tilted, were exposed to long-continued erosion, which exposed beds hitherto buried to depths of as much as thousands of feet. Where sandstone beds are common in the succession now exposed, the land is relatively high and the topography rolling. These are the typical uplands such as are found along the Alaska Highway northwest of Fort St. John and in the area between the Pine and Kiskatinaw rivers.[4] Nearly flat-topped mesas and gently sloping cuestas persist where the sandstones are particularly thick or indurated; most notable among these is the cuesta a few miles south of Dawson Creek, supported by Cardium sandstone,[5] and the mesa east of Pouce Coupe. Areas where sandstones are almost completely absent from the succession, as east of Beatton River, west of Cache Creek, and along Pouce Coupe River, have lower elevations and subdued topography. The difference of but a few hundred feet in altitude between the uplands underlain by sandstone and the lowlands underlain by shales has in many places been critical in influencing, through climate and vegetation, the resulting soil characteristics. The shale lowlands, being slightly warmer and drier, have supported a grassland rather than woodland vegetation, and accordingly have favored the development of Black and Dark Gray rather than Gray Wooded soils on similar parent materials.

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[3] Contributed by Professor W. H. Mathews, Department of Geology, University of British Columbia, Vancouver, B.C.

[4] Irish, E. W. J. Charlie Lake, British Columbia; Geol. Surv. Can. Map 17, 1958.

[5] Scott, D. F. Dawson Creek map area, British Columbia. Geol. Surv. Can. Paper 61-10, 1961.

Soils are shallow and underlain by bedrock in a few areas, notably on the higher parts of the uplands. Here the parent materials of the soils have been derived from the bedrock. Boundary, Tremblay and Shearerdale are the soils developed on these materials.

Glaciation followed the long period of erosion that affected the Cretaceous beds, and has directly or indirectly been responsible for the mantle of unconsolidated debris now overlying nearly all the Cretaceous rocks.

The ice sheets that invaded the surveyed area in Wisconsin time have left their records both in deposits of till and in a more or less conspicuous erosion pattern of parallel grooves and drumloidal ridges. Three areas of glaciation are evident from the erosion pattern: one in the southwestern third of the area in which the grooves and ridges radiate northerly, northeasterly and easterly from the area where Pine and Sukunka rivers emerge from the Rocky Mountains; a second extending into the extreme northwestern corner of the area in which grooves and ridges parallel the valley of Halfway River; and a third, occupying the remainder of the area, in which trends of grooves and ridges are nearly north-south or northeast-southwest. The direction of ice movement in the last-mentioned area is not readily apparent from the erosional features, but the presence on the surface, throughout its extent, of boulders of red granite and granite gneiss from the Precambrian shield indicates that the ice must have moved from the northeast and north. In the three areas the latest glaciation has been attributed respectively to (1) a piedmont lobe of the Cordilleran ice sheet, (2) a glacier system originating in the higher peaks of the northern Rocky Mountains, near the head of Halfway River, and (3) the Keewatin ice sheet.

Till laid down by the Keewatin ice occurs throughout the eastern and northern parts of the surveyed area as a widespread blanket interrupted only by rare rock exposures and by later erosion. Above an altitude of 2,250 feet it lies at or close to the surface; below this altitude it may be buried as deep as 100 feet by later lacustrine sediments. The till in the upland areas seems to be generally less than 20 feet thick. In the main valleys and lowlands, however, it is commonly 100 feet thick. The till is typically a pebbly clay of a dull-brown color; locally in deep, fresh excavations it tends to be bluish. Boulders distributed sparsely through or on the till include granite gneiss and red granite from the Precambrian shield, pink quartzite thought to have been derived from the later Precambrian Athabasca formation, and rare fragments of shale containing a species of *Atrypa* and thought to have come from outcrops of the Waterways formation. Also present in the Keewatin till are boulders of white to creamy quartzitic sandstone and fragments of clay ironstone, sandstone and coal. These till deposits are the parent materials of the Alcan, Murdale, Mytron, Fellers, Demmitt and Hanshaw series.

The Keewatin till usually shows little or no variation in texture, composition or color in the upper few feet. It may, however, grade through an obscurely stratified material, otherwise indistinguishable from till, into lacustrine clay in which pebbles are scarce or absent. The obscurely stratified material is probably morainal debris dropped from the ice through the waters of a glacier-dammed lake, and it may be called simply "lacustro-till." It forms the parent material of the Donnelly, Esher, Landry, Hazelmere and Albright soils and occurs mainly on the lower slopes of the till plain.

In the deposits of the Cordilleran ice sheet, the till, lake-lain or otherwise, is distinctly subordinate to fairly well sorted sediment. East of the foothills the till sheet, even within the major valleys, is rarely more than 10 feet thick and in some places it is represented only by lenses a foot or two thick. It consists of grayish-brown and light yellowish brown calcareous sandy clay loam and clay loam that has many stones and boulders. It forms the parent material of the Moberly soils.

The till is commonly buried by sands and silts from a foot to many scores of feet thick. Much of this sand and silt was probably deposited in the shallow waters of one or more preglacial lakes, but in a few localities, notably near the mouth of Rocky Mountain Portage and north of Jackfish Lake, the surface debris over considerable areas was evidently laid down as outwash by temporary meltwater streams leaving the ice front. The main soils developed on these variable deposits are the Beryl and Sloane.

Dislocation of drainage by Keewatin ice, which blocked the lower Peace River valley, led to the development of proglacial lakes. Two of these, both large, are indicated in the surveyed area by extensive wave-cut strandlines and the accompanying beach deposits of gravel and sand, and by lake-bottom deposits of lacustrine till, clay, silt and, locally, sand. The higher and older of these two lakes, the shorelines of which are about 2,750 feet above sea level, occurred in the Bessborough stage of Lake Peace. A successor to this lake was a body of water of which the shorelines within the surveyed area are about 2,260 feet above sea level. The levels of these lakes fluctuate because of downcutting of their outlet channels or tilting of the land during deglaciation or a combination of the two processes. As a result, the Bessborough stage is represented by as many as four distinct shorelines within a vertical interval of about 40 feet, and wave-washed gravels occur through a vertical range of about 50 feet at an altitude of 2,260 feet. The low gravel ridges marking the old shorelines have become prominent landforms along those parts of the lake margins most affected by wave action, places where deep water formerly extended close to shore and that were fully exposed to the sweep of wind and waves. The shorelines can be recognized better by the gravelly texture of the wave-washed surface debris than by any configuration of the land. Commonly the gravel and sand along the shorelines are only a few feet thick and but a few score feet wide. Locally, however, they are sometimes much thicker. Gravel, sand and silt may also occur in considerable volume in abandoned deltas where streams intersected the old shorelines. These deposits are the principal parent materials of the Codesa, Belloy. Clouston and Grouard soils.

Lake-bottom sediments grade progressively from gravel at the former shorelines through sand and silt to clay, laid down in what was formerly the deeper, central parts of the lakes. The transition from gravel to clay may take place within a horizontal distance of only a few hundred feet and a vertical distance of a few tens of feet. Elsewhere, notably in the western part of Lake Peace, where much sand and silt was introduced by glacial meltwater and where shallow water extended far from shore, clay is scarce or absent within miles of the lake margins. The sediment varies slightly in thickness and in many cases appears to have been reworked by wind action. Soils developed on the fine sandy loam and silt loam deposits are the Toad, Lynx, Davis and Tangent series, and those on the sandy or gravelly materials are the Groundbirch, Sundance and Twidwell series.

Some sediment was evidently moved from slopes to basin floors by underwater slides, for there are local beds of silt between strata of undisturbed clays. Soils developed on these sediments are the Peoria and Codesa series and, in part, the Sloane and Beryl series.

The bottom sediments of Lake Peace are as much as 100 feet thick near the axes of the main valleys, where the lake itself was as much as 250 feet deep. From Cache Creek east to the Alberta-British Columbia boundary, clay is the main bottom sediment. The sediments are dark gray to gray, stone-free, and somewhat saline; they are believed to have been derived in large part from the Smoky River shales by glacial erosion followed by glaciolacustrine sedimentation. The Rycroft, Falher, Nampa, Beatton, Doig and Roseland soils developed in this lacustrine clay.

Earth mounds of an unusual size and number occur along the present major stream courses. They are as much as 40 feet high and hundreds of feet across at their bases. Most have the form of a smooth, broad cone; a few, however, have dimples or craters on their summits and some are irregular in shape as a result of the coalescence of two or more domes. They may be widely separated by flat ground, or they may be separated only by a network of narrow troughs. Few of the mounds are elongated and nowhere is there a prevailing trend to their long axes. Well-developed soils are found on the slopes and in the summit craters. Clearly the mounds have existed for a considerable period, if not since Lake Peace drained. The internal structure of only a very few mounds has been exposed in road cuts or by landslide scars. In some, calcareous silt overlies till; in others a similar silt overlies lacustrine clay; still others consist of bedded sands throughout the exposed depth. These varied deposits are the principal parent materials of the Kathleen, Judah, Davis and Tangent soils and, in part, the Beatton, Doig and Roseland soils.

The major geological development in post-Pleistocene time has been the cutting of deep valleys in the old lake beds by the Peace River and its tributaries. In places the river is now as much as 750 feet lower than when Lake Peace was drained (Figure 5). In cutting to this depth it has left a series of discontinuous benches cut in bedrock and mantled with a layer of fluviatile debris as much as 65 feet deep. Tributary streams have cut valleys of similar depth, at least near their mouths, and have left smaller benches veneered with thinner mantles of stream-lain sediment. A few small or intermittent streams debouching on flat ground, either the former lake bottom or later stream-cut benches, have deposited broad cones of ill-sorted sediment up to about 100 feet deep. The Pingel, Widmark, Branham, Taylor and Farrell series occur on these varied and comparatively recent deposits.

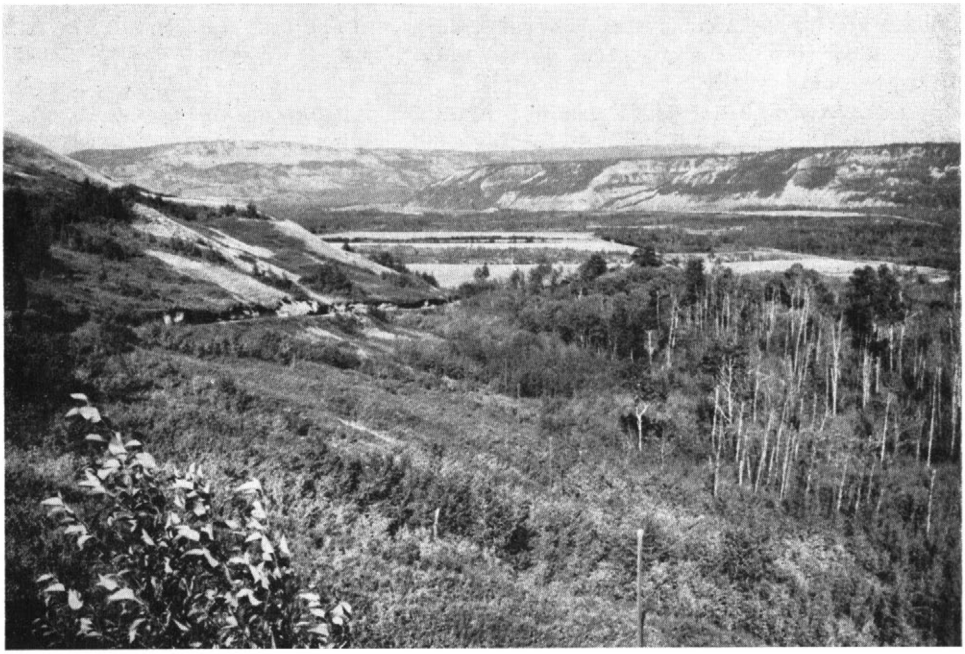


Figure 5.—View of the Peace River near Bear Flats. (British Columbia Government photograph)

SOIL FORMATION, MAPPING AND CLASSIFICATION

Soil Formation

The soil at any particular site is the net result of the interaction of parent material, climate, vegetation, topography, drainage and time. The importance of each varies from place to place; sometimes one is more important, sometimes another.

In the soil-forming process, layers parallel to the surface develop. A vertical section of these layers, or horizons, from the surface into the unweathered parent material is called a *soil profile* (Figure 6). The L, F and H horizons are organic accumulations on the surface of the mineral soil. The A horizon, the first mineral layer, is the horizon in which most weathering takes place and from which soluble materials are leached; it may contain more organic matter than other mineral layers. The materials leached from A accumulate in the B horizon, which is often finer in texture and more compact than A. The C horizon is the parent material.

Subdivisions of the horizons are designated by lower-case letters and Arabic numerals, for example, Ah1, Ae1 and Bt1 (Figure 6 and glossary).

Mapping

Soil surveys involve the study, identification and mapping of the soils in the field, as well as the assembling, analyzing and interpreting of the data.

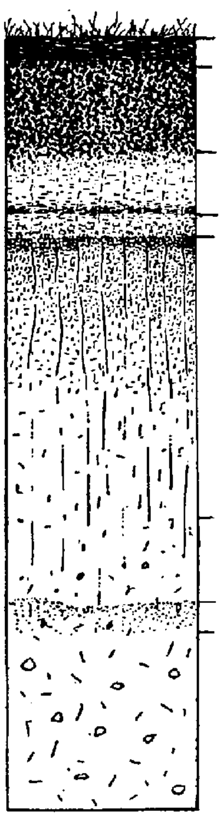


Figure 6.—Common horizons in a soil profile. Some profiles may not have all these horizons clearly developed. The mineral horizons are denoted by lower-case suffixes, for example, h, e and k, the suffix depending on the distinctive feature of the layer.

The survey of the area was a detailed reconnaissance of the settled areas and a broad reconnaissance of the areas beyond the fringe of settlement. Traverses were made by car, and where necessary by saddle horse. Roads and trails provided access to most parts of the area, enabling traverses to be made at intervals of one to three miles. Where more detail was required, traverses on foot were made inside each quarter section.

The soils were examined in test pits, road cuts and ditches to determine the texture, color, depth, and structure of the various horizons. Additional notes were taken on topography, stones and other features important in the agricultural development of the area.

Soils having different types of profile occur in close association. The differences may be due to relief and drainage or to parent material. The Landry and Esher series are examples of the former, and the Landry and Belloy series are examples of the latter. It was impossible to separate closely related soils like these on the scale of mapping used. Hence the mapping unit consists of two or more soil series, which are indicated on the soil map by alphabetic symbols. Only the main series are indicated. The boundaries between mapping units were determined with the aid of aerial photographs.

Classification

The soils were classified on the basis of soil series and types. A *soil series* consists of soils developed on similar parent materials under similar environmental conditions. Most were named after places in the areas where they were found. The series are usually subdivided into *types* according to the texture of the surface soil (Table 7). Textural names such as silt loam and silty clay loam, when added to the series name, give the full name of the soil type, e.g., Kathleen silt loam.

In Table 7 the soil series are grouped according to the type of parent material. The differences between soils within each group are due to differences in vegetation and drainage. Each group is often referred to as a *catena.* Many soils that are poorly drained are similar to one another though the parent materials are different. Soils of the same series, therefore, are often included in two or more catenas.

The soil types were grouped into topographic classes based on characteristics important in agriculture. These classes (see glossary) reflect mainly differences in slope, degree of erosion, and stoniness.

Major Soil Groups

Many major kinds of soil profiles were distinguished on the basis of general characteristics associated with the main soil-forming processes. These were classified into *great groups* and *subgroups* on the basis of morphological, chemical and physical properties, as follows.

Black Great Group

The Black soils are most commonly found on nonsaline parent materials under grassland vegetation in well to moderately well drained positions. These soils have very dark gray or black surface (A) horizons high in organic matter and granular in structure. The B horizon is brown and has a granular or subangular blocky and weak columnar structure. Under the B, a light-colored lime layer (Ck) usually occurs. Two subgroups were mapped, as follows:

Eluviated Black soils have a well-developed, dark-gray, very dark gray or black Ahe horizon several inches thick, a gray or grayish-brown leached (Ae) horizon, and a transitional (AB) horizon underlain by a subangular blocky illuvial (Bt) horizon in which clay is the main accumulation product.

Table 7.—Classification of the Soils in the Peace River District of British Columbia

Soils Developed on Glacial Till

On gray and grayish-brown clay loam and clay, slightly calcareous and somewhat saline

Alcan, Gray Wooded Solod loam and clay loam
Murdale, Dark Gray Solod loam and clay loam
Mytron, Black Solod loam and clay loam
Buick, Low Humic Eluviated Gleysol loam and clay loam

On grayish-brown and yellowish-brown sandy loam, clay loam and clay, slightly calcareous, often gravelly or stony

Fellers, Bisequa Gray Wooded sandy loam and loam
Demmitt, Orthic Gray Wooded sandy loam and loam
Hanshaw, Gray Wooded Solod loam and clay loam
Snipe, Low Humic Eluviated Gleysol loam and clay loam

On gray and gray-brown loam and clay loam, moderately and strongly calcareous, often stony or gravelly

Moberly, Bisequa Gray Wooded loam and clay loam

Soils Developed on Lacustrine—Glacial Till
(Lacustro-till)

On gray and dark grayish brown clay loam and clay, slightly and moderately calcareous and somewhat saline

Donnelly, Gray Wooded Solod loam and clay loam
Esher, Dark Gray Solod loam and clay loam
Landry, Black Solod loam and clay loam
Snipe, Low Humic Eluviated Gleysol loam and clay loam
Goose, Orthic Meadow silty clay loam and clay
Prestville, Peaty Meadow silty clay loam and clay

On strata of gray and dark grayish brown clay loam and clay alternating with yellowish-brown sandy loam and clay loam strata, slightly calcareous and somewhat saline, often gravelly or stony

Hazelmere, Gray Wooded Solod loam and clay loam
Albright, Dark Gray Solod loam and clay loam
Snipe, Low Humic Eluviated Gleysol loam and clay loam
Goose, Orthic Meadow silty clay loam and clay

Soils Developed on Lacustrine Materials

On gray and dark-gray clay, slightly and moderately calcareous, somewhat saline

Nampa, Gray Wooded Solod clay loam and clay
Falher, Dark Gray Solod clay loam and clay
Rycroft, Black Solodized Solonetz clay loam and clay
Goose, Orthic Meadow silty clay loam and clay
Prestville, Peaty Meadow silty clay loam and clay

On gray silty clay loam and silty clay, moderately and strongly calcareous, often somewhat saline

Sukunka, Orthic Gray Wooded silt loam and silty clay loam
Devereau, Dark Gray Wooded silty clay loam
Arras, Dark Gray Solod silt loam and silty clay loam

Table 7.—Classification of the Soils in the Peace River District of British Columbia—Cont.

Rolla, Black Solod silty clay loam and silty clay
Coleman, Low Humic Eluviated Gleysol silt loam and silty clay loam
Goose, Orthic Meadow silty clay loam and clay
Prestville, Peaty Meadow silty clay loam and clay

On brown silty clay loam and silty clay, friable, moderately calcareous

Kathleen, Orthic Gray Wooded silt loam and silty clay loam
Judah, Dark Gray Wooded silty clay loam and silty clay

On gray and grayish-brown silty clay loam and silty clay, somewhat saline

Beatton, Gray Wooded Solod silty clay loam and silty clay
Doig, Dark Gray Solod silty clay loam and silty clay
Roseland, Black Solod silty clay loam and silty clay
Prespatou, Low Humic Eluviated Gleysol silty clay loam and silty clay
Prestville, Peaty Meadow silty clay loam and clay

Soils Developed on Alluvial and Aeolian Materials

On gray and gray-brown, variable fine sandy loam and silt loam, very calcareous

Toad, Bisequa Gray Wooded sandy loam and silt loam
Lynx, Brunisolic Gray Wooded fine sandy loam and silt loam
Davis, Orthic Gray Wooded loam and silt loam
Tangent, Dark Gray Wooded loam and silt loam
Codner, Orthic Meadow sandy loam and silt loam
Centurion, Calcareous Meadow sandy loam and silt loam

On gray-brown and yellowish-brown, variable sandy materials, often underlain by gravel, moderately calcareous

Groundbirch, Bisequa Podzol sand and loamy sand
Sundance, Bisequa Gray Wooded loamy sand and sandy loam
Twidwell, Bisequa Gray Wooded gravelly loamy sand and sandy loam

On comparatively recent alluvial, colluvial and flood deposits, slightly and moderately calcareous

Pingel, Degraded Brown Wooded clay
Widmark, Degraded Brown Wooded silt loam and silty clay loam
Branham, Orthic Brown Wooded sandy loam and fine sandy loam
Taylor, Rego Black loam and clay loam
Farrell, Mull Regosol silt loam and silty clay loam
Alluvial, Undifferentiated river flat and terrace deposits

On yellowish-brown sandy loam and silt loam

Alces, Orthic Podzol fine sandy loam

On relatively thin, sandy loam and silt loam (not exceeding 30 inches) overlying slightly calcareous and somewhat saline clay loam and clay

Codesa, Orthic Gray Wooded loamy sand and silt loam
Peoria, Eluviated Black sandy loam and silt loam
Belloy, Dark Gray Wooded sandy loam and loam

On relatively thin, sandy loam and silt loam overlying moderately calcareous silty clay loam and silty clay

Beryl, Bisequa Gray Wooded fine sandy loam and silt loam
Sloane, Orthic Gray Wooded fine sandy loam and silt loam
Coldstream, Low Humic Eluviated Gleysol fine loam and silt loam

Table 7.—Classification of the Soils in the Peace River District of British Columbia—Conc.

Soils Developed on Coarse Outwash and Beach Materials

On gray-brown and pale-brown gravelly loamy sand and gravelly, sandy loam, often stony

Clouston, Orthic Gray Wooded gravelly loamy sand, and gravelly sandy loam
Clayhurst, Degraded Brown Wooded sandy loam and gravelly sandy loam
Grouard, Dark Gray Wooded gravelly loamy sand and sandy loam

Soils Developed on Residual and Modified Residual Materials

On brown and yellowish-brown sandstone

Tremblay, Podzol fine sandy loam
Shearerdale, Orthic Gray Wooded sandy loam and gravelly sandy loam

On gray and dark-gray mixed till and shale, somewhat saline

Boundary, Undifferentiated Podzolic soils: clay loam and clay
Buick, Low Humic Eluviated Gleysol loam and clay loam

Soils Developed on Organic Materials

On dark-brown and black, fine peat developed mainly from sedges and coarse grasses

Eaglesham, Fibrous peat

On brown and dark-brown, coarse peat developed mainly from sphagnum moss

Kenzie, Sphagnum peat

Rego Black soils have thick, very dark gray or black surface mineral (Ah) horizons underlain by C horizons; B horizons are lacking. These soils occur mainly on recent alluvial or colluvial materials on intermediate terraces along the Peace River.

Solodized Solonetz Great Group

The Solodized Solonetz soils occur in association with the Black soils. These soils are similar to Black soils except that they have a hard, compact and strongly columnar Bn horizon, and often a thin eluvial (Ae) horizon. The tops of the columns are capped with gray and the sides have dark coatings or stainings. Lime and other salts are usually present in the lower B and upper C horizons.

Black Solodized Solonetz is the only subgroup found.

Solod Great Group

Solod soils have a thick light-colored (Ae) horizon, a transitional (AB) horizon, and a loose, subangular blocky, solonetzic (Bn) horizon. The B horizon is finer in texture than the A horizon and has a weak prismatic structure.

Solod soils are the most common ones in the eastern part of the surveyed area and are found mainly on saline or somewhat saline materials. Depending on the organic matter and color of the A horizons, they are Black, Dark Gray or Gray Wooded Solod soils.

Black Solod soils have developed under grassland. They have a thick, very dark gray or black Ah horizon, a well-developed, platy Ae horizon, and a transitional (AB) horizon.

Dark Gray Solod soils have developed under grassland recently invaded by trees. These soils differ from Black Solod soils in having a gray, very dark gray or brown Ah or Ahe horizon and a light-colored, platy Ae horizon. A surface organic (L-H) horizon may be present.

Gray Wooded Solod soils have developed under mixed deciduous and coniferous forest. These soils have a thin Ah or Ahe horizon, a thick gray or pale-brown Ae horizon, and a well-developed, subangular blocky Bn horizon. Organic surface (L-H) horizons are commonly present.

Gray Wooded Great Group

The Gray Wooded great group includes soils with organic surface (L-H) horizons in undisturbed areas, light-colored eluvial (Ae) horizons and illuvial horizons in which clay is the main accumulation product (Bt). The solum generally has a medium to high degree of base saturation.

Gray Wooded soils are found under mixed forest vegetation or under forest in the grassland-forest transition zone.

Orthic Gray Wooded soils have a thin or no Ah horizon and usually have an AB horizon.

Dark Gray Wooded soils differ from the Black in having a gray or dark gray Ah or Ahe horizon 2 to 4 inches thick and overlying a lighter-colored Ae horizon. This subgroup is an intergrade between the Orthic Gray Wooded and Eluviated Black soils. The soils have developed in areas where woodland vegetation has invaded grassland rather recently.

Brunisolic Gray Wooded soils have a well-developed organic surface (L-H) horizon overlying a brown Ae1 horizon that grades to a lighter-colored Ae2 horizon over a finer-textured Bt horizon. These soils are so called because of the Brunisolic (Acid Brown Wooded) profile that has developed in the Ae horizon of the original Gray Wooded profile.

In Bisequa Gray Wooded soils, Podzol horizons (Ae and Bfh) have developed in the Ae horizon of a Gray Wooded soil and are underlain by a continuous Bt horizon. The podzol-like or secondary profile is readily recognized by its light-gray Ae horizon overlying a distinct-brown or reddish-brown Bfh or Bf horizon. Remnants of the Gray Wooded Ae horizon are still recognizable. The Bt horizon of the Gray Wooded profile usually undergoes some alteration but generally is continuous. These soils are found mainly on medium- and light-textured material of Cordilleran origin.

Podzol Great Group

Undisturbed Podzol soils have an organic surface (L-H) horizon, a light-colored eluvial (Ae) horizon and an illuvial (B) horizon in which organic matter and sesquioxides are the main accumulation products (Bfh or Bf). The solum is generally moderately to strongly acid. Podzol soils have developed under a mixed forest vegetation on noncalcareous material or on materials from which free lime has been removed.

Orthic Podzol soils in the area have a light-gray Ae horizon more than 1 inch thick and a brown, friable Bf horizon. These soils occupy small areas north and east of Cecil Lake and have developed under coniferous forest.

Bisequa Podzol soils in the area have Ae and Bf horizons that have developed in the Ae horizon of a Gray Wooded soil. They are underlain by a Bt horizon. This subgroup differs from the Bisequa Gray Wooded soils in that the Podzol profile is more than 18 inches thick and is underlain by a weak and discontinuous Bt horizon.

Brown Wooded Great Group

The Brown Wooded soils represent an early stage of development between a Regosol and a Gray Wooded soil. They have developed in wooded areas and are common on the intermediate terraces along the Peace River between Clayhurst and Hudson Hope. These soils are well drained and usually have a thin organic surface layer, and a brown or yellowish-brown mineral horizon on light-gray calcareous material. Two subgroups were identified.

Orthic Brown Wooded soils are well drained and have no apparent eluvial or illuvial horizons. The upper part of the solum is usually brown in color and low in organic matter.

Degraded Brown Wooded soils are well drained Brown Wooded soils that have weakly developed eluvial (Aej) and illuvial (Btj) horizons as shown by some clay accumulation.

Meadow Great Group

Meadow soils are poorly drained and have developed under sedge and grass. They have a dark-colored Ah horizon more than two inches thick that grades into a lighter-colored horizon or horizons that often show evidence of gleying. Three subgroups were found.

Orthic Meadow soils have a noncalcareous, very dark gray or black Ah horizon that is high in organic matter and often granular in structure. The underlying horizon, Bg or Cg, is dull gray and mottled with yellowish and brownish streaks and spots. The soils are noncalcareous but free lime may occur in the subsoil.

Calcareous Meadow soils differ from the Orthic subgroup in being calcareous throughout. Some of them are also somewhat saline.

Peaty Meadow soils differ from the Orthic subgroup in having a peaty surface layer less than 12 inches thick. This peaty horizon appears to be formed from sedge-grass vegetation, although sphagnum moss may also occur on the surface.

Eluviated Gleysol Great Group

Eluviated Gleysol soils have organic (L-H) horizons 12 inches thick and/or Ah horizons overlying mottled Aeg and Bg horizons. These soils are poorly drained and have developed under grasses, sedges or swamp-forest vegetation.

Two subgroups were found.

Humic Eluviated Gleysol soils have an Ah horizon more than two inches thick and a mottled Aeg and Btg horizon. Organic surface (L-H) horizons up to six inches thick may be present.

Low Humic Eluviated Gleysol soils have organic surface (L-H) horizons up to six inches thick, and a thin or no Ah horizon underlain by mottled Aeg and Btg horizons.

Regosol Great Group

Regosol soils lack discernible horizons or have only organic surface (L-H) horizons up to 12 inches thick, or weakly developed (nonchernozemic) organic mineral (Ah) horizons. These soils occur mainly along the Peace River and tributary streams, on recent alluvium. Two subgroups were found.

Orthic Regosol soils are well and imperfectly drained soils lacking horizons or with thin, weak (nonchernozemic) Ah horizons. These soils are confined mainly to recent river alluvium, low islands and terraces. Many are still subject to flooding.

Mull Regosol soils have distinct (nonchernozemic) Ah horizons and little or no surface organic (L-H) accumulation. These soils are not common in the surveyed area and are confined to intermediate river terraces near Hudson Hope.

Organic Soils

Organic soils are found in many level to depressional areas where drainage is restricted. They have developed under grass, sedge and moss and, in places, under swamp-forest vegetation. They have an organic surface (L-H) layer more than 12 inches thick overlying a wet, poorly drained mineral subsoil.

The two types of Organic soils found differ in nature and depth of the peat accumulation. They are called Sedge Peat and Moss Peat.

DESCRIPTIONS OF THE SOILS[6]

This section gives information on the classification, locations, surface features, profiles, and agricultural uses of the soils. Table 12 gives the acreage for each soil, and the soils are rated for agriculture on page 106. For photographs of representative profiles, see Figure 10.

Soils Developed on Glacial Till

ON GRAY AND GRAYISH-BROWN CLAY LOAM AND CLAY, SLIGHTLY CALCAREOUS AND SOMEWHAT SALINE

Alcan, Murdale, Mytron and Buick, the series formed on these materials, are clay loams. The first three occupy the better-drained areas. The Buick soils occur in depressions and poorly drained lowlands.

Alcan Series (Ac)

The Alcan soils, Gray Wooded Solod loams and clay loams, are widely distributed throughout the surveyed area. They have developed under a tree cover thought to be mainly an aspen-spruce association; repeated fires have destroyed much of the spruce, leaving aspen, willow and alder as the present cover.

These are the main soils on about 940,950 acres. About 524,235 acres have long, uniform slopes; 146,155 acres are rolling and moderately sloping and some 270,460 acres are steeply sloping and hilly.

In moderately well drained soil, the profile is remarkably uniform over much of the area. Several imperfectly drained areas were observed, but these evidently were of limited extent. Runoff is generally high, particularly in burned areas, and movement of water through the profile is moderate to slow.

The Alcan soils have a thick, gray Ae horizon and a brown to dark grayish brown B horizon that is finer in texture than the A horizon. An accumulation of lime is often found in the subsoil at depths of 6 to 10 feet. Salts, mainly gypsum, are relatively abundant. Sandstone and shale fragments are numerous and increase in abundance with depth. A typical profile is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Very dark brown litter. pH 6.9.
Ahe	0 – 1	Grayish-brown (10YR 5/2, moist) loam. Fine granular structure; friable. pH 5.2.

[6] In the descriptions, the soil colors are as in the Munsell soil color charts (Munsell Color Company Inc., Baltimore 2, Maryland, U.S.A. 1954).

Horizon	Depth Inches	
Ae	1 – 4	Light-gray (10YR 7/2, dry), grayish-brown (10YR 5/2, moist) silt loam. Weak, platy and moderately fine granular structure; friable. pH 4.8.
AB	4 – 7	Light-gray (10YR 7/2, dry), grayish-brown (10YR 5/2, moist) clay loam. Moderate, fine blocky structure; plastic. pH 4.8.
BA	7 – 10	Light brownish gray (10YR 6/2, dry), dark grayish brown (10YR 4/2, moist) clay. Weak, medium prismatic breaking to moderate, fine, subangular blocky structure; plastic. pH 4.8.
Bn	10 – 24	Light brownish gray (10YR 6/2, dry), dark grayish brown (10YR 4/2, moist) clay. Weak, prismatic, and strong, medium blocky structure; clay skins common; firm. pH 4.6.
BC	24 – 31	Very dark grayish brown (10YR 3/2, moist) clay. Medium and fine blocky structure; very hard when dry and moderately firm when moist; pH 4.4.
CB	31 – 72	Very dark grayish brown (10YR 3/2, dry), dark-gray (10YR 4/1, moist) clay. Medium and fine blocky structure; firm. pH 5.0.
Ck	72 – 74	Dark-gray (10YR 4/1, moist) clay. Fine blocky structure; slight lime accumulation. pH 7.8.
Cs	74+	Dark-gray clay till. Moderate, fine blocky structure; gypsum accumulation. pH 8.0.

The pH ranges from 3.9 to 5.8 in the B horizons.

Use

Agricultural development of the Alcan soils has proceeded very slowly even though most of the soils are arable. Moderately undulating and gently sloping areas provide soils reasonably suitable for farming. Lands with 9 to 15 percent slope are classed as poor and areas with steeper slopes are non-arable.

High costs of clearing, inaccessibility, a short growing season and many problems in fertility and physical condition are adverse factors.

When developed, these soils are probably suitable at first for acid-tolerant crops. The Ae horizon has a weak structure and extends well below the normal depth of tillage. In addition, when wet this horizon tends to run or flow, and upon drying forms a firm, compact mass that hinders plant emergence and tillering.

These soils are low in fertility, but undoubtedly are capable of significant improvement through the adoption of good management practices.

Murdale Series (Mu)

The Murdale soils, Dark Gray Solod loams and clay loans, predominate on about 29,215 acres of the surveyed area between Fort St. John and Montney. They are associated with the Alcan and Mytron series. They have developed under parkland cover consisting of grasses, shrubs and sparse stands of aspen.

These soils are mainly gently or moderately sloping, the slopes being long and smooth. The soils are well drained but because of their slope have moderately high to high runoff.

The main morphological feature of Murdale soils is a well-developed, dark-colored surface horizon (Ah) with a granular structure. The leached (Ae) horizon, rarely more than three inches thick, rests on a weakly columnar, clay-textured B horizon. The boundary between the A and B horizons is abrupt and wavy. A typical profile is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown leaf litter. pH 7.0.
Ah1	0 – 2	Very dark grayish brown (10YR 3/2, dry), very dark brown (10YR 2/2, moist) loam. Moderate, medium granular structure; friable. pH 6.4.
Ah2	2 – 5	Dark grayish brown (10YR 4/2, dry), very dark grayish brown (10YR 3/2, moist) loam. Moderate, weak prismatic breaking readily to medium and fine granular structure; friable. pH 6.1.
Ae	5 – 6	Light-gray (10YR 7/2, dry), light brownish gray (10YR 6/2, moist) silt loam. Moderate, coarse platy and fine granular structure; friable. pH 5.3.
AB	6 – 7	Very pale brown (10YR 7/3, dry), brown (10YR 5/3, moist) silt loam. Medium, subangular blocky and coarse prismatic structure; firm. pH 5.0.
BA1	7 – 10	Very pale brown (10YR 7.5/3, dry), brown (10YR 4/3, moist) clay. Moderate, weak prismatic breaking readily to medium, subangular blocky structure; hard when dry and firm when moist. pH 4.7.
BA2	10 – 15	Pale-brown (10YR 6/3, dry), dark-brown (10YR 3/3, moist) clay. Moderate, medium prismatic and strong blocky structure; hard when dry, firm when moist; pH 4.6.
Bn	15 – 26	Brown (10YR 5/3, dry), dark-brown (10YR 3/3, moist) clay. Moderate, medium prismatic breaking readily to fine and medium blocky structure; hard when dry and very firm when moist. pH 4.6.
BC	26 – 31	Brown (10YR 5/3, dry), very dark grayish brown (10YR 3/2, moist) clay. Weak prismatic and strong, medium blocky structure; very firm when moist. pH 4.4.
Cs	31 – 50	Grayish-brown (10YR 5/2, dry), very dark brown (10YR 2/2, moist), silty clay loam. Coarse, medium blocky structure; very compact; firm. pH 5.6.
C	50+	Dark grayish brown clay loam till. pH 8.0.

Use

Most of the Murdale soils are cultivated and valued for general grain production. Legumes and grasses also do very well. Largely because of the farm practices followed, the nature of the soil, topography and type of rainfall, soil erosion is a serious problem. The hazard may be reduced by contour cultivation, maintenance of organic matter in the surface soil, and mixed farming with grasses and legumes in the rotation.

Murdale soils are classed as good arable soils.

Mytron Series (My)

The Mytron soils, Black Solod loams and clay loams, occur mainly in the area commonly known as the Fort St. John Indian Reserve, north of Fort St. John. Small areas were mapped in the Montney, Tupper Creek and Kilkerran districts. The soils are associated with Murdale and Landry soils and are found on well-drained south slopes and many of the high ridges and knolls in the parkland areas. About 8,580 acres were mapped.

Typical soils of this series have developed on gently and moderately sloping land with long, uniform slopes. Only about 2,230 acres were classed as irregular, steeply sloping.

A representative profile has a rather thick, well-developed dark-brown to black Ah horizon and a B horizon that is normally finer in texture than the horizons above or below. The soil has a weakly developed columnar structure. Horizons of lime carbonate and salt accumulation are found at depths of 24 to 36 inches.

A typical profile is described as follows:

Horizon	*Depth Inches*	
Ah1	0 – 6	Very dark grayish brown (10YR 3/2, dry), loam. Moderate, coarse prismatic breaking readily to granular structure; friable. pH 6.6.
Ah2	6 – 8	Dark grayish brown (10YR 4/2, dry) loam. Moderate, coarse prismatic breaking readily to granular structure; friable. pH 5.6.
Ae	8 – 10	Pale-brown (10YR 6/3, dry) clay loam. Weak, medium platy and subangular blocky structure; friable. pH 5.2.
AB	10 – 13	Light yellowish brown (10YR 6/4, dry) clay loam. Moderate, medium, subangular blocky structure; peds with many fine pores and coated with bleached sand grains; slightly hard, firm; lower boundary wavy. pH 4.6.
BA	13 – 16	Light brownish gray (10YR 6/2, dry), grayish-brown (10YR 5/2, moist) clay loam. Weak, medium prismatic breaking to strong, fine, subangular blocky and blocky structure; very hard when dry and very firm when moist. pH 4.6.
Bn	16 – 21	Very dark grayish brown (10YR 3/2, moist) clay. Weak, medium prismatic breaking to strong, fine and medium blocky structure; patchy clay skins and organic coatings on peds; very hard when dry and very firm when moist. pH 4.9.
BC	21 – 33	Dark grayish brown (10YR 4/2, moist) clay. Moderate, medium blocky structure; few clay skins and organic coatings on peds; very firm when moist. pH 6.6.
Ck	33 – 36	Similar to above horizon but containing moderate amounts of lime carbonate. pH 7.6.
Cs	36 – 38	As above with an accumulation of gypsum. pH 7.5.
C	38+	Very dark gray (10YR 3/1, moist), clay loam. Fine blocky structure; pockets of salts common; few stones. pH 8.2.

Use

Depending on topography, Mytron soils are good to very good arable soils.

The general characteristics of the profile, field observations and preliminary physical studies indicate that these soils are productive. Their texture, structure, permeability, friability and tilth promote high yields of cereals and other crops for which the climate is suitable. They are high in organic matter and reasonably high in nitrogen, phosphate and potash. Though the soils are medium to strongly acid they are well supplied with calcium.

These soils occur in areas where creeping red fescue, brome and other grasses have been very successful. Mixed farming combined with other approved management practices, including systematic use of legume and grass crops, will ensure maintenance of the natural fertility. Water erosion is a serious hazard on all of the soils. Wind erosion, too, may be serious on exposed slopes.

Buick Series (Bu)

The Buick soils, Low Humic Eluviated Gleysol loams and clay loams, have developed on brown, somewhat saline materials and are found in the low-lying, poorly drained depressions in association mainly with the Alcan, Boundary, Beatton and Doig soils. They have developed under a forest cover consisting mainly of aspen poplar, black poplar, lodgepole pine, willows, groundbirch and varying amounts of coarse grasses and sedges. They are poor to very poorly drained and may on occasion be ponded.

These are the main soils of some 18,285 acres.

The profile has a thin peaty horizon, a thin, granular Ah horizon and a thick, iron-stained Ae horizon. The B horizon is fine in texture and highly mottled and grades into a gray, impervious substratum. The profile of a loam is described as follows:

Horizon	*Depth Inches*	
L	4 – 2	Brown moss peat. Often absent because of fires. pH 7.5.
F-H	2 – 0	Very dark brown decomposed moss. pH 7.4.
Aeg	0 – 4	Very pale brown (10YR 8/3, dry), light gray (10YR 7/2, moist) loam. Strong, medium platy structure; mottled; firm. pH 6.3.
BAg	4 – 5	Grayish-brown (10YR 5/2, dry) mixed with yellowish-brown (10YR 5/4, moist) silty clay loam. Moderate, medium, subangular blocky structure; plastic when wet; tongues of this material often extending into the Btg horizon. pH 6.0.
Btg	5 – 25	Grayish-brown (10YR 5/2), and brown (10YR 4/3, moist) silty clay. Medium, yellowish-brown mottles common. Massive, breaking to coarse and medium blocky structure; very sticky when wet and hard when dry. pH 4.5.
BCg	25 – 33	Dark-gray (10YR 4/1, moist) silty clay loam. Common, medium, distinct yellowish-brown (10YR 5/4, moist) mottles. Massive to weak, coarse blocky structure; very plastic. pH 4.5.

Use

Until drained, Buick soils are suitable only for pasture.

Practically all the areas covered by these soils are still in their natural forested state, and little information is available on their productivity. Successful management of these poorly drained soils will evidently depend on improvement of their fertility and physical condition.

On grayish-brown and yellowish-brown sandy loam, clay loam, and clay, slightly calcareous, often gravelly or stony

The Fellers, Demmitt and Hanshaw series are the well to imperfectly drained soils formed on these materials. The Snipe series occurs in the depressions and poorly drained lowlands.

Fellers Series (Fe)

The Fellers soils, Bisequa Gray Wooded sandy loams and loams, occur in the southern part of the surveyed area, on the tablelands at elevations above 3,000 feet. They are normally very well drained but the variations in relief result in very different local drainage conditions.

The forest cover consists of fairly dense stands of lodgepole pine and poplar, with varying amounts of spruce, birch and various shrubs.

These are the main soils on about 156,740 acres, most of which is irregularly steeply sloping and hilly land.

Fellers profiles have a thick, undecomposed organic layer, a thin, highly leached Ae horizon, and a strong-brown to yellowish-brown Bf horizon containing accumulations of iron and humus. This horizon grades to a brown Bt horizon containing clay as the main product of accumulation. Sandstone fragments are common and increase in frequency and size with depth.

The profile is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Very dark brown and black litter of needles, twigs, etc. pH 6.2.
Ae	0 – 3	Light-gray (10YR 7/1 dry), gray (10YR 6/1, moist) silt loam. Moderate, fine platy structure; loose, friable. pH 5.6.
Bf	3 – 7	Light brownish gray (10YR 6/2, dry), brown 10YR 4/3, moist) clay loam. Strong, fine, subangular blocky structure; slightly hard; firm. pH 4.5.
Ae	7 – 9	Light brownish gray (10YR 6/2, dry), dark grayish brown (10YR 4/2, moist) clay. Strong, fine and medium subangular blocky structure; slightly hard, when dry, firm when moist. pH 4.5.
Bt	9 – 30	Gray (10YR 6/1, dry), dark-gray (10YR 4/1, moist) clay. Strong, medium blocky structure; clay skins common; very hard, very firm. pH 4.2.
BC	30 – 39	Grayish-brown (10YR 5/2, dry), dark grayish brown (10YR 4/2, moist) clay. Moderate, medium blocky structure; few clay skins; sandstone fragments common. pH 4.2.
C	53+	Grayish-brown clay. Few faint yellowish brown mottles; numerous sandstone fragments. pH 8.0.

Sandstone often occurs at shallow depths.

Use

Fellers soils are often shallow and stony because of the proximity of the underlying sandstone. They are inferior for agriculture and should not be cultivated. This has been verified by the number of abandoned farms and the poor condition of the crops.

For the most part, Fellers soils occur on steep slopes, along deeply incised streams, and on sharply rising moraines. Trees grow well in these soils and produce excellent timber. Their continued use for forestry is recommended.

Demmitt Series (Dm)

The Demmit soils, Orthic Gray Wooded sandy loams and loams, occur in the southeastern part of the surveyed area and are the main soils on some 15,925 acres. They are found on the intermediate slopes of the till plain at elevations ranging from 2,400 to 2,600 feet, usually in association with the Hazelmere and Codesa soils.

They have developed under a thick mixed forest cover dominated by aspen and lodgepole pine. Willows, alder and many shrubs such as rose, shepherdia and kinnikinnick are common.

At lower elevations they have a gently and moderately sloping topography, and at higher elevations irregularly steeply sloping ridges and knolls predominate. Stones are usually present in sufficient number to interfere with tillage. These soils are normally well drained; often the steeply sloping areas have excessive runoff.

Demmitt soils have a thin surface organic layer, a moderately thick, gray leached (Ae) horizon, and a brown or yellowish-brown B horizon that is finer in texture than the horizon above or below. Concentrations of lime are found at depths of 36 to 40 inches.

A profile of a typical sandy loam is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Dark-brown to black leaf litter. pH 6.1.
Ae	0 – 6	Light brownish gray (10YR 6/2, dry), grayish-brown (10YR 5/2, moist) sandy loam. Moderate, fine platy structure; friable. pH 5.0.
AB	6 – 10	Clay loam of same color as Ae horizon. Moderate, fine, vesicular, subangular blocky structure; firm. pH 5.5.
BA	10 – 12	Pale-brown (10YR 6/3, dry), grayish-brown (10YR 5/2, moist) clay. Moderate, medium, subangular blocky structure; hard and firm. pH 5.5.
Bt	12 – 27	Brown (10YR 5/3 dry), dark grayish brown (10YR 4/2, moist) clay. Moderate, coarse blocky structure; few clay skins; very hard. pH 6.0.
C	34+	Grayish-brown clay loam till. Few stones; very hard. pH 8.0.

Use

The simple, gently and moderately sloping classes are fair to fairly good arable land if good management practices are followed. The steeply sloping and hilly classes are nonarable.

Demmitt soils are initially low in fertility. Low organic matter content, poor physical condition and the difficulty of maintaining good tilth are associated with the thick leached (Ae) horizons. At present these soils are largely under native vegetation and provide valuable forest products and limited grazing.

Hanshaw Series (Ha)

The Hanshaw soils, Gray Wooded Solod loams and clay loams, are found on the intermediate and lower slopes of the till plain at elevations below 2,800 feet. They are the main soils on about 19,030 acres, in the Fellers Heights area. They occur in association with the Fellers soils and have developed under a mixed forest cover consisting mainly of dense stands of poplar with scattered conifers. The understory is mainly willows, poplars and a variety of low-growing shrubs.

About 14,300 acres of the soils are gently or moderately sloping. Some 3,500 acres are steeply sloping. The soils are imperfectly drained except that on steep slopes they are excessively drained. Internal drainage is slow.

These soils usually have a well-developed, gray Ae horizon and a dark-brown, coarse, blocky-prismatic B horizon overlying very dark gray clay. The typical profile is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Very dark brown, friable layer of leaf litter. pH 7.0.
Ae	0 – 2	Brown (10YR 5/3, moist) sandy clay loam. Moderate, fine granular structure; hard when dry; interior of peds pale-brown (10YR 6/3, moist); lower boundary abrupt. pH 6.0.
AB	2 – 5	Grayish-brown (10YR 5/2, moist) clay. Moderate fine and medium subangular blocky structure; hard when dry; firm; lower boundary abrupt. pH 5.8.
BA	5 – 10	Very dark grayish brown (10YR 3/2, moist) clay. Weak, coarse blocky structure; interior of aggregates very dark brown (10YR 2/2, moist); very hard and very firm. pH 5.2.
Bn	10 – 17	Dark grayish brown (10YR 4/2, moist) clay. Interior of peds very dark brown (10YR 2/2, moist) with few, faint, yellow-brown mottles. Moderate, coarse prismatic and coarse block structure; very hard. pH 5.2.
BC	17 – 21	Very dark brown (10YR 2/2, moist) clay. Weak blocky structure; very firm. pH 5.7.
C	21 – 60	Black (10YR 2/1, moist) clay till with few pebbles and stones. Very hard. pH 8.1.

Use

Hanshaw soils are fairly good arable soils.

Agricultural development of these soils has been slow. Heavy clearing costs, a short frost-free period, and a long distance from market have handicapped development. It is difficult to obtain satisfactory tilth in the cultivated layer. When the fine-textured, solonetzic B horizon is brought to the surface, crops are often patchy. Applications of manure, nitrogen and phosphorus fertilizers are likely to improve crop yields. A greater use of grasses and legumes in the rotation may be desirable.

Snipe Series (Sn)

The Snipe soils, Low Humic Eluviated Gleysol loams and clay loams, predominate on about 64,380 acres. They are very widely distributed on poorly and very poorly drained areas.

The land is nearly level, flat or depressional. Wet, undrained areas are very common. The vegetation ranges from coarse grasses, sedges and willows to scrub birch, black poplar and, in places, black spruce. Peat may be found with the black spruce.

The soils are readily distinguished by a surface layer of undecomposed peaty material usually 2 to 4 inches thick overlying a gray Ae horizon with brown and yellowish-brown mottles. The B horizon is fine in texture, gray-brown, mottled, and grades into a plastic, gleyed subsoil.

The profile of a typical loam is described as follows:

Horizon	Depth Inches	
L-H	4 – 0	Semi decomposed layer of grasses, leaves and forest litter. pH 5.7.
Ah	0 – 1	Dark-brown (10YR 3/3, dry) loam. Fine granular structure. pH 5.4.
Aeg	1 – 7	Light-gray (10YR 7/2, dry) loam. Weak, fine platy structure; friable; mottled in lower part. pH 5.2.
ABg	7 – 8	Light brownish gray (10YR 6/2, dry) clay. Few, fine brown (10YR 5/3) mottles. Moderate, medium, subangular blocky structure; firm when moist; aggregates often coated with gray. pH 4.5.
Btg	8 – 20	Pale-brown (10YR 6/3, dry) clay. Coarse and medium blocky structure; aggregates coated with gray-brown clay skins; hard when dry, very plastic when wet. pH 5.3.
BCg	20 – 26	Dark-gray (10YR 4/1, moist) clay. Massive; very plastic when wet. pH 6.6.
Cg	30+	Gray-brown clay loam. pH 7.0.

Use

Most of the Snipe soils are still under native vegetation. Texturally they are suitable for agriculture but their development will doubtless be slow because of poor drainage and hazard of summer frosts. Also, they are low in organic matter and base exchange capacity. A small acreage under cultivation in the Cecil Lake area has been producing reasonably good yields of alfalfa and grass seeds, but until adequate drainage has been effected they are not suitable for grain crops.

On gray and gray-brown loam and clay loam, moderately and strongly calcareous, often stony or gravelly

Moberly soils are the only ones developed on this glacial till. They are found at higher elevations than other soils in the area, mainly along the foothills of the Rocky Mountains, and are usually shallow and stony.

Moberly Series (Mo)

The Moberly soils, Bisequa Gray Wooded loams and clay loams, occur in the western part of the surveyed area and cover about 744,190 acres. They are found mainly at higher elevations and have developed under a cover consisting mainly of spruce, lodgepole pine and aspen. The understory includes alder, willows, thimbleberry, shepherdia, blueberry, kinnikinnick and various grasses.

These soils occur principally on steeply sloping and hilly topography. Only 79,105 acres were mapped as gently and moderately sloping. Stones and gravel are common, particularly at higher elevations and where the underlying bedrock comes close to the surface.

Moberly soils normally have excessive drainage because of the topography. The lower slopes are usually well drained.

These soils have a thin organic surface horizon underlain by a light-gray, leached (Ae) horizon and a thick, brown Bf horizon containing accumulations of iron and humus. This horizon grades through a grayish layer into a brown B horizon (Bt) finer in texture than the overlying horizons. This secondary B horizons overlies highly calcareous parent material. The upper 10 to 12 inches is a Podzol solum that has developed in the Ae horizon of a Gray Wooded soil.

The profile of a typical loam on gently sloping topography is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Loose litter of pine needles, twigs, leaves, etc. pH 6.2.
Ae	0 – 3	Light-gray (10YR 7/2, moist) silt loam. Moderate, fine platy structure; friable. pH 5.6.
Bf	3 – 6	Light yellowish brown (10YR 6/4, moist) silt loam. Moderate, medium subangular blocky structure; friable. pH 5.9.
Ae	6 – 13	Grayish-brown (10YR 5/2, moist) loam. Weak, medium platy structure; friable. pH 5.8.
Bt	13 – 18	Yellowish-brown (10YR 5/4, moist) loam. Moderate, medium, subangular blocky structure; hard, firm; few roots, moderately stony. pH 5.7.
BC	18 – 24	Dark grayish brown (10YR 4/2, moist) loam. Moderate, medium blocky structure; hard. pH 6.8.
Ck	24+	Very dark grayish brown (10YR 3/2, moist) loam till. Free lime evenly spread throughout. pH 7.8.

At lower elevations Moberly soils have a fine sandy loam or silt loam texture. At higher elevations, glacial boulders and rock outcrops are common.

Use

Moberly loams on well-drained or on smooth, gently sloping topography are fair arable soils. The steeply sloping and hilly areas are nonarable.

Only small areas have been developed agriculturally and there are few records of their productivity. Forage crops have been produced satisfactorily and provide a satisfactory permanent system of agriculture for these soils. Use of manure and nitrogen and phosphorus fertilizers will evidently be necessary if these soils are to be productive.

High cost of clearing trees and, in some areas stones, is also a handicap to settlement. Erosion is not a serious problem, although slight water erosion has been observed on the steeply sloping land.

At present these soils are largely under native vegetation and are a valuable source of commercial timber.

Soils Developed on Lacustrine–glacial Till

(Lacustro-till)

ON GRAY AND DARK GRAYISH BROWN CLAY LOAM AND CLAY, SLIGHTLY AND MODERATELY CALCAREOUS AND SOMEWHAT SALINE

The parent materials of these soils are an obscurely stratified, variable mixture of materials transported by ice and deposited in glacial lakes. The materials are relatively low in lime carbonate and somewhat saline; they produce mineral soils with heavy, compact subsoils. The better-drained soils are the Donnelly, Esher and Landry series. The Goose and Presville series are found in the poorly drained depressions. Snipe soils may also occur on poorly drained areas.

Donnelly Series (Do)

The Donnelly soils, Gray Wooded Solod loams and clay loams, cover about 91,785 acres and are widely distributed throughout the western portion of the surveyed area. They are found mainly on lower slopes of the till plain and occur at elevations ranging from 2,150 to 2,700 feet. Fires have destroyed much of the native vegetation, which consisted of a mixed stand of poplar with variable amounts of spruce, lodgepole pine, black poplar, alder and willow.

They are found mainly on a gently and moderately sloping topography with long, smooth slopes and are imperfectly to somewhat poorly drained.

The Donnelly soils usually have a thick, light-gray, platy Ae horizon; well-developed AB and BA horizons; and a thin, hard, blocky B horizon. Lower horizons are calcareous and saline.

A profile is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Black, decomposed and semidecomposed leaf litter. pH 6.1.
Ah	0 – 1	Very dark gray (10YR 3/1, dry), black (10YR 2/1, moist) loam. Weak, fine granular and platy structure; friable. pH 6.0.
Ae	1 – 9	Light-gray (10YR 7/2, dry), very dark gray (10YR 3/1, moist), very fine sandy loam. Moderate, medium platy structure; friable. pH 5.1.
AB	9 – 11	Light-gray (10YR 7/2, dry), light yellowish brown (10YR 6/4, moist) loam. Moderate, fine and medium subangular blocky structure; peds vesicular; firm. pH 4.6.
Bn1	11 – 18	Dark yellowish brown (10YR 4/4, moist) clay. Moderate, fine, subangular blocky structure; vesicular peds; hard, firm. pH 4.3.
Bn2	18 – 28	Dark yellowish brown (10YR 4/4, moist) clay. Strong, coarse prismatic breaking to medium blocky structure; clay skins common; very hard, very firm. pH 5.4.
BC	28 – 33	Dark grayish brown (10YR 4/2, dry), very dark gray (10YR 4/1, moist) clay. Medium, subangular blocky structure; very firm; few clay skins. pH 6.2.
Ck	33 – 50	Clay of same color and consistence as BC horizon. Moderate lime content. pH 7.9.
C	50+	Very dark gray clay loam till with pockets of salt accumulations. pH 8.1.

Use

Donnelly soils are fairly good to good arable soils. They occur mainly in densely wooded areas and hence have been developed slowly for agriculture. They are used chiefly for grain production, principally wheat. Some coarse grains, grasses and legumes are also produced. These soils are highly leached and low in organic matter, and are difficult to keep in good tilth where only grain is grown. Moderate to severe water erosion was observed on gentle slopes. In the moderately sloping areas, erosion is likely to be serious.

Experiments at the Experimental Farm, Beaverlodge, suggested that applications of manure and phosphatic fertilizers are likely to improve yields. Greater use of legumes and other forage crops may also be desirable.

Esher Series (Es)

The Esher soils, Dark Gray Solod loams and clay loams, cover about 48,515 acres and are found mainly in association with Donnelly and Landry soils in the Dawson Creek, Rolla, Fort St. John and Rose Prairie areas. They have developed under relatively open forest of which much has been cleared (Figure 7).

These soils occur chiefly on very gently sloping and moderately sloping topography and to a limited extent on irregular, steeply sloping land. Surface drainage is adequate except that it is slow on flat and level land adjacent to undrained depressions.

Figure 7.—Typical farmstead on an Esher soil. (British Columbia Government photograph)

Most of the soils have a few large stones and boulders that may be readily removed.

Esher soils have a dark-colored Ah horizon, a grayish, platy Ae horizon, and a compact, prismatic B horizon that breaks into hard, compact, subangular blocky aggregates when dry.

A profile is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown and black leaf litter. pH 7.0.
Ah	0 – 6	Very dark gray to very dark grayish brown (10YR 3/1.5, dry), dark-brown (10YR 4/3, moist) loam. Moderate, fine granular structure, becoming platy in lower 2 inches; friable. pH 6.6.
Ae	6 – 12	Light-gray (10YR 7/2, dry), light yellowish brown (10YR 6/4, moist) silt loam. Moderate, fine platy structure; friable. pH 5.6.
AB	12 – 18	Light-gray (10YR 7/2, dry), brown (10YR 5/3, moist) clay loam. Peds coated with grayish-brown (10YR 5/2, moist). Strong, medium, subangular blocky structure; hard when dry, firm when moist. pH 4.9.

Horizon	Depth Inches	
Bn	18 – 24	Dark yellowish brown (10YR 4/4, dry), very dark brown (10YR 2/2, moist) clay. Moderate, coarse, prismatic blocky and subangular blocky structure; clay skins and organic coatings common; very hard, very firm; few roots. pH 5.8.
BC	24 – 28	Gray (10YR 5/1, dry), dark-gray (10YR 4/1, moist) clay. Moderate, medium and coarse blocky structure; few clay skins; hard; compact. pH 7.8.
Ck	28 – 34	Grayish-brown (10YR 5/2, moist) silty clay. Moderate, fine, blocky and subangular blocky structure; hard; moderate lime. pH 7.8.
C	34+	Very dark grayish clay loam till. Numerous pockets of gypsum salts. pH 8.0.

Use

Esher soils are highly productive and are good arable soils.

They are adapted to a wide variety of crops. Wheat, oats and barley are usually the main crops grown. Water erosion and slight wind erosion have occurred in some areas. Prevention of water erosion is essential for continued high productivity. The incorporation of organic matter and the growing of grasses and deep-rooted legumes may improve permeability and structure.

Landry Series (La)

The Landry soils, Black Solod loams and clay loams, predominate on about 65,465 acres and are almost all arable. They occur on the well-drained, gentle to moderate slopes that rise from lacustrine basins and merge with uplands. They are found mainly in the Dawson Creek-Rolla areas, and also near Fort St. John, Rose Prairie and North Pine (Figure 8).

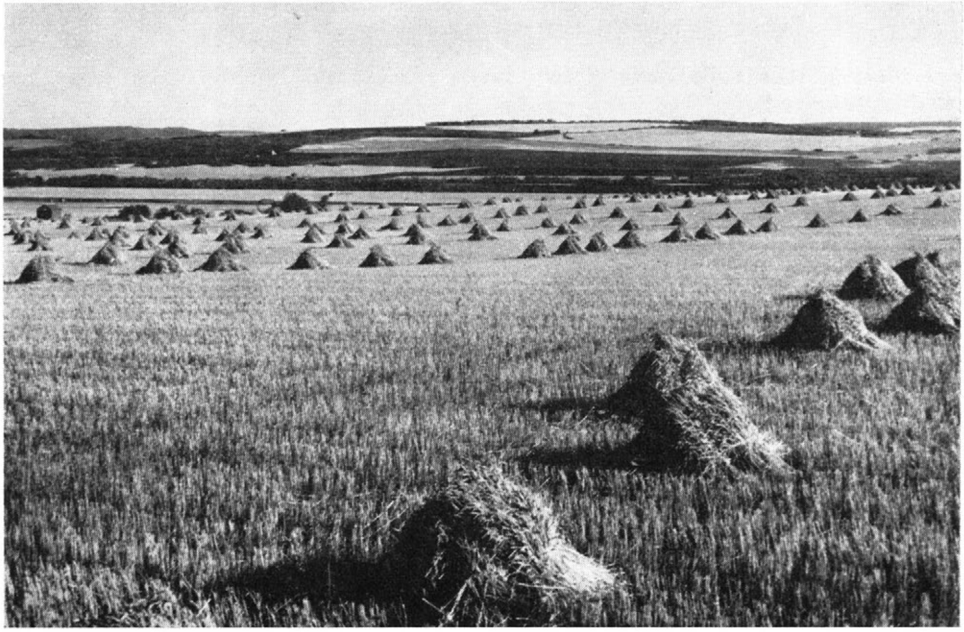


Figure 8.—Wheat on a Landry soil near Dawson Creek. (British Columbia Government photograph)

The native vegetation is a parkland type consisting of native grasses, shrubs, and scattered bluffs of aspen and willow.

These soils have a well-developed Ah horizon 4 to 8 inches thick, and an Ae or AB horizon resting on a fine-textured B horizon with subangular blocky and prismatic structure. The lower horizons grade through layers of lime carbonate and salt into an obscurely stratified till.

The profile of a typical clay loam is described as follows:

Horizon	*Depth Inches*	
Ah	0 – 6	Very dark brown to black (10YR 2/2, 2/1, dry) clay loam. Strong, medium to fine granular structure; friable. pH 6.4.
Ae	6 – 9	Grayish-brown (10YR 5/2, dry) silt loam. Moderate, medium, subangular blocky structure; friable; firm. pH 6.4.
AB	9 – 13	Yellowish-brown (10YR 5/4, moist) clay loam. Moderate, medium, subangular blocky structure; hard. pH 6.0.
Bn	13 – 19	Dark-brown (10YR 3/3, moist) clay. Weak, coarse, prismatic breaking to strong, medium, subangular blocky and blocky structure; clay skins and organic coatings continuous; hard and firm. pH 5.7.
Ck	19 – 23	Dark-gray (10YR 4/1, moist) clay and yellowish-brown (10YR 5/4, moist) sandy clay loam strata containing moderate amounts of lime; salts at the base of the horizon. pH 7.7.
C	23 – 36	Dark-gray and yellowish-brown bands of clay and sandy clay loam. Few stones and pebbles; lime carbonate in upper part and salt lenses in lower. pH 7.6.

Use

Landry soils are among the most productive in the surveyed area and may be used for all the crops for which the climate is suited. However, crop rotations that include grasses and legumes are necessary if these soils are to retain their productivity.

Erosion, particularly by water, is a serious hazard. Losses approximating 5 to 10 percent of the surface soil from gentle slopes on summerfallow have occurred during flash storms. Increasing attention to grass and grass-seed production. cultivation on the contour, and use of legumes are practices that should help to control erosion and maintain productivity (Figure 9).

These are very good arable soils.

Goose Series (Go)

The Goose soils, Orthic Meadow silty clay loams and clays, commonly occur in valleys where the topography varies from depressional to very gently sloping. They are poorly drained and are most often associated with the Eaglesham and Snipe soils and occasionally with Falher, Rycroft, Landry and Esher soils.

They cover about 49,020 acres.

The characteristic cover is groundbirch, often in association with willows, sedges and reeds. The vegetation is distinctive and frequently serves as a guide in determining the soil boundaries.

The surface horizon is a thin peat and muck of variable thickness overlying a black Ah horizon and a mottled B horizon. The Ah horizon generally contains numerous firm, rounded aggregates (shot-like) that appear to be very stable.

Figure 9.—Soil erosion on a Landry soil near Dawson Creek. A 2½-inch rain removed 11 percent of the topsoil in an 80-acre field with a slope of 1 to 2 percent in less than an hour. Throughout the surveyed area, erosion is often severe on long, smooth slopes left in fallow.

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

Horizon	*Depth Inches*	
L-F	4 – 0	Dark-brown, semidecomposed organic remains. pH 5.6.
Ah	0 – 7	Very dark gray (10YR 3/1, moist) and black (10YR 2/1, moist) silty clay loam. Moderate, medium, granular and subangular blocky (shot-like) structure; firm. pH 6.0.
Bg	7 – 18	Dark-gray (10YR 4/1, moist) silty clay, with many medium, prominent mottles of yellowish-brown (10YR 5/5, moist). Moderate, medium, subangular blocky structure; friable. pH 5.7.
BCg	18 – 28	Yellowish-brown (10YR 5/6, moist) clay with mottles as streaks of dark gray (10YR 4/1), moist. Massive; plastic and sticky when wet. pH 7.0.
Cg	28+	Gray and dark-gray clay. Prominent iron stains; sticky when wet. pH 7.0.

Use

Goose soils are high in organic matter, exchange capacity, and degree of base saturation. They have given good yields of alsike clover and grass crops, but until drainage has been improved they should not be used for grain crops.

Prestville Series (Pr)

The Prestville soils, Peaty Meadow silty clay loams and clays, are confined to level and depressional areas where drainage is poor. Many areas are ponded for considerable periods. These soils are found in association mainly with Goose, Prespatou, Snipe, Eaglesham and to a limited extent with Codner soils.

About 10,150 acres were mapped.

The native vegetation consists mainly of sedges, coarse grasses, willows and groundbirch.

These soils normally have an organic surface horizon of sedge remains that rarely exceeds 12 inches and is underlain by a fine-textured clay horizon that is often iron-stained. A thin Ah horizon may be present.

The profile of a typical soil is described as follows:

Horizon	*Depth Inches*	
L-F	10 – 3	Brown and dark-brown sedge peat, largely undecomposed. pH 5.6.
H	3 – 0	Dark-brown to black muck. pH 6.5.
Ah	0 – 2	Very dark brown (10YR 3/3, moist) and black (10YR 2/1, moist) clay. Moderate, medium, subangular blocky and granular structure; friable. pH 7.0.
Bg	2 – 4	Very dark gray (10YR 3/1, moist) clay. Massive and coarse blocky structure; few, faint yellowish brown (10YR 5/4) mottles; very firm. pH 7.5.
BCg	4 – 10	Dark-gray (10YR 4/1, moist) clay. Many prominent medium, yellowish-brown (10YR 5/6) mottles; massive breaking to coarse and medium blocky structure; very firm. pH 7.8.
Cg	10+	Dark-gray clay. Few mottles; moderate lime accumulation. pH 7.8.

Use

Prestville soils in their native state are too wet for continuous cultivation and cropping. Many areas are used for wild hay or pasture. When adequate drainage has been provided, many of the soils can be developed into good arable soils.

ON STRATA OF GRAY AND DARK GRAYISH BROWN CLAY LOAM AND CLAY ALTERNATING WITH STRATA OF YELLOWISH BROWN SANDY LOAM AND CLAY LOAM, SLIGHTLY CALCAREOUS AND SOMEWHAT SALINE, OFTEN GRAVELLY OR STONY

The Hazelmere and Albright soils have developed on the well-drained areas of these variable materials, the Snipe and Goose soils being found on poorly drained areas. The parent materials differ from those of Donnelly, Esher and Landry soils in being darker in color, more stony and more obscurely stratified. Sand and gravel lenses or thick bands of heavy clay may occur. The soils are found mainly in the broad valley of the Pouce Coupe River and its tributary streams, on the intermediate and upper valley slopes at elevations of about 2,400 to 2,700 feet.

Hazelmere Series (Hz)

The Hazelmere soils, Gray Wooded Solod loams and clay loams, are found mainly on the north-facing valley slopes at elevations below 2,700 feet in the Tupper Creek—Swan lake area. About 29,075 acres were mapped. About 20,010 acres occur on smooth, gentle slopes and the remainder, about 9,065 acres, is irregular, steeply sloping and hilly.

Surface drainage is slow on the smooth, gentle slopes, but tends to be excessive on the steeper slopes. Most of the cultivated areas have imperfect drainage. The soils are often wet in the spring and during wet seasons.

A dense growth of poplars, lodgepole pine, willows, alders and various shrubs occupies most of the uncultivated land. Agricultural development is generally slow, because of the hazard of frost.

Hazelmere soils have a thin Ah horizon; a thick, gray Ae horizon; and a brown, subangular blocky B horizon. They are similar to the Donnelly soils except that the Ae is thicker and the B less compacted. Accumulations of lime carbonate and salts occur at depth of about 26 inches. The profile of a typical loam is described as follows:

Horizon	*Depth Inches*	
L-H	3 – 2	Dark-brown leaf litter. pH 6.0.
H	2 – 0	Very dark brown, well-decomposed layer. pH 6.0.
Ah	0 – 1	Dark-brown (10YR 3/3, moist) loam.
Ae	1 – 6	Light brownish gray (10YR 6/2, dry), grayish-brown (10YR 5/2, moist), very fine sandy loam. Moderate, fine granular structure, becoming fine platy in lower 2 inches; friable. pH 6.2.
AB	6 – 8	Dark grayish brown (10YR 4/2, moist) clay loam. Moderate, medium, subangular blocky structure; hard, firm. pH 5.7.
Bn	8 – 15	Dark grayish brown (10YR 4/2, moist) clay. Weak, coarse prismatic breaking to moderate, coarse and medium blocky structure; clay skins evident; very hard when dry, very firm moist; lower boundary gradual. pH 5.7.
BC	15 – 26	Dark yellowish brown (10YR 4/4, moist) clay. Moderate, medium blocky structure; very firm; clay skins discontinuous. pH 6.1.
Ck	26 – 36	Grayish-brown (2.5Y 5/2, dry), very dark grayish brown (10YR 3/2, moist) clay loam. Moderate, medium blocky structure; very firm when moist; moderately calcareous. pH 7.8.
C	36+	Grayish-brown and dark grayish brown clay loam and clay. Stratified till; salt pockets common. pH 8.0.

Use

Hazelmere soils are fairly good arable soils. Stones are generally numerous enough to require removal. The moisture-holding capacity is high, and the soil pH is favorable for plant growth. The surface horizons are low in organic matter and crops respond favorably to nitrogenous fertilizers. Water erosion is a serious problem in the soils under cultivation.

These soils are suited to mixed farming, and crop rotations should include a high percentage of grasses and legumes. The steeper slopes and lands at higher elevations should not be cleared.

Albright Series (Ab)

The Albright soils, Dark Gray Solod loams and clay loams, predominate on 7,610 acres in the southeast part of the surveyed area. They are found in the same general areas as Hazelmere soils but occur at lower elevations and are confined mainly to the more open sites on the south and southwest slopes.

The land is mainly smooth, gently and moderately sloping, and irregular, steeply sloping. The slopes and ridges are well to moderately well drained.

The vegetation on the well-drained sites consists mainly of grasses and shrubs. Open stands of poplar, with an understory of willows, rose and various shrubs, occur as bluffs scattered throughout the area.

The soils closely resemble the Landry series except that they usually have a well-developed leached (Ae) horizon. Generally, the B horizon is more compact and fined in texture.

The profile of a typical soil is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Very dark gray to black leaf litter. pH 7.0.
Ah	0 – 6	Very dark gray (10YR 3/1, dry), very dark brown (10YR 2/2, moist) loam. Moderate, fine and very fine granular structure; friable. pH 6.7.
Ae	6 - 9	Light-gray (10YR 7/2, dry), grayish-brown (10YR 5/2, moist) silt loam. Moderate, fine platy structure; friable. pH 6.6.
AB	9 – 12	Clay loam of same color as Ae horizon. Moderate, medium, subangular blocky structure; slightly hard. pH 6.1.
Bn1	12 – 15	Grayish-brown (10YR 5/2, dry), very dark grayish brown (10YR 3/2, moist) silty clay. Moderate, medium, subangular blocky and blocky structure; hard when dry and firm when moist. pH 5.4.
Bn2	15 – 19	Grayish-brown (10YR 5/2, dry), very dark grayish brown (10YR 3/2, moist) clay. Weak, medium, prismatic and strong, medium blocky structure; very hard when dry; clay skins continuous. pH 5.3.
BC1	19 – 26	Dark-gray and very dark gray (10YR 3.5/1, moist), heavy clay loam. Moderate, fine blocky structure; hard, firm; few clay skins; few faint brown (10YR 5/3) mottles. pH 5.2.
BC2	26 – 32	Similar to BC1 horizon except in acidity. pH 6.2.
Ck	32+	Very dark gray, obscurely stratified clay loam till. Moderate free lime; few pockets of gypsum. pH 7.8.

Use

The undulating and gently sloping areas are good arable land. The steeply sloping parts are generally fair to poor.

These soils have a high moisture-holding capacity and are well supplied with organic matter. They have been used, to a large extent, for grain crops but such use has resulted in severe water erosion, particularly on the long, smooth, gentle slopes. Grass and legume crops are generally recommended, as is the seeding down of the steeper slopes and eroded areas. Cultivation of up-and-down slopes should be avoided.

Soils Developed on Lacustrine Materials

On gray and dark-gray clay, slightly and moderately calcareous, somewhat saline

The Nampa, Falher and Rycroft soils are the main series developed on these sediments. Goose and Prestville soils may also occur on these materials.

Nampa Series (Np)

The Nampa soils, Gray Wooded Solod clay loams and clays, cover about 4,830 acres, principally in the Dawson Creek, Rolla and North Pine areas. They have developed on fine-textured deposits and occupy imperfectly and poorly drained positions.

The land is level and depressional.

Willows, coarse grasses, and shrubs are the dominant vegetation, although in some areas poplar and spruce occur in fairly dense stands.

Nampa and Donnelly soils are so similar that it is often difficult to separate them. Generally the Ae horizons in Nampa soils are mottled and the B more compact and darker in color than in Donnelly soils.

The profile of a typical clay is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Dark-brown layer of leaf and grass litter; loose. pH 7.0.
Ah	0 – 1	Very dark grayish brown (10YR 3/2, dry), very dark brown (10YR 2/2, moist) clay loam. Moderate, medium and fine granular structure; friable. pH 6.4.
Ae	1 – 4	Light brownish gray to pale-brown (10YR 6/3, moist) silt loam. Moderate, medium platy structure; friable. pH 5.0.
AB	4 – 6	Pale-brown (10YR 6/3, moist) clay loam. Few, faint, brown (10YR 5/3, moist) mottles. Weak, fine platy and subangular blocky structure; firm when moist. pH 5.0.
Bn1	6 – 11	Grayish-brown (10YR 5/2, dry), very dark grayish brown (10YR 3/2, moist) clay. Weak, medium, prismatic breaking to strong, angular blocky structure; very firm. pH 4.5.
Bn2	11 – 15	Similar to Bn1 horizon in color and texture. Fine, prominent yellowish-brown (10YR 5/4) mottles. Moderate, coarse prismatic structure; very firm. pH 5.5.
BC	15 – 26	Very dark grayish brown (10YR 3/2, moist) clay. Coarse blocky structure; very firm. pH 7.7.
Ck	26 – 30	Dark-gray and very dark gray, stratified clay and silty clay; weakly calcareous. pH 7.6.
Cs	30+	Similar to Ck horizon except pockets of gypsum common. pH 8.0.

Use

Nampa soils are fairly good arable soils and present many of the same general problems as the Donnelly soils. They are moderately fertile, hold moisture very well, and are slightly acid. Organic matter content, however, is low and the maintenance of good tilth presents a problem.

The available experimental evidence on these soils suggests that substantial increases in yields of grains may be obtained and fertility built up through use of barnyard manure, nitrogen and phosphorus fertilizers. A greater use of legume and grass crops may also be desirable.

Falher Series (Fa)

The Falher soils, Dark Gray Solod clay loams and clays, are found near Pouce Coupe, Rolla, North Pine and Murdale, and are the main soils over an area of about 25,165 acres. They are mainly associated with Rycroft and Nampa soils.

The soils occur chiefly on nearly level, smooth, gently and moderately sloping topography. Only about 2,725 acres were classed as irregular, gently and moderately sloping. These soils are naturally imperfectly and somewhat poorly drained. Surface drainage is satisfactory on slopes, but slow to very slow on the lower, flat areas bordering undrained depressions.

These soils are typically stone-free. Most of them are cleared but, bordering fields, stands of poplar, willows and shrubs may occur.

The soils have a well-developed, dark-colored Ah horizon 4 to 6 inches thick. The depth to the fine-textured B horizon is variable and the boundary is usually wavy but distinct. At a depth of 25 or 30 inches the substratum is somewhat saline and moderately calcareous.

The profile of a typical clay loam is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown leaf litter. pH 7.0.
Ah1	0 – 2	Black (10YR 2/1, moist) clay loam. Moderate, fine granular structure; friable. pH 6.8.
Ah2	2 – 6	Very dark gray (10YR 3/1, moist) clay loam. Moderate, fine, granular and very fine, subangular blocky structure; firm when moist. pH 6.5.
Ae	6 – 7	Gray (10YR 5/1, dry) dark-gray (10YR 4/1, moist) silt loam. Moderate, medium platy structure; friable. pH 5.9.
AB	7 – 10	Grayish-brown (10YR 5/2, dry), very dark grayish brown (10YR 3/2, moist) silty clay loam. Moderate, medium, subangular blocky structure; hard when dry and firm when moist. pH 6.0.
Bn	10 – 19	Dark grayish brown (10YR 4/2, moist) clay. Moderate, coarse prismatic breaking to strong, coarse blocky structure; clay and organic coatings on peds; very hard when dry and firm when moist. pH 6.2.
BC	19 – 23	Dark-gray (10YR 4/1, moist) clay. Moderate, medium angular structure; extremely hard, very firm; slickensides common. pH 6.7.
Ck	23 – 30	Very dark brown and black, stratified clay. Calcareous. pH 8.1.
Cs	34+	Similar to Ck horizon except for numerous gypsum crystals. pH 8.1.

Use

Falher soils are good arable land; they are fertile, productive and largely under cultivation.

These soils are used mainly for grain production, with wheat the main crop. Oats, barley and occasionally flax crops are also successfully grown. The absence of stones and the smooth topography favour large-scale farming. Recently more attention has been given to legume and grass crops.

Slight wind erosion occurs locally on exposed sites, and slight to moderate water erosion is common on the long, smooth slopes.

Rycroft Series (Ry)

The Rycroft soils, Black Solodized Solonetz clay loams and clays, occur mainly along the British Columbia–Alberta border near Rolla, at Murdale and North Pine, and along the Peace River west of Taylor.

They are the main soils on about 35,055 acres, and have level and undulating topography. They contain few stones. The vegetative cover is believed to have been a parkland mixture of grasses alternating with groves of poplar and willows. The soils are now largely under cultivation.

The soils have a dark-colored surface horizon very similar to that of Landry soils. The leached horizon (AB) is thin and abruptly overlies a columnar-structured, fine-textured B horizon similar to that of Falher soils.

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

Horizon	*Depth Inches*	
Ah	0 – 6	Very dark gray (10YR 3/1, dry), black (10YR 2/1, moist) silty clay loam. Weak, coarse prismatic and fine granular structure; friable. pH 5.9.
AB	6 – 8	Gray (10YR 5/1, dry), dark-gray (10YR 4/1, moist) clay loam. Strong, medium, subangular blocky structure; peds in loose clusters; hard when dry. pH 5.3.
Bn	8 – 15	Dark-gray (10YR 4/1, dry), very dark grayish brown (10YR 3/2, moist) clay. Strong, medium blocky structure; very hard and very firm. pH 5.8.
BC	15 – 25	Dark-gray (10YR 4/1, dry), very dark brown (10YR 2/2, moist) clay. Strong, coarse prismatic structure; very hard and very firm. pH 7.7.
Ck	25 – 27	Similar to BC horizon except for lime pockets. pH 7.8.
Cs	27+	Light brownish gray (10 YR 6/2, dry) and very dark gray clay. Stratified; gypsum crystals in pockets. pH 7.8.

Use

Rycroft soils are very good arable soils, and are largely under cultivation. They are fertile and drought-resistant. These soils are used mainly for cereal production, with wheat the main crop. Forage crops, are grown to a limited extent.

The main problems associated with Rycroft soils are wind and water erosion. Wind erosion, very noticeable in dry seasons, should not become a serious problem if the grain–summerfallow rotation is replaced by suitable soil-conserving rotations. Water erosion is a hazard on slopes and may become serious unless preventive measures are used when it first become evident.

ON GRAY SILTY CLAY LOAM AND SILTY CLAY, MODERATELY AND STRONGLY CALCAREOUS, OFTEN SOMEWHAT SALINE

The Sukunka, Devereau, Arras, Rolla and Coleman soils have developed on uniform silty lacustrine deposits. They occur in much of the area occupied by glacial Lake Rycroft and in areas, notably Sunset Prairie, that may have been arms of the lake or upper terraces of the main drainageway. These stone-free materials are gray and dark gray in color and moderately and strongly calcareous. Goose and Prestville soils may occur on poorly drained areas.

Many of the deposits are irregularly shaped mounds, or "humpies", separated from one another by flat ground or narrow troughs. In distribution as well as shape they resemble the "pingos" in the Mackenzie delta [7], which are attributed to frost heaving.

Sukunka (Sk)

The Sukunka soils, Orthic Gray Wooded silt loams and silty clay loams, are the main soils on about 12,465 acres in the Kiskatinaw river valley between

[7] Porsild, A. E. Earth mounds in unglaciated North America. Geog. Rev. 28: 46-58, 1938.

Shearerdale and Arras. They are associated with Arras and Devereau soils on well-drained positions and with Goose and Coleman soils in the low-lying areas.

The surface relief is mainly level to very gently sloping. About 5,385 acres were mapped as level or very gently sloping; 1,180 acres as smooth, moderately sloping; and 5,900 acres as irregular, moderately sloping.

Surface drainage is good on most of these soils, but is rapid to somewhat excessive on the steeper slopes. Local level areas frequently have poor surface drainage. Internal drainage is about optimum for the crops grown in the area.

The native vegetation is a mixed woodland dominated by poplar and lodgepole pine. Much of this cover has been destroyed in recent years by fire.

These soils have a thick, light-gray leached horizon and a grayish-brown, fairly fine textured B horizon. High concentrations of lime are found at depths of 10 to 14 inches below the surface.

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

Horizon	*Depth Inches*	
L-H	2 – 0	Dark-brown leaf mat. pH 6.6.
Ae	0 – 2	Light-gray (10YR 7/2, dry), grayish-brown (10YR 5/2, moist) silt loam. Moderate, fine platy structure; friable. pH 6.6.
AB	2 – 4	Silty clay loam of same color as Ae horizon. Moderate, medium, subangular blocky structure; hard, firm; peds vesicular. pH 6.4.
BA	4 – 7	Light brownish gray (10YR 6/2, dry), grayish-brown (10YR 5/2, moist) silty clay. Moderate, fine, subangular blocky structure; hard and firm. pH 5.7.
Bt	7 – 12	Very dark gray (10YR 3/1, moist) silty clay. Moderate, fine, blocky and subangular blocky structure; clay skins common; very firm when moist. pH 5.6.
Ck	12 – 22	Very dark gray (10YR 3/1, moist) silty clay loam. Moderate, medium blocky structure; firm; highly calcareous. pH 8.1.
C	22+	Dark-gray lacustrine silty clay loam. Calcareous. pH 8.5.

Use

Sukunka soils are fairly good arable soils. They have been developed slowly for agriculture mainly because of the high cost of clearing. They are moderately fertile, are well drained and hold moisture well, and are slightly acid. As the organic matter is low and the soil structure weak, it is difficult to obtain good tilth in the cultivated layer.

These soils are used mainly for growing coarse grains, alfalfa and various grasses.

Devereau Series (Du)

The Devereau soils, Dark Gray Wooded silt loams and silty clay loams, are the main soils on about 74,500 acres. They were mapped chiefly in the Kiskatinaw River valley, where they are closely associated with Sukunka and Arras soils.

The topography varies from level to gently sloping and hilly because of many irregular-shaped mounds, or "humpies." About 9,640 acres were mapped as gently sloping; 22,985 acres as smooth, moderately sloping; 32,045 acres as irregular, gently and moderately sloping; and 9,830 acres as irregular, steeply sloping and hilly. Soils on the smooth, gently and moderately sloping areas have been developed for agriculture.

Surface drainage is excessive on the steeply sloping and hilly areas. Internal drainage is usually good.

The vegetation consists of open stands of mixed woods dominated by poplar. Tall prairie grasses and various shrubs are common on the southern slopes of the hilly and steeply sloping areas.

These soils are similar to the Sukunka soils except that they have a dark-brown A horizon with distinct graying in the lower part (Ae). The B horizon tends to be somewhat less compact than that of the Sukunka soils.

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

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown leaf litter. pH 6.8.
Ah (Ahe)	0 – 4	Dark-brown (10YR 3/3, moist) silty clay loam. Moderate, medium to fine granular structure; friable. pH 6.3.
Ae	4 – 7	Light-gray (10YR 7/2, dry), brown (10YR 5/3, moist) silty clay loam. Moderate, medium platy structure, becoming subangular blocky at lower depths; firm when moist. pH 6.3.
BA	7 – 11	Light brownish gray (10YR 6/2, dry), very dark grayish brown (10YR 3/2, moist) silty clay. Moderate, coarse, subangular blocky structure; very firm. pH 5.4.
Bt	11 – 19	Very dark gray (10YR 3/1, moist) silty clay. Clay skins common. Weak, coarse, prismatic breaking to strong, medium, blocky and subangular blocky structure; very hard when dry. pH 6.1.
BC	19 – 25	Very dark gray (10YR 3/1, moist) silty clay. Moderate, coarse blocky structure; clay skins discontinuous; friable. pH 8.2.
Ck	25+	Dark-gray silty clay loam. Stratified; highly calcareous. pH 8.3.

Use

Devereau soils on smooth, gently and moderately sloping areas are fairly good arable soils. Irregular, steeply sloping and hilly lands should be withheld from cultivation.

Grain crops are the most common, although forage crops appear to be equally well adapted to these soils.

These soils are fertile but require careful management to maintain productivity. This need is due to the uneven topography of the abundant mounds in certain localities. Maintenance of organic matter at existing levels is highly desirable.

Arras Series (Ar)

The Arras soils, Dark Gray Solod silt loams and silty clay loams, occur chiefly in the Sunset Prairie and Doe River areas, along the main drainage systems. About 23,285 acres were mapped. The associated soils are the Devereau, Sloane and Coleman series. A dense growth of aspen, willows and shrubs occupies most of the uncultivated land.

The soils vary from very gently sloping to irregular, moderately sloping. About 5,035 acres were mapped as smooth and gently sloping, and 18,250 acres as irregular, moderately sloping. The rougher topography is due to close-spaced mounds, or "humpies." In such areas, Arras soils occupy the well-drained sites and Coleman soils the flat and depressional areas.

Surface runoff is generally medium to high. Internal drainage is slow, but most of the soils are well to moderately well drained.

These soils are similar to the Devereau soils except that they have a fairly well developed Solod type of profile and have developed on somewhat saline parent materials.

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

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown leaf mat. pH 6.8.
Ah	0 – 5	Dark-brown and very dark brown. (10YR 2.5/2, moist) silty clay loam. Moderate, fine and medium granular structure; friable. pH 6.5.
Ae	5 – 8	Very pale brown (10YR 7/3, dry), brown (10YR 5/3, moist) silt loam. Weak, coarse, platy and moderate, medium, subangular blocky structure; friable. pH 6.2.
BA	8 – 11	Light-gray (10YR 7/2, dry), dark-gray (10YR 4/1, moist) silty clay loam. Weak, medium, prismatic breaking to moderate, medium, coarse blocky structure; slightly hard. pH 5.7.
Bn	11 – 18	Very dark gray (10YR 3/1, moist) silty clay. Weak, columnar and moderate, medium blocky structure; clay skins common; hard when dry, firm when moist. pH 6.7.
Ck	18 – 22	Dark-gray (10YR 4/1, moist) silty clay. Moderate, medium blocky structure; friable; moderately to highly calcareous. pH 8.0.

Use

Arras soils are fairly good to good arable soils. They are well to moderately well drained, and have a medium content of organic matter. As they are neutral to slightly acid and hold moisture especially well, they provide a good medium for the growth of plants.

These soils have been used mainly for grain production. They are subject to severe water erosion and, in some cases, wind erosion. Use of grasses and legumes in the rotation, plowing down of sweet clover and use of manure help to combat erosion. On long, smooth slopes, particularly the steeper ones, cultivation across the slopes is advisable.

Rolla Series (Rl)

Rolla silty clay loams and silty clays are Black Solod soils. They occur in the eastern part of the surveyed area near Rolla and are found in association with Arras and Rycroft soils. They cover about 6,880 acres.

They have developed under a parkland vegetation consisting of grasses, willow, shrubs, and occasional bluffs of poplar.

About 5,180 acres were mapped as level and very gently sloping, these areas being largely a mixture with Rycroft and Rolla soils. About 1,080 acres were mapped as irregular, steeply sloping.

These soils range from well to excessively well drained. Moisture penetration is medium to high on the nearly level and gently sloping areas, but on the more steeply sloping areas much of the precipitation is lost through runoff and crops often suffer from drought.

The soils have a fairly thick, granular Ah horizon underlain by a gray-brown, fine-textured B horizon. The parent material is strongly calcareous and somewhat saline.

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

Horizon	Depth Inches	
Ah1	0 – 4	Very dark brown (10YR 2/2, dry), black (10YR 2/1, moist) silty clay loam. Strong, fine granular structure; friable. pH 6.4.
Ah2	4 – 11	Very dark grayish brown (10YR 3/2, dry), very dark brown (10YR 2/2, moist) silt loam. Moderate, medium columnar breaking to fine, subangular blocky structure; friable. pH 6.0.
Ae	11 – 15	Gray (10YR 5/1, dry), dark grayish brown (10YR 4/2, moist) silty clay loam. Weak, medium prismatic breaking to strong, fine, subangular blocky structure; peds vesicular; firm. pH 6.0.
Bn	15 – 20	Brown (10YR 5/3, dry), very dark grayish brown (10YR 3/2, moist) silty clay. Weak, medium columnar breaking to fine blocky structure; dark-brown and black clay and organic films on peds; very hard when dry. pH 6.8.
Ck	20 – 24	Grayish-brown (10YR 5/2, dry), dark-gray (10YR 4/1, moist) silty clay loam. Moderate, fine blocky structure; very firm; moderately calcareous. pH 8.4.
C	30+	Light brownish gray (10YR 6/2, dry), dark-gray (10YR 4/1, moist) silty clay loam. Stratified. pH 8.1.

Use

Rolla soils are very good arable soils. They hold moisture especially well and have a high reserve of organic matter. The level and gently sloping areas are well suited to cereal and forage crops.

These soils are subject to wind erosion, particularly during a dry season. Serious sheet and gully erosion often occur on the long, smooth slopes and in the steeply sloping areas. Cultivating across these slopes counteracts erosion.

Coleman Series (Cm)

Coleman silt loams and silty clay loams are Low Humic Eluviated Gleysol soils. They are found mainly in the central part of the surveyed area and are closely associated with Arras, Devereau and Sukunka soils. They occur on flat and depressional areas where surface and internal drainage conditions are very poor. Only 2,045 acres were mapped.

The native vegetation consists mainly of willows, groundbirch and occasional pine. Coarse grasses and sedges are also common.

The soils have a thin peaty surface layer, a light-colored leached (Ae) horizon and fine-textured B horizons. Both surface and subsurface horizons are mottled.

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

Horizon	Depth Inches	
L-H	3 – 0	Dark-brown litter consisting mainly of sedge and coarse-grass remains. pH 6.5.
Ah	0 – 1	Gray (10YR 5/1, dry), very dark gray (10YR 3/1, moist) silt loam. Moderate, fine granular structure; friable. pH 6.0.

Horizon	Depth Inches	
Aeg	1 – 3	Light-gray (10YR 6/1, dry), dark-gray (10YR 4/1, moist), very fine sandy loam. Moderate, medium platy structure; mottled; small iron concretions; friable. pH 6.1.
BAg	3 – 9	Gray (10YR 5/1, dry), dark-gray (10YR 4/1, moist) silty clay. Dark-brown (10YR 3/3) mottles common and distinct. Moderate, medium, coarse blocky structure; very sticky when wet. pH 5.7.
Btg	9 – 14	Gray (10YR 6/1, dry), dark-gray (10YR 4/1, moist) silty clay. Common, medium, distinct mottles of dark grayish brown (10YR 3/2, moist) and dark yellowish brown (10YR 4/4, moist). Moderate, medium, fine blocky structure; hard, firm. pH 6.3.
Ck	14+	Gray (10YR 5/1, dry), very dark gray (10YR 3/1, moist) silty clay. Weak coarse blocky structure; very hard; very firm; moderately calcareous. pH 8.0.

Use

Until drainage is improved, Coleman soils have limited agricultural use. They are suited for pasture or grazing land.

Poor drainage, lack of aeration and the difficulty of maintaining a good tilth are some of the problems encountered. Grasses and legumes that can withstand periodic flooding are essential to successful crop production.

ON BROWN SILTY CLAY LOAM AND SILTY CLAY, FRIABLE, MODERATELY CALCAREOUS

The Kathleen and Judah soils have developed on these materials, which appear to be, in part, of alluvial origin. The materials are stone-free. They form "humpies," or gently and moderately sloping mounds irregularly distributed and highly variable in composition. In some places, the silt overlies till; in others it overlies lacustrine clay; in still others, alternate beds of sands and silts occur throughout.

Kathleen Series (Kt)

The Kathleen soils, Orthic Gray Wooded silt loams and silty clay loams, occur near the Peace River between Halfway River and Clayhurst. They are the main soils on about 35,900 acres. They commonly occur in association with Judah, Nampa, Falher and to a limited extent Doig and Davis soils on well and moderately well drained areas, and with Goose, Eaglesham and Prestville soils on poorly and very poorly drained areas.

About 3,400 acres were mapped as very gently sloping, 13,330 acres as moderately sloping, 18,050 as irregular, gently and moderately sloping, and 1,120 acres as irregular, steeply sloping.

The vegetation consists normally of poplars and willows with a grassy and shrubby understory. The area has been subjected to repeated fires and has a parkland appearance.

These soils are moderately well drained. The runoff is high to moderate on the steeper slopes.

The soils have a thin surface organic layer, a thin Ah horizon, and a fairly thick, pale-brown Ae horizon 2 to 4 inches thick. The B horizon is brown and relatively thick and overlies a highly calcareous subsoil.

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

Horizon	Depth Inches	
L-H	2 – 0	Leaf mat consisting mainly of deciduous leaves, grasses. pH 6.5.
Ahe	0 – 2	Brown (10YR 5/3, dry), dark grayish brown (10YR 4/2, moist) silty clay loam. Moderate, fine granular structure; friable. pH 7.1.
Ae	2 – 5	Pale-brown (10YR 6/3, moist), silty clay loam. Weak, fine platy and subangular blocky structure; firm. pH 6.9.
AB	5 – 7	Pinkish-gray (7.5YR 6/2, dry), brown (10YR 4/3, moist) silty clay. Moderate, medium, subangular blocky structure; hard when dry and firm when moist. pH 6.4.
BA	7 – 13	Pinkish-gray (7.5YR 6/2, dry), dark-brown (7.5YR 3/2, moist) silty clay. Moderate, medium blocky structure; hard when dry; firm when moist. pH 5.6.
Bt	13 – 17	Brown (7.5YR 4/2, dry), dark-brown (7.5YR 3/2, moist) silty clay. Strong, medium and coarse blocky structure; hard and very hard when dry; clay skins continuous. pH 7.5.
BC	17 – 22	Grayish-brown (10YR 5/2, dry), very dark grayish brown (10YR 3/2, moist) silty clay. Strong, medium and fine blocky structure; firm. pH 8.4.
Ck	22 – 32	Dark grayish brown (10YR 4/2, moist) silty clay. Stratified; discontinuous clay skins; moderately calcareous. pH 8.4.
IIC	32+	Very dark gray (10YR 3/1, moist) bands of silt loam and silty clay. Moderately calcareous. pH 8.3.

Use

Kathleen soils are fairly good arable land.

These soils are low in natural fertility. To improve and maintain yields it is necessary to increase the organic matter content of the soil. Crop rotations should include a high percentage of grasses and legumes. Manure and nitrogen and phosphate fertilizers are evidently necessary to keep these soils productive.

Water erosion may become serious on the moderately sloping lands. Cross-slope cultivation and use of deep-rooted legumes counteract erosion. Irregular, steeply sloping areas are best suited for sod or pasture crops.

Judah Series (Ju)

The Judah soils are Dark Gray Wooded silty clay loams and silty clays. They are found in the central part of the surveyed area near the Peace River between Fort St. John and Clayhurst. They occur at elevations between 1,900 and 2,250 feet and cover some 51,580 acres.

The vegetative cover is dominated by poplar and lodgepole pine. Spruce occurs in areas that have escaped forest fires.

The topography ranges from smooth very gently sloping to irregular, gently and moderately sloping. About 86 percent (44,700 acres) of the area has a succession of irregular-shaped mounds separated from one another by flat areas.

The soils are well drained. Surface runoff on the steeper slopes is generally high.

These soils have dark-brown or brown surface horizons (Ah) overlying a gray-brown or yellowish-brown, indistinct Ae horizon. At depths of 6 to 12 inches, a brown, friable, fine-textured B horizon occurs. This layer is underlain by brownish, stratified materials containing a high concentration of lime carbonate.

A typical profile is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown, partly decomposed plant remains. pH 7.0.
Ah	0 – 4	Grayish-brown (10YR 5/2, dry), dark grayish brown (10YR 4/2, moist) silty clay loam. Moderate, medium, subangular blocky structure; firm. pH 6.0.
Ahe	4 – 8	Light brownish gray (10YR 6/2, dry), yellowish-brown (10YR 5/4, moist) silt loam. Moderate, medium and fine, subangular blocky structure; friable. pH 6.0.
AB	8 – 12	Grayish-brown (10YR 5/2, dry) silty clay loam. Moderate, medium, subangular blocky structure; peds vesicular; hard when dry. pH 5.5.
Bt	12 – 19	Dark yellowish brown (10YR 4/4, moist) silty clay. Strong, medium and coarse, subangular blocky structure; clay skins common; hard when dry. pH 7.0.
Ck	19 – 24	Grayish-brown and dark grayish brown silty clay loam. Moderate, coarse blocky structure; strongly calcareous. pH 8.0.
C	24+	Grayish-brown, stratified silty clay loam. Moderately calcareous. pH 7.8.

Use

Judah soils are fairly good to good arable land.

Topography is a serious problem in some areas, particularly where the mounds are steep and are closely spaced. Frost is often a serious hazard, and has caused much damage to wheat and alfalfa seed crops. With the introduction of earlier-maturing varieties, increased clearing and improved air drainage, frost damage may gradually be decreased.

Water erosion, particularly gully erosion, is a serious problem even on the more gentle slopes. Cultivation across slopes and use of fertilizers, manure and rotations that include grasses and legumes for forage or seed are necessary to maintain productivity.

ON GRAY AND GRAYISH-BROWN SILTY CLAY LOAM AND SILTY CLAY, SOMEWHAT SALINE

The Beatton, Doig and Roseland soils have developed on these materials on well-drained areas, and the Prespatou soils on poorly drained areas. Prestville soils may also occur on poorly drained areas. The deposits were laid down in lakes in front of the retreating ice and are confined mainly to the broad valleys of the Blueberry, Beatton, Doig and Alces rivers.

The topography of most of these soils ranges from gently sloping to irregular, steeply sloping. On the steep slopes the materials are mainly thin lacustrine deposits over glacial till. Along the rivers, closely spaced mounds and ridges are common.

Beatton Series (Bt)

The Beatton soils, Gray Wooded Solod silty clay loams and silty clays, are found mainly along the Beatton and Blueberry rivers north of Rose Prairie. Smaller areas were mapped in the upper Alces valley north and east of Boundary Lake. They are found on about 48,100 acres, mainly in association with Doig, Buick, Prespatou, Kenzie or Eaglesham soils.

The topography is mostly smooth, gently sloping. Complex slopes, with a rolling or "humpy" topography, occur near the rivers. The soils are well to imperfectly drained. Runoff is generally high on the slopes and ridges.

The native cover is dominantly lodgepole pine, spruce, aspen, poplar and willows.

The soils normally have a thin surface organic horizon, and a gray leached (Ae) horizon 2 to 4 inches thick. The grayish-brown B horizon tends to be compact and acid.

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

Horizon	*Depth Inches*	
L-H	1 – 0	Leaf mat, often absent due to forest fires. pH 6.8.
Ah	0 – 3	Light brownish gray (10YR 6/2, dry), very dark grayish brown (10YR 3/2, moist) silt loam. Moderate, fine granular structure; friable. pH 6.2.
Ae	3 – 5	Light brownish gray (10YR 7/3, dry), grayish-brown (10YR 5/2, moist) clay loam. Moderate, medium, subangular blocky structure; firm when moist. pH 5.6.
BA	5 – 13	Light-gray (10YR 7/2, dry), dark grayish brown (10YR 4.5/2, moist) clay. Moderate, medium, subangular blocky structure; hard when dry. pH 5.1.
BN	13 – 19	Light yellowish brown (10YR 6/4, dry), dark-brown (10YR 4/3, moist) clay. Surfaces of peds light gray (10YR 7/2, dry) and grayish brown (10YR 5/2, dry). Weak, coarse columnar breaking to strong, medium blocky structure; hard when dry, very firm when moist. pH 4.6.
C	19+	Light yellowish brown (10YR 6/4, dry), dark-brown (10YR 4/3, moist), stratified layers of clay and silt loam. pH 4.7.

Use

The Beatton soils on well-drained sites are fair arable soils. High costs of clearing, inaccessibility and the danger of frost have handicapped settlement.

These soils are somewhat low in fertility. They should, however, respond favorably to good cropping and management practices that include use of fertilizers and rotations with both grasses and legumes.

Doig Series (Dg)

The Doig silty clay loams and silty clays are Dark Gray Solod soils. They occur in the upper Alces valley and in the basin of the Beatton River north of Rose Prairie. They are the main soils on about 33,040 acres.

The soil materials are thick in the valleys, but thin on the lower till slopes. In some areas long, smooth, gentle slopes are common. In other areas the topography is humpy or rolling.

The native cover consists mainly of grasses and herbaceous perennials under widely spaced poplars. After fires, grasses, fireweed, lupin and various shrubs quickly become established in luxuriant stands.

These soils are normally moderately well drained. Runoff is excessive on the steeply sloping areas.

In moderately well drained areas the soils have a dark-colored Ah horizon and a gray, platy-structured Ae horizon. The B horizon is relatively thick and has hard, columnar structure. The lower horizons are calcareous and saline.

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

Horizon	*Depth Inches*	
L-H	1 – 0	Thin leaf mat. pH 6.8.
Ah	0 – 4	Dark grayish brown (10YR 4/2, moist) silty clay loam. Strong, fine granular structure; friable, many roots. pH 5.3.
Ae	4 – 7	Very pale brown (10YR 7/3, dry), light brownish gray (10YR 6/2, moist) silt loam. Moderate, medium platy structure; loose when dry, friable when moist. pH 4.4.
AB	7 – 11	Light-gray (10YR 7/2, dry), grayish-brown (10YR 5/2, moist) silty clay loam. Moderate, medium, subangular blocky structure; ped very porous; moderately hard when dry, friable when moist. pH 4.4.
Bn	11 – 19	Dark grayish brown (10YR 4/2, dry), very dark grayish brown (10YR 3/2, moist) silty clay. Moderate, coarse columnar breaking to strong, medium and coarse blocky structure; very hard when dry. pH 4.4.
BC	19 – 32	Very dark brown (10YR 2/2, moist) silty clay. Coarse prismatic breaking to medium blocky structure; very hard when dry. pH 4.6.
Cs	32 – 38	Similar to BC horizon except gypsum crystals very common. pH 7.3.
C	38+	Very dark brown silty clay containing pockets of salts; stratified pH 7.1.

Use

Most Doig soils are fairly good arable land. The steeply sloping areas are less favorable for agriculture.

These soils have rather high fertility. They are undoubtedly suitable for livestock farming and for the production of legumes and grasses for forage and seed. Hardy coarse grains should also fit into the rotation.

Roseland Series (Ro)

The Roseland soils, Black Solods, occur mainly in the Beatton River basin near Rose Prairie and North Pine. Small "islands" occur farther south. They are found in association with Doig, Falher and Landry soils and are the main soils on about 17,620 acres.

About 8,880 acres, or about 50 percent of the acreage, were mapped as smooth, steeply sloping. About 8,740 acres were mapped as irregular, steeply sloping.

These soils have developed under a parkland type of cover, consisting mainly of grasses, shrubs and open stands of poplar. Repeated fires have removed practically all the woody vegetation.

The soils have a thick, dark-colored surface horizon (Ah) from 6 to 10 inches thick. The B horizon is usually columnar and more compact than that of Doig soils. The parent materials are moderately calcareous and somewhat saline.

The profile of a typical clay is described as follows:

Horizon	Depth Inches	
Ah1	1 – 5	Black (10YR 2/1, dry) clay. Moderate, coarse prismatic breaking to medium and fine granular structure; friable; high in organic matter. pH 6.7.
Ah2	5 – 8	Very dark gray (10YR 3/1, moist) clay. Similar in structure to Ah1 horizon; high in organic matter. pH 5.1.
BA	8 – 14	Very dark gray (10YR 3/1, moist) clay. Strong, coarse blocky structure; very hard when dry. pH 4.3.
Bn	14 – 24	Very dark grayish brown (10YR 3/2, moist) heavy clay. Weak, coarse prismatic breaking readily to strong, coarse blocky structure; outsides of peds dark brown; clay skins evident; very hard when dry, very plastic when wet. pH 6.2.
Cs	24 – 36	Very dark gray (10YR 3/1, moist) clay. Massive structure; very slowly permeable; slight effervescence; high concentration of gypsum crystals. pH 7.4.
C	36+	Dark-brown (10YR 3/3, moist) clay. Massive to coarse blocky structure; slickensides evident; gypsum crystals common. pH 7.5.

Use

Roseland soils are good arable land. The areas of smooth slopes are the most desirable.

These soils are, in general, highly fertile. The loose, well-aggregated surface layer is highly porous and high in organic matter.

The soils are used mainly for grain production but are capable of producing a wider variety of crops than is generally grown. They are probably best suited for rotations with legumes and grasses. The systematic use of phosphatic and nitrogenous fertilizers will probably increase productivity.

Prespatou Series (Pu)

The Prespatou soils occur chiefly in the drainage basin of the Blueberry River. The are low Humic Eluviated Gleysol silty clay loams and silty clays and cover about 61,505 acres.

They occur on level and depressional land and have developed in the presence of a high or fluctuating water table. They are poorly or very poorly drained.

The vegetation consists mainly of willows, groundbirch, scattered pine and coarse grasses and sedges.

The soils have a few inches of surface organic debris, a leached (Ae) horizon and a fine-textured, highly mottled Bt horizon. The solum is strongly acid throughout.

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

Horizon	Depth Inches	
L-H	2 – 0	Brown and dark-brown peat. pH 6.0.
Ae	0 – 4	Very pale brown (10YR 8/3, dry), light-gray (10YR 7/2, moist) silty clay loam. Strong, medium platy structure; friable. pH 5.8.

Horizon	Depth Inches	
BAg	4 – 5	Yellowish-brown (10YR 5/4, moist) silty clay. Many fine, medium (10YR 5/8, moist) mottles; moderate, medium, subangular blocky structure; friable. pH 5.8.
Btg	5 – 25	Grayish-brown and brown (10YR 4/3 - 5/2, moist) clay. Yellowish-brown (10YR 5/4, moist) mottles common; hard when dry. pH 4.8.
BCg	25 – 33	Dark-gray (10R 4/1, moist) clay. Many prominent yellowish-brown (10YR 5/4, moist) mottles; weak, coarse blocky structure; very plastic when wet. pH 4.8.
C	33+	Very dark-gray clay. Faintly mottled; plastic. pH 4.5.

Use

Prespatou soils, unless drained, are suitable only for pasture. They are "cold," poorly drained soils with an impervious subsoil and collect seepage and runoff water from adjacent uplands.

With improved drainage, they may be developed into fairly good arable soils.

Soils Developed on Alluvial and Aeolian Materials

These variable sediments are found mainly in the western part of Lake Rycroft basin, where much silt and sand was deposited by glacial meltwaters. The sediments are stratified, variable in thickness and strongly calcareous. In some areas the strata are cross-bedded and appear to have been reworked somewhat by wind action.

ON GRAY AND GRAY-BROWN, VARIABLE FINE SANDY LOAM AND SILT LOAM, VERY CALCAREOUS

The Toad, Lynx, Davis and Tangent soils have developed on these materials, in well-drained areas. The Codner and Centurion soils occur in poorly drained areas.

Toad Series (Td)

The Toad soils, Bisequa Gray Wooded sandy loams and silt loams, are found mainly near Hudson Hope above the present channels of the Peace River. A small area also occurs near Groundbirch. About 28,280 acres were mapped. They are associated mainly with Beryl and Lynx soils.

Most of the soils occur on irregular, gently and moderately sloping topography. Only about 450 acres were mapped as level and gently sloping.

The vegetation consists mainly of lodgepole pine, poplar and spruce. The understory is dominated by alder, shepherdia, kinnikinnick and various other shrubs.

The soils have a thin leaf litter underlain by a light-gray Ae horizon and a brown Bf horizon. The Bf layer in turn grades to a finer-textured and more compact horizon (Bt) in which clay is the main product of accumulation.

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

Horizon	Depth Inches	
L-H	1 – 0	Dark-brown layer of needles, grass and other litter in varying stages of decomposition. pH 6.4.
Ae	0 – 2	Light-gray (10YR 6/1, dry), gray (10YR 5/1, moist) silt loam. Moderate, fine platy structure; loose. pH 6.0.

Horizon	Depth Inches	
Bf	2 – 8	Pale-brown (10YR 6/3, dry), brown (10YR 4/3, moist) silt loam. Moderate, fine platy structure; very friable. pH 5.5.
Ae	8 – 12	Light brownish gray (10YR 6/2, moist) silt loam. Moderate, fine platy structure; very friable. pH 5.5.
Bt	12 – 20	Brown (10YR 4/3, dry), dark yellowish brown (10YR 4/4, moist) silty clay loam. Moderate, medium, subangular blocky structure; clay skins common; firm when moist. pH 5.5.
BC	20 – 28	Yellowish-brown (10YR 5/4, dry), dark yellowish brown (10YR 4/4, moist) silty clay loam. Weak, medium, subangular blocky structure; friable. pH 6.0.
Ck	28 – 32	Grayish-brown (10YR 5/2, dry), dark grayish brown (10YR 4/2, moist) silt loam. Highly calcareous; friable. pH 8.0.
C	32+	Gray silt loam. Moderately calcareous. pH 8.0.

Use

The Toad soils on undulating and gently sloping areas are fair to fairly good arable land.

These soils are friable and may be cultivated over a fairly wide range of moisture conditions. The surface horizons are slightly acid and the subsoil neutral to strongly alkaline. The moisture-holding capacity of the upper 12 inches tends to be low, but the fine-textured Bt horizon helps to retain moisture during the growing season.

A small acreage of Toad soils has been brought under cultivation. The soils are low in organic matter and nitrogen. The major management problem is to increase and maintain the organic matter content. This may be readily effected through the adoption of a mixed type of farming based primarily on livestock.

Lynx Series (Ly)

The Lynx soils, Brunisolic Gray Wooded fine sandy loams and silt loams, occur throughout the western part of the surveyed area between Hudson Hope and Bear Flats, on the margins of the Halfway, Pine and Moberly rivers. They are associated with Sundance, Toad, Beryl, Centurion and Kenzie soils. About 183,735 acres were mapped.

The topography ranges from level and very gently sloping to irregular, steeply sloping and hilly. About 37,370 acres are smooth, very gently sloping; 29,125 acres are gently sloping; 90,365 acres are irregular, gently and moderately sloping; and about 26,875 acres are steeply sloping. These soils are well drained.

The vegetation consists of fairly dense stands of mixed woods dominated by poplar and lodgepole pine.

A brownish profile is typical of Lynx soils. The solum layers are as follows: 4 inches of brown, fine sandy loam; 4 to 6 inches of light yellowish brown, fine sandy loam; about 2 inches of dark brown clay loam; and about 2 inches of brown silt loam. The underlying material is calcareous silt loam.

The profile of a typical fine sandy loam is described as follows:

Horizon	Depth Inches	
L-H	2 – 0	Dark-brown leaf litter. pH 7.2.
Bf	0 – 4	Brown (7.5YR 3/4, moist) fine sandy loam. Weak, medium, subangular blocky structure; very friable. pH 6.6.

Horizon	Depth Inches	
Ae	4 – 8	Light yellowish brown (10YR 6/4, moist), fine sandy loam. Weak, fine platy structure; friable. pH 6.6.
Bt	8 – 10	Dark-brown (10YR 4/3, moist) clay loam. Moderate, medium, subangular blocky structure; clay skins common; hard when dry. pH 6.0.
BC	10 – 12	Olive-brown (2.5Y 4/4, moist) silt loam. Moderate, medium, subangular blocky structure; clay skins discontinuous; friable. pH 6.7.
Ck	12 – 28	Light-gray (10YR 7/2, moist) silt loam. Weak, subangular blocky structure; frequently stratified; very high lime content. pH 8.2.
C	28+	Gray silt loam. Stratified; high lime content. pH 8.0.

Use

Lynx soils are fair agricultural land.

These soils are low in organic matter and are likely to present fertility problems where grain growing is practised. Control of wind erosion may be vital to the successful management of these soils. Mixed farming, including the use of grasses and legumes and the keeping of livestock, may help to control erosion and maintain production.

Davis Series (Dv)

The Davis soils, Orthic Gray Wooded loams to silt loams, are found chiefly in the area between the Moberly and Pine rivers. Smaller areas occur at Progress, Valleyview and Farrell Creek. They are associated with Groundbirch, Toad, Kenzie and, to a lesser extent Devereau, Coleman and Codner soils. About 34,030 acres were mapped.

About 50 percent of the soils are smooth, gently and moderately sloping. The rest are irregular, moderately sloping, because of numerous, closely spaced mounds, or "humpies". The smooth slopes are well to moderately well drained. Most of the more steeply sloping areas are excessively drained.

The vegetation is a mixed woodland dominated by poplar, lodgepole pine and spruce.

These soils have a yellowish-brown Ae horizon, overlying a finer-textured brown to reddish-brown B horizon. The parent material is highly calcareous and usually irregularly stratified.

The profile of a fine sandy loam is described as follows:

Horizon	Depth Inches	
L-H	3 – 0	Dark-brown layer of leaves, needles, etc. pH 6.5.
Ae	0 – 7	Grayish-brown (10YR 5/2, dry), light yellowish brown (10YR 6/4, moist) very fine sandy loam. Moderate, fine platy structure; very friable. pH 7.0.
AB	7 – 10	Brown (10YR 5/3, dry), dark yellowish brown (10YR 4/4, moist) silty clay loam. Moderate, fine, subangular blocky structure; firm. pH 6.0.
Btl	10 – 13	Dark-brown (10YR 4/3, moist) silty clay. Moderate, medium, subangular blocky structure; clay skins common; firm. pH 6.0.

Horizon	Depth Inches	
Bt2	13 – 17	Dark yellowish brown (10YR 4/4, dry), dark grayish brown (10YR 4/2, moist) silty clay loam. Moderate, coarse, subangular blocky; structure; discontinuous clay skins; moderately firm. pH 7.0.
Ck	17+	Light-gray (10YR 6/1, dry), light brownish gray (10YR 6/2, moist) silt loam. Fairly high lime concentration. pH 8.2.

Use

Davis soils are fair to fairly good arable land. They are not well developed agriculturally, mainly because of their inaccessibility. They are suitable for forage crops.

These soils are deeply leached and low in organic matter and nitrogen. The fairly good soils occur on smooth, gently sloping areas. They have a fine-textured subsoil. The irregular, steeply sloping areas are nonarable.

Tangent Series (Ta)

The Tangent soils, Dark Gray Wooded loams and silt loams, are found near Cecil Lake on high terraces above the Beatton River. Small areas also occur at Lone Prairie. They occur in association with Judah, Esher and, to a limited extent, Roseland soils. About 3,100 acres were mapped.

About 72 per cent of the soils occur on complex slopes having a gradient of 2 to 9 percent. Only 170 acres were mapped as smooth, gently sloping land.

The native vegetation consists mainly of various shrubs, grasses and scattered poplar trees. Much of the area is under cultivation.

Generally, these soils are well drained and stones and gravel are rarely found.

These soils normally have a thick Ah horizon. The upper part is dark brown, and the lower part yellowish brown and platy-structured. The B horizon is brown or yellowish brown and overlies highly calcareous parent material.

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

Horizon	Depth Inches	
Ah	0 – 4	Very dark grayish brown (10YR 3/2, dry) to brown (10YR 4/3, dry) fine sandy loam. Moderate, medium granular structure; friable. pH 7.5.
Ae	4 – 9	Very pale brown (10YR 7/3, dry), fine sandy loam. Moderate, fine platy structure; friable. pH 6.9.
Bt	9 – 17	Yellowish-brown (10YR 5/4, moist) silty clay loam. Weak, coarse prismatic breaking to moderate, medium, subangular blocky structure; clay skins common; firm. pH 7.5.
BC	17 – 24	Yellowish-brown (10YR 5/4, dry), dark-brown (10YR 4/3, moist) silty clay loam. Moderate, medium, subangular blocky structure; clay skins discontinuous; friable. pH 8.0.
Ck	24 – 27	Grayish-brown (10YR 5/2, moist) silt loam. Weakly stratified; very high in lime; friable. pH 8.0.
C	27+	Gray-brown silt loam. Fairly high lime content. pH 8.0.

Use

Tangent soils are fairly good to good arable land. They have been used mainly for grain crops, particularly wheat, although a considerable acreage has been devoted to growing alfalfa for seed. The soils are vulnerable to both wind and water erosion. A type of mixed farming with emphasis on livestock and forage crops is recommended.

Codner Series (Cn)

The Codner soils, Orthic Meadow sandy loams and silt loams, are found mainly in association with Toad, Beryl, Sloane and Davis soils. They are the main soils on about 27,850 acres.

They occur on level to depressional areas and are imperfectly to poorly drained. The native vegetation consists of coarse grasses, sedges, groundbirch and scattered bluffs of willows and black poplar. Occasionally black spruce and larch are present.

These soils can be recognized by their dark-colored, highly organic Ah horizon, which is underlain by a medium-textured subsoil that is distinctly mottled. A peaty surface horizon (L-H) is usually present.

The profile of a typical Codner silt loam is described as follows:

Horizon	*Depth Inches*	
L-H	3 – 0	Very dark brown, semidecomposed sedge peat. pH 6.4.
Ah	0 – 5	Dark-gray (10YR 4/1, dry), very dark gray (10YR 3/1, moist) silt loam. Moderate, medium and fine granular structure; high in organic matter; friable. pH 6.0.
ABg	5 – 8	Brown and yellowish-brown (10YR 5/3, 5/4, dry), dark-brown (10YR 4/3, moist) silt loam. Moderate, medium, subangular blocky structure; friable. pH 6.3.
Bg	8 – 15	Brown (10YR 5/3, moist) and dark yellowish brown (10YR 3/4, moist) silt loam. Mottled throughout; friable. pH 6.6.
IICg	15+	Gray (10YR 5/1, dry), dark-gray (10YR 4/1) silt loam. Brown mottles common; moderate content of lime carbonate. pH 8.0.

Use

Little use has been made of the Codner soils in the surveyed area. These soils can be cropped successfully if they are satisfactorily drained. In some places, adequate drainage can be provided without undue expenditure, but in others the cost is prohibitive. Where drainage is satisfactory, these soils are fair arable land and suitable for pasture.

Centurion Series (Ce)

The Centurion soils, Calcareous Meadow sandy loams and silt loams, occur in the western part of the surveyed area. They are found in association with Lynx and Sundance soils near Hudson Hope and Chetwynd. They are the main soils on about 12,540 acres.

Like the Codner soils, these are found on level to depressional areas and usually support a vegetation of willows, groundbirch, Labrador tea and mosses. They are poorly drained soils with a water table at or near the surface throughout most of the year.

These soils can be distinguished by their dark-colored, highly calcareous Ah horizon, which is underlain by a limy, mottled subsoil.

The profile of a typical loam is described as follows:

Horizon	Depth Inches	
L-H	5 – 0	Dark-brown peaty material consisting of leaves and mosses. pH 8.0.
Ahk1	0 – 4	Dark-gray (10YR 4/1, moist) loam. Moderate, fine granular structure; snail shells common; friable. pH 8.0.
Ahk2	4 – 8	Dark-gray silt loam. Fine granular structure; few snail shells; moderately calcareous. pH 8.0.
Ckg	8 – 15	Gray and dark-gray (10YR 5/1, 4/1, moist) silt loam. Few, fine brown (10YR 5/3) mottles; mildly calcareous. pH 8.0.

Use

These highly calcareous and poorly drained soils are unsuitable for grain crops unless they are adequately drained. A few areas have been cultivated and used for growing forage and legume seed.

The soils are suitable for pasture.

ON GRAY-BROWN AND YELLOWISH-BROWN, VARIABLE SANDY MATERIALS, OFTEN UNDERLAIN BY GRAVEL, MODERATELY CALCAREOUS

The Groundbirch, Sundance and Twidwell soils have developed on alluvial deposits in the western part of the surveyed area. The deposits have been modified by wind in many areas. The dunes vary in form but are mostly elongate, the long axes being in the direction of the prevailing winds.

Groundbirch Series (Gb)

The Groundbirch soils, Bisequa Podzol sands and loamy sands, are found along the Halfway, Peace and Pine rivers in the western part of the surveyed area. They are the main soils on about 34,270 acres. They are associated with Davis and Lynx soils on well-drained areas, and with Eaglesham and Kenzie soils on poorly drained areas.

The topography ranges from smooth, gently sloping to irregular, steeply sloping and hilly. Only about 5 per cent, or 1,805 acres, of the soils are very gently sloping.

Drainage varies appreciably, but is generally excessive. Loamy sand is the main textural class. Stones are rarely encountered but gravelly subsoils are common.

The forest cover is a fairly heavy stand of coniferous trees, principally lodgepole pine with occasional areas of spruce. The understory is rather sparse and consists of shepherdia, kinnikinick and seedling trees.

The organic surface litter, usually 1 to 2 inches thick, overlies a thin, gray leached (Ae) horizon. Immediately below is a brown Bf horizon 4 to 6 inches thick, overlying a fine-textured Bt horizon.

The profile of a typical loamy sand is described as follows:

Horizon	Depth Inches	
L-H	1 – 0	Brown layer of pine needles, leaves, etc. pH 5.2.
Ae	0 – 1	Pinkish-gray (7.5Y 7/2, moist) loamy sand. Single-grained; loose; pH 5.9.
Bf	1 – 5	Reddish-brown (5YR 5/3, moist) loamy sand. Single-grained; slightly compacted. pH 5.6.

Horizon	Depth Inches	
Ae	5 – 20	Yellowish-brown (10YR 5/4, moist) loamy sand. Single grained; loose. pH 6.0.
Bt	20 – 25	Brown and yellowish-brown (10YR 5/3, 5/4, moist) sandy clay loam. Moderate, medium, subangular blocky structure; few clay skins and clay bridges; firm. pH 6.7.
Ck	25+	Gray (10YR 5/1, moist) loamy sand and sand. Single-grained, often cross-bedded; lime tongues along old root channels. pH 8.4.

Use

Groundbirch soils are nonarable and should not be cultivated. They hold moisture poorly and are low in organic matter, nitrogen and mineral plant foods. These soils should be left in their native state.

Sundance Series (Su)

The Sundance soils, Bisequa Gray Wooded loamy sands and sandy loams, are found mainly in the southwestern part of the surveyed area near Chetwynd and Moberly Lake. They are associated mainly with Lynx, Beryl and Twidwell soils but may also occur with Coldstream, Centurion and Kenzie soils.

About 20,760 acres were mapped on smooth, gently and moderately sloping land, and 49,520 acres on irregular, moderately and steeply sloping land. The latter class includes dunes formed by wind.

The soils are excessively drained and the upper horizons are readily permeable. The solum holds moisture satisfactorily only if the Bt horizon is unbroken.

The vegetation consists chiefly of poplar and lodgepole pine, with minor amounts of spruce and balsam. Kinnikinick, blueberry and grasses form a sparse ground cover.

The surface layer consists of about 2 inches of leaf litter. The solum layers are as follows: 1 to 4 inches of light-gray loamy sand; 4 to 6 inches of yellowish-brown, fine sandy loam; about 8 inches of brown, fine sandy loam; and about 6 inches of yellowish-brown loam. The underlying material is calcareous sand.

The profile of a typical loamy sand is described as follows:

Horizon	Depth Inches	
L-H	2 – 0	Leaf litter and roots. pH 6.7.
Ae	0 – 2	Pinkish-gray (7.5YR 7/2, dry) sandy loam. Weak, fine, platy structure. pH 6.7.
Bf	2 – 6	Brownish-yellow to yellowish-brown (10YR 5.5/6, dry), fine sandy loam. Weak, medium, subangular blocky structure; friable. pH 6.4.
Ae	6 – 14	Brown (10YR 5/3, moist) loamy sand. Weak, medium, subangular blocky structure breaking to single grains; loose. pH 6.7.
Bt	14 – 20	Yellowish-brown (10YR 5/4, moist) sandy loam. Moderate, medium, subangular blocky structure; clay skins and bridges common; firm. pH 7.0.
Ck	20 – 24	Grayish-brown (10YR 5/2, moist) loamy sand. Stratified; strongly calcareous. pH 8.0.

The depth of the profile varies considerably. On the knolls the Ae is thin and the Bt consists mainly of thin bands. On smoother areas the Ae is thick and the Bt well developed and occurs at depths of 14 to 20 inches.

Use

In general, Sundance soils make poor arable land. They are low in fertility, hold water poorly and are susceptible to wind erosion.

The gently sloping and finer-textured areas may be used for growing alfalfa and clovers. Other areas should be left in their native state.

Twidwell Series (Tw)

The Twidwell soils, Bisequa Gray Wooded gravelly loamy sands and sandy loams, occur in abandoned glacial drainageways near Moberly Lake, Chetwynd and Sundance Lake. About 25,390 acres were mapped, mainly in association with Sundance, Beryl and Moberly soils. These soils occur principally on irregular, moderately to steeply sloping eskers, kames and terraces characterized by numerous kettles. In some places, low dunes are common. Only 100 acres were mapped as smooth, gently sloping.

The forest cover consists of an open stand of lodgepole pine, poplar and spruce. Kinnikinick, blueberry, shepherdia and various other shrubs form a sparse ground cover.

Drainage is excessive and the solum is rapidly permeable.

These soils vary markedly from gravelly and shallow to sandy and deep. They are stone-free soils and have a brown surface layer overlying a gravelly subsoil.

The profile of a gravelly sandy loam is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Undecomposed layer of pine needles, twigs and leaf litter. pH 6.7.
Ae	0 – 2	Light brownish gray (10YR 6/2, dry) gravelly sandy loam. Weak, platy structure. pH 6.0.
Bf	2 – 6	Brown (7.5Y 5/4, dry) gravelly sandy loam. Weak, medium, subangular blocky and single-grained structure. pH 6.5.
Ae	6 – 12	Grayish-brown to brown (10YR 5/2.5, dry) gravelly sandy loam. Weak, medium, subangular blocky structure; loose. pH 6.7.
Bt	12 – 14	Yellowish-brown (10YR 5/4, dry) gravelly silt loam. Moderate, medium, subangular blocky structure; clay skins common; firm. pH 7.0.
IIC	14+	Gray gravelly sand and gravelly loamy sand. Lime coating on undersides of pebbles. pH 7.5.

Use

Twidwell soils are nonarable. They are very shallow and have enough gravel and other coarse fragments at or near the surface to interfere seriously with cultivation. They do provide limited pasture and should be left in their native state.

The gravel deposits are used in construction of roads and buildings.

ON COMPARATIVELY RECENT ALLUVIAL, COLLUVIAL AND FLOOD-PLAIN DEPOSITS, SLIGHTLY AND MODERATELY CALCAREOUS

The soils developed on these materials are the Pingel, Widmark, Branham, Taylor and Farrell series and the undifferentiated Alluvial soils.

Pingel Series (Pg)

The Pingel soils, Degraded Brown Wooded clays, occur on intermediate terraces along the Peace River. They are found mainly along the south side of the Peace River between Taylor and Clayhurst, on an area of about 2,030 acres.

The soils have long, gentle slopes, which permit slow surface runoff. Internal drainage is slow.

The forest cover consists mainly of dense stands of poplar and lodgepole pine.

Beneath the thin surface forest litter lies a weakly developed eluvial (Ae) horizon about 2 inches thick, and a brownish B horizon showing some clay accumulation. The soil is therefore intermediate between a Resogol and a Gray Wooded soil.

The profile of a typical clay is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown leaf litter, partly decomposed. pH 6.5.
Ah	0 – 2	Dark grayish brown (10YR 4/2, moist) clay. Moderate, medium granular structure; friable. pH 6.0.
Aej	2 – 4	Grayish-brown (10YR 5/2, moist) clay. Granular structure; friable. pH 6.0.
BC	4 – 7	Grayish-brown (10YR 5/2, moist) clay. Moderate, medium and coarse blocky structure; thin, discontinuous clay skins; very hard when dry. pH 7.0.
C	7+	Dark-gray (10YR 4/1, moist) clay. Massive to coarse blocky structure; very hard when dry. pH 7.0.

Use

Pingel soils make good arable land.

Agricultural development has been slow because of the high cost of clearing. Cultivated acreages are small and they are used mainly for growing grass and legume crops.

Widmark Series (Wi)

The Widmark soils, Degraded Brown Wooded silty loams and silty clays, occur on along the valley floors and upper terraces along Centurion Creek near Chetwynd. About 8,680 acres were mapped in mixtures with Sukunka and Centurion soils.

Most of the areas are irregular, gently and moderately sloping, and are moderately well drained.

Mixed stands of poplar and lodgepole pine are the main tree types. The understory includes alder, thimbleberry, shepherdia, and various grass species.

These soils can be recognized by the dark grayish brown surface horizon showing distinct graying in the lower part. The B horizon is weakly developed and overlies highly calcareous parent material.

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

Horizon	*Depth Inches*	
L-H	2 – 0	Dark-brown leaf litter. pH 7.0.
Ah	0 – 2	Very dark grayish brown (10YR 3/2, moist) silt loam. Moderate, fine granular structure; friable. pH 7.0.

Horizon	Depth Inches	
Aej	2 – 4	Dark grayish brown to grayish-brown (10YR 4.5/2) silt loam. Weak, platy structure; friable. pH 7.0.
Btj	4 – 10	Brown to dark grayish brown (10YR 4/2.5) silt loam. Weak, medium, subangular blocky structure; friable. pH 7.5.
Ck	10+	Brown and grayish brown, highly calcareous silt loam. pH 8.0.

Use

Widmark soils make fair arable land. At present, they are not developed agriculturally. These silty soils are vulnerable to water erosion. They are low in organic matter and should respond to good management practices involving the use of fertilizers.

Branham Series (Br)

The Branham soils, Brown Wooded sandy loams and fine sandy loams, occur mainly on intermediate terraces in the Peace River valley between Farrell Creek and Branham Flats. About 31,620 acres were mapped.

They are found in close association with Clayhurst, Farrell and Alluvial soils and occur on long, narrow terraces modified appreciably by stream action. These soils are well drained except on the sloping areas along escarpments, where drainage is excessive.

The native vegetation is a mixed forest, predominantly poplar and lodgepole pine. Spruce and birch trees are common.

These soils may be recognized by a yellowish-brown mineral horizon lying directly over gray, calcareous parent material.

The profile of a sandy loam is described as follows:

Horizon	Depth Inches	
L-H	2 – 0	Dark-brown layer of needles, leaves, etc. pH 7.0.
Bm	0 – 8	Yellowish-brown to dark yellowish brown (10YR 5/4, 4/4), fine sandy loam. Weak, medium, subangular blocky structure; friable. pH 7.2.
Ck	8+	Gray (10YR 5/1) silt loam. Weakly stratified; strongly calcareous. pH 8.0.

Use

Branham soils are fair arable land. They are low in organic matter and have high concentrations of lime within 12 inches of the surface. The growing of legume and grass crops has met with considerable success in some areas. Shallow cultivation is necessary to avoid bringing the excess lime to the surface. Permanent pasture and the frequent incorporation of crop residues and manures may decrease the effects of excessive amounts of lime.

Taylor Series (Ty)

The Taylor soils, Rego Black loams and clay loams, have developed on fine-textured colluvial materials on intermediate terraces along the Peace River near Taylor and Bear Flats. Small areas also occur near Farrell Creek and Beatton River. About 12,370 acres were mapped.

The soils are found on smooth, gently and moderately sloping areas and contain few stones or gravel. They are well drained and yet hold adequate moisture for crops. Almost the entire acreage is cultivated.

They have a dark-brown to black surface (A) horizon overlying brown and dark-brown strata that appear to represent a succession of buried soil horizons.

The profile of a clay loam is describd as follows:

Horizon	*Depth Inches*	
Ahp	0 – 4	Black (10YR 2/1, moist) clay loam. Strong, medium granular structure; friable. pH 6.8.
CB	4 – 9	Very dark grayish brown (10YR 3/2, moist) clay loam. Weakly stratified breaking to blocky and subangular blocky structure friable. pH 6.3.
IIAh	9 – 11	Black (10YR 2/1, moist) clay. Moderate, medium granular structure; friable. pH 6.3.
IICB	11 – 19	Very dark grayish brown (10YR 3/2, moist) clay. Moderate, medium, subangular blocky structure; firm. pH 5.6.
IIC	19+	Very dark gray (10YR 3/1, moist) clay. Firm. 6.5.

The thickness of the upper two horizons varies considerably. Though the average is about 9 inches, it is several feet in places.

Use

Taylor soils make very good arable land. Nearly all have been cleared and used for agriculture. They are highly fertile and, being on south-facing slopes, are "early" and have a long frost-free period. They are somewhat susceptible to wind and water erosion. Rotations that include grasses and legumes and infrequent summerfallowing are desirable.

Farrell Series (Fr)

The Farrell soils, Mull Regosol silt loams and silty clay loams, occur on intermediate terraces near Farrell Creek and Hudson Hope. About 3,240 acres were mapped, mainly in association with Branham soils.

The soils occur mainly on smooth, very gentle sloping land. Surface drainage is adequate except on moderately sloping areas bordered by steep, broken land, where it is excessive.

Practically all these soils have developed under open forest dominated by popar, lodgepole pine and spruce.

The solum has only an Ah horizon. It is indistinct and overlies calcareous parent material.

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

Horizon	*Depth Inches*	
L-H	1 – 0	Partly decomposed litter, mainly current leaf fall. pH 7.5.
Ah	0 – 4	Dark-gray (10YR 4/1, moist) silt loam. Weak, fine granular structure; friable. pH 7.2.
C	4 +	Gray to dark-gray (10YR 4/1.5, moist) silt loam. Highly calcareous. pH 8.0.

Use

Farrell soils make fairly good arable land. Their fertility is moderately high. Organic matter is low and crops respond to nitrogen and phosphorus fertilizers. Soil erosion by water is a serious problem on the long, smooth slopes.

These soils are among the earliest to be settled in the surveyed area and have consistently given high yields of grass and legume crops.

Alluvial Soils (Al)

The Alluvial soils, found on about 60,170 acres, are mainly islands, undifferentiated river-flat and low-terrace deposits. Sandy loam, silt loam and, in some areas, gravel are the most common textures. The texture varies horizontally and vertically to such an extent that separation into textural classes was not possible at the scale of mapping used.

Most of the land is level or gently sloping, and eroded somewhat by post-glacial streams. Drainage is extremely variable. The higher terraces and benches are well drained, but flooding is common on the lower areas.

The native vegetation is a mixed forest, predominantly deciduous. The undergrowth is dominantly willows and alder. Some areas are open grassland. These are confined to the drier and more exposed positions.

Use

In general, these soils make fair to fairly good arable land. Much of the arable land is on islands in the Peace River and is difficult of access. A small acreage in the more readily accessible areas has been cleared and cultivated and is highly productive. Most of the soils, due to their location, are used for grazing.

ON YELLOWISH-BROWN SANDY LOAM AND SILT LOAM

The Alces series are the only soils formed in this material. The deposits are found at elevations ranging from 2,300 to 2,800 feet in the northeast part of the surveyed area. The material is stratified.

Alces Series (As)

The Alces soils, Orthic Podzol fine sandy loams, are confined to the upper Alces valley. About 11,390 acres were mapped.

The land is mainly level to moderately sloping and the soils are well drained.

The vegetation consists of dense stands of spruce and pine with minor amounts of poplar and birch. A thick ground cover of moss is characteristic.

The upper mineral layer is an Ae horizon of light-gray sandy loam 2 to 3 inches thick. It overlies a yellowish-brown B horizon 9 to 12 inches thick. The parent material is stratified, grayish brown and strongly acid.

The profile of a typical soil is described as follows:

Horizon	*Depth Inches*	
L-F	3 – 0	Dark-brown forest liter, mainly moss, needles and twigs. pH 4.5.
Ae	0 – 3	Grayish-brown (10YR 5/2, moist) fine sandy loam. Moderate, fine platy structure; friable. pH 3.9.
Bf1	3 – 7	Yellowish-brown (10YR 5/6, moist) fine sandy loam. Weak, medium, subangular blocky structure; friable. pH 4.3.
Bf2	7 – 12	Light yellowish brown (10YR 6/4, moist) fine sandy loam. Weak, medium, subangular blocky structure; friable. pH 4.7.
BC	12 – 20	Yellowish-brown (10YR 5/4, moist) fine sandy loam; loose. pH 5.0.

Horizon	Depth Inches	
CB	20 – 35	Light yellowish brown (2.5Y 6/4, moist) fine sandy loam; loose. pH 4.7.
C	35 +	Light brownish gray and light yellowish brown (2.5Y 6/2, 6/4, moist), fine sandy loam. Stratified; friable. pH 4.7.

Use

The Alces soils are rated as fair arable land. They have not been used for cultivated crops. They are very strongly acid and have not only a low base exchange capacity but also a low percentage base saturation. Organic matter and nitrogen are low. The soils are probably suited to growing only acid-tolerant grasses and legumes.

On relatively thin sandy loams and silt loams (not exeeding 30 inches) overlying slightly calcareous and somewhat saline clays and clay loams

These parent materials are variable sandy deposits, 12 to 24 inches thick, overlying finer-textured deposits. The deposits may be shorelines, beaches or outwash plains and are the parent materials of the Codesa, Peoria, and Belloy series.

Codesa Series (Co)

The Codesa soils, Orthic Gray Wooded soils, occupy an area of 61,680 acres. They occur in the eastern part of the surveyed area, in association with Donnelly, Alcan, Clouston and Fellers soils.

About 88 percent of the soils occur on smooth, gently and moderately sloping land and about 11 percent on irregular, steeply sloping hilly land. Drainage varies with slope and depth to the underlying till or lacustro-till. Most of the soils are well drained except on the steeply sloping and hilly areas, where drainage is excessive.

Fairly dense stands of poplar, lodgepole pine, alder and shrubs occur on the uncultivated areas. Willows and alder are common in local depressions.

These soils, because of their origin, vary greatly in texture. Sandy loams are the most common; loamy sands and silt loams are relatively inextensive. The underlying clay layer may begin at depths of 12 to 30 inches, and occasionally it is overlain by a thin gravelly layer.

The profile of a sandy loam is described as follows:

Horizon	Depth Inches	
L-H	2 – 0	Dark-brown leaf litter. pH 6.0.
Ah	0 – 2	Light brownish gray (10YR 6/2, moist) sandy loam. Weak, fine granular and platy structure; friable, pH 6.2.
Ae	2 – 8	Light brownish gray (10YR 6/2, moist) sandy loam. Moderate, medium platy structure; friable. pH 5.5.
Bt	8 – 16	Brown (10YR 5/3, moist) loam. Weak, subangular blocky structure; clay skins common; friable. pH 5.0.
IIC	16+	Dark grayish brown (10YR 4/2, moist) clay loam. Moderate, medium and coarse blocky structure, becoming massive with depth. pH 7.0.

Use

Codesa soils make fairly good arable land. A limited acreage of the finer-textured soils has been brought under cultivation near Baldonnel and is producing very good crops. Those that are gravelly or stony should not be cultivated.

These soils require careful management, and are likely to be unproductive if only grain is grown. Slight to severe water erosion was observed on the cultivated areas. This may be avoided by use of legume and grass crops in the rotation.

Peoria Series (Pe)

The Peoria soils, Eluviated Black silt loams, have developed on sandy and silty deposits overlying lacustro-till near Dawson Creek, Rolla, Fort St. John and North Pine. The overwash is 6 to 30 inches deep. The soils are associated with Landry and Esher soils and predominate on about 5,545 acres.

Most of the acreage is a smooth, gently sloping land. About 1,575 acres were mapped as steeply sloping. The natural vegetation consists of grasses and scattered bluffs of poplar.

These soils are well drained but the underlying fine-textured subsoil tends to impede percolation.

The surface horizon (Ah) is composed of 5 to 8 inches of dark-brown to black silt loam. It is underlain by a yellowish-brown horizon (B) having subangular blocky structure.

The profile of a typical soil is described as follows:

Horizon	*Depth Inches*	
Ah	0 – 7	Very dark gray to black (10YR 2.5/1, moist) silt loam. Moderate, medium granular structure; friable. pH 6.7.
Ae	7 – 11	Brown to pale-brown (10YR 5.5/3, moist), fine sandy loam. Weak, medium platy and moderate, medium granular structure; friable. pH 6.1.
Btj	11 – 16	Dark-brown (10YR 4/3, moist) silt loam. Moderate, medium, subangular blocky structure; firm. pH 6.2.
IIBt	16 – 20	Very dark grayish brown (10YR 3/2, moist) clay. Strong, coarse blocky structure; firm. pH 6.2.
IIBC	20 – 30	Very dark gray clay. Moderate, coarse blocky structure; firm. pH 7.0.
IICk	30 – 34	Dark-gray clay. Moderately limy. pH 8.1.
IICs	34+	Like II Ck horizon, but stratified and containing pockets of gypsum. pH 8.4.

Use

Peoria soils make very good arable land. Most of the acreage is cultivated. The smooth, gently sloping areas are used for grain crops, mainly wheat. Steeply sloping areas are not cultivated. Generally, the soils are suited to the same crops as the Landry series, and frequent use of legumes and grass crops in the rotation is recommended.

Belloy Series (Be)

The Belloy soils, Dark Gray Wooded sandy loams and loams are found in the Fort St. John area. They occur on long, smooth, gently and moderately sloping land. A total of 3,005 acres were mapped.

The drainage is good on the smooth, gentle slopes but tends to be excessive on the steeper slopes. The vegetation is a parkland type consisting of grassland and scattered groves of trees.

Beneath thin organic surface litter, the soils have a well-developed, dark-colored Ah horizon and a yellowish-brown Ae horizon 2 to 4 inches thick. The B horizon is weakly developed, is often gravelly and rests on the fine-textured parent material.

The profile of a typical sandy loam is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Very dark brown leaf litter. pH 7.5.
Ah	0 – 6	Very dark grayish brown (10YR 3/2, moist) sandy loam. Moderate, medium granular structure; friable. pH 7.0.
Ae	6 – 9	Pale-brown to light yellowish brown (10YR 6/2.5, moist) sandy loam. Weak, medium platy structure; loose. pH 5.5.
Bt	9 – 14	Yellowish-brown and brown (10YR 5/4, 5/3, moist) loam. Weak, subangular blocky structure. Gravelly layers may occur at the contact with the underlying material. pH 6.0.
IIC	14+	Dark grayish brown clay loam till. pH 7.0.

Use

Most of the Belloy soils make good arable land. The steeply sloping and gravelly areas are poor to fair. Most of the soils are cleared and farmed in conjunction with Landry and Esher soils. The main crop grown is wheat. These soils are fairly high in organic matter and retain moisture moderately well as the fine-textured subsoil is rather close to the surface. Use of legumes, grasses and fertilizers in rotations will make the soils more productive. Care must be taken to prevent water erosion on the steeper slopes. There appears to be little wind erosion on these soils.

On relatively thin sandy loam and silt loam overlying moderately calcareous silty clay loam and silty clay

These materials are widely distributed in the main valleys and depressions throughout the southwestern part of the surveyed area. The materials are fairly siliceous and practically free from stones. Beryl, Sloane and Coldstream are the three series on these materials.

Beryl Series (By)

The Beryl soils, fine sandy loams and silt loams, are Bisequa Gray Wooded soils. They are associated mainly with Moberly, Lynx, Sundance, Toad and Groundbirch soils.

About 27,260 acres were mapped as smooth, gently sloping; 81,970 acres as smooth, moderately sloping; and 33,965 acres as irregular, gently and moderately sloping. The soils are well drained.

The native vegetation consists mainly of commercial stands of forest dominated by spruce, lodgepole pine and balsam fir. Poplar and birch are minor components of the cover.

Under a thin organic litter the soils have a light-colored, platy Ae horizon underlain by a yellowish-brown Bf horizon. This in turn grades through a light-brown layer into a dark-brown, finer-textured Bt horizon. High concentrations of lime are present in the lower horizons.

The profile of a typical fine sandy loam is described as follows:

Horizon	Depth Inches	
L-F	1 – 0	Brown layer of leaf litter. pH 6.0.
Ae	0 – 2	Light brownish gray (10YR 6/2, moist) fine sandy loam. Fine platy structure; friable. pH 5.4.
Bf	2 – 5	Yellowish-brown (10YR 5/4, moist) fine sandy loam. Moderate, medium and fine platy structure; friable. pH 5.2.
Ae	5 – 8	Light yellowish brown (10YR 6/4, moist) fine sandy loam. Moderate, medium platy structure; friable. pH 5.5.
Bt	8 – 10	Dark-brown (10YR 4/3, moist) clay loam. Moderate, medium, subangular blocky structure; clay skins common; very firm. pH 5.8.
IICB	10 – 16	Very dark gray (10YR 3/1, moist) clay. Moderate, medium to coarse, subangular blocky structure; few clay skins; hard. pH 7.5.
IIC	16+	Dark grayish brown (10YR 4/2, moist) sandy clay loam glacial till. Moderately stony; strongly calcareous. pH 8.0.

Use

Beryl soils on smooth, gently sloping areas make fairly good arable land. They are not well developed agriculturally because of the high cost of clearing, low fertility, and inaccessibility. They are used mainly for growing alfalfa, clover and other forages. Use of manure and of nitrogen and phosphorus fertilizers is necessary to keep the soils productive.

Sloane Series (Sl)

The Sloane soils, Orthic Gray Wooded fine sandy loams and silt loams, occur mainly along the river valleys near Sunset Prairie and Progress. They are associated mainly with Sukunka, Beryl and Davis soils and occupy an area of about 20,200 acres.

The topography varies from smooth, gently sloping to irregular, steeply sloping. About 50 percent of the area was mapped as smooth, gently sloping. The soils are generally well drained but small areas are imperfectly drained. The tree cover consists mainly of poplar, lodgepole pine and spruce. Willows, alder and numerous shrubs also occur.

Underlying a thin leaf layer this soil has a fairly thick leached (Ae) horizon and a well-developed, subangular blocky B horizon. As in the Beryl soils, the underlying material is finer in texture and moderately to highly calcareous.

The profile of a fine sandy loam is described as follows:

Horizon	Depth Inches	
L-H	3 – 0	Dark-gray leaf litter and partly decomposed organic matter. pH 7.0.
Ae	0 – 7	Light-gray (10YR 7/2, dry), dark grayish brown (10YR 4/2, moist), fine sandy loam. Moderate, medium and fine platy structure; friable. pH 6.8.

Horizon	Depth Inches	
IIBt	7 – 12	Very dark grayish brown (10YR 3/2, moist) silty clay. Moderate, medium, and coarse, subangular blocky structure; firm. pH 5.8.
IIBC	12 – 16	Very dark gray (10YR 3/1, moist) silty clay. Strong, medium, subangular blocky structure; hard when dry. pH 7.2.
IIC	16 – 28	Very dark gray and black (10YR 3/1, 2/1, moist) silty clay. Moderately calcareous. pH 8.1.

Use

Sloane soils are fairly good arable soils. They are leached and are low in organic matter, nitrogen and mineral nutrients. They are also susceptible to wind and water erosion. Use of legumes, grasses, manure and fertilizers may be necessary to keep the soils productive.

Coldstream Series (Cd)

The Coldstream soils, Low Humic Eluviated Gleysol fine sandy loams and silt loams, are found in poorly drained depressions, and are associated with Beryl, Devereau, Davis and Sundance soils. A total of 8,365 acres were mapped.

The vegetation consists mainly of willows, lodgepole pine, cottonwood and black spruce. Coarse grasses, sedges and mosses are also very common.

These soils are distinguished by a peaty surface horizon about 4 inches thick, and a thick, iron-stained Ae horizon overlying a fine-textured and mottled subsoil.

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

Horizon	Depth Inches	
L-F	4 – 1	Brown and dark-brown peat from grasses and mosses. pH 6.3.
H	1 – 0	Very dark gray (10YR 3/1, moist) muck. Fine granular structure; friable. pH 6.5.
Ahe	0 – 2	Dark-gray (10YR 4/1, dry) very dark gray (10YR 3/1, moist) silt loam. Fine granular structure; friable. pH 7.1.
Aeg	2 – 16	Gray (10YR 5/1, dry), dark-gray (10YR 4/1, moist) sandy clay loam. Many prominent dark yellowish brown (10YR 4/4) mottles. Weak, medium platy structure; friable. pH 7.0.
IIBtg	16 – 18	Yellowish-brown (10YR 5/6, moist) silty clay. Many prominent mottles as in Aeg horizon; massive; very plastic. pH 7.0.
IICg	18+	Dark-gray (7.5YR 4/1, moist) silty clay. Yellowish-brown (10YR 5/4) mottles common; massive structure; moderately calcareous. pH 8.4.

Use

Coldstream soils are not suitable for crop production until their drainage has been improved. Poor drainage and the high cost of clearing have hindered agricultural development. The few acres cleared and cultivated near Groundbirch and Sunset Prairie are used chiefly for pasture and hay.

Soils Developed on Coarse Outwash and Beach Materials

ON GRAY-BROWN AND PALE-BROWN GRAVELLY LOAMY SAND AND GRAVELLY SANDY LOAM, OFTEN STONY

The soils developed on coarse outwash and beach materials are the Clouston, Clayhurst and Grouard series. The Clouston soils have developed from a variety of materials deposited as beaches of glacial lakes. The Clayhurst and Grouard soils have developed mainly from coarse outwash on the narrow terraces along the Peace River.

Clouston Series (Cl)

The Clouston soils, Orthic Gray Wooded gravelly sandy loams and gravelly loamy sand, are mainly associated with Alcan, Fellers, Donnelly and Codesa soils. The largest area occurs south of Dawson Creek. About 15,715 acres were mapped.

The topography is extremely variable, the surface ranging from narrow terraces to low, wave-cut cliffs and steep embankments. Only 2,150 acres were mapped as gently and moderately sloping. Drainage varies from good to excessive. In a few places stones and boulders are numerous.

The forest vegetation is mainly poplar, lodgepole pine and spruce. In some places alder is particularly abundant.

The surface soil varies from fine sandy loam to gravel, but gravelly sandy loam is the main textural class. The profile is similar to that of other coarse-textured Gray Wooded soils.

The profile of a gravelly sandy loam is described as follows:

Horizon	*Depth Inches*	
L-H	2 – 0	Very dark grayish brown leaf litter. pH 7.0.
Ae	0 – 5	Pale-brown (10YR 6/3, moist) gravelly sandy loam. Weak platy structure. pH 5.5.
Bt	5 – 20	Brown (10YR 5/3) gravelly sandy loam. Weak, coarse, subangular blocky structure, breaking to single grains. pH 6.0.
C	20+	Brown and pale-brown gravelly sandy loam. Lime accumulation at 30 inches. pH 7.0.

Use

Clouston soils are poor to fair arable land. Those soils with gravel within 12 inches of the surface are very droughty and should not be cultivated.

Clayhurst Series (Cy)

The Clayhurst soils are Degraded Brown Wooded sandy loams and gravelly sandy loams. The land generally slopes towards the valley bottom and varies from smooth, gently sloping to irregular, steeply sloping. About 17,025 acres were mapped.

These soils are excessively drained. Though surface runoff is very slow, water-holding capacity is low.

The vegetation consists largely of lodgepole pine with some poplar and spruce. The undergrowth is mainly kinnikinick, blueberry and other shrubs.

The profile of a typical sandy loam is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Dark-brown leaf litter. pH 7.0.
Aej	0 – 4	Light-brown (7.5YR 6/4, dry), strong brown (7.5 YR 5/6, moist) sandy clay loam. Weak granular structure; firm. pH 6.6.
Btj	4 – 10	Brown (7.5YR 5/4, dry), dark brown (7.5YR 4/4, moist) clay loam. Moderate, medium, subangular blocky structure; firm. pH 6.2.
IICB	10 – 20	Brown (7.5YR 5/2 dry) gravelly sandy loam. Loose. pH 6.6.
IIC	20+	Gray gravelly loamy sand. Lime carbonate undercoating pebbles at 50 inches. pH 7.5.

Use

Clayhurst soils are used mainly for pasture land. They are not suitable for cultivation.

Grouard Series (Gr)

The Grouard soils, Dark Gray Wooded gravelly loamy sands and sandy loams, have developed on deposits 1 to 2 feet thick overlying gravel. They are found chiefly along the terraces at the mouth of the Pine River on smooth, gently sloping land. About 5,800 acres were mapped.

Water penetrates readily through the coarse materials, so that the soils are excessively drained.

The native cover consists of open stands of poplar and lodgepole pine with an understory of shrubs and grasses. These soils have a very dark brown Ah horizon 3 to 6 inches thick, and a pale-brown Ae horizon. The Bt horizon, containing appreciable clay accumulation, is yellowish-brown and grades to poorly assorted gravelly material.

The profile of a typical loamy sand is described as follows:

Horizon	*Depth Inches*	
L-H	1 – 0	Very dark brown leaf litter. pH 7.2.
Ah	0 – 6	Very dark grayish brown (10YR 3/2) sandy loam. Weak, medium granular structure. pH 6.5.
Ae	6 – 8	Light brownish gray (10YR 6/2) sandy loam. Weak platy structure; loose. pH 6.0.
Bt	8 – 20	Yellowish-brown (10YR 5/4) gravelly sandy loam. Weak, subangular blocky structure; clay skins and clay bridges common. pH 6.8.
C	20+	Grayish-brown (10YR 5/2) gravelly sandy loam; lime coating on undersides of pebbles. pH 7.5.

Use

Most of the Grouard soils are poor to fair arable land. The low natural fertility and low moisture-holding capacity are serious limitations. Where arable agriculture is practiced the best results are obtained by growing grasses and legumes. Generally, the soils with gravel within 12 inches of the surface should not be cultivated.

Gravel pits of commercial importance are common near the confluence of the Pine and Peace rivers.

Soils Developed on Residual and Modified Residual Materials

In the high uplands and plateaus the soils have developed on glacial till, a deposit that is 1 to 4 feet thick. The soils in this broad group are the Tremblay, Shearerdale and Boundary series.

On brown and yellowish-brown sandstone

Tremblay Series (Tb)

The Tremblay soils, Orthic Podzol fine sandy loams, occur in the Feller's Heights area at elevations of 3,000 feet or more. About 8,750 acres were mapped.

The topography varies widely; slopes generally exceed 30 percent, but small areas, remnants of the plateau proper, are smooth and gently sloping. The soils are imperfectly drained. The native vegetation is mainly spruce, lodgepole pine and balsam fir, with minor inclusions of poplar and birch.

The surface layer of litter and the underlying thin, gray Ae horizon are strongly acid. The layer below is brownish and moderately acid. The parent material grades into sandstone.

The profile of a fine sandy loam is described as follows:

Horizon	*Depth Inches*	
L-F	2 – 0	Dark-brown layer of mosses, needles. pH 5.0.
Ae	0 – 3	Light-gray (10YR 7/1, dry) fine sandy loam. Weak platy structure; loose. pH 5.0.
Bf1	3 – 5	Yellowish-brown (10YR 5/6, dry) sandy loam. Weak, medium, subangular blocky structure; friable. pH 5.8.
Bf2	5 – 8	Light yellowish brown (10YR 6/4, dry) sandy loam. Weak, medium, subangular blocky structure; friable. pH 5.8.
C	8 – 10	Pale-brown (10YR 6/3, dry) sandy loam till. pH 6.0.
IIC	10+	Pale-brown sandstone. pH 5.0.

Use

All of these soils are forested and are not suited for cultivated crops. Their main value is for forestry although some areas may be used for limited grazing.

Shearerdale Series (Sh)

The Shearerdale soils, Orthic Gray Wooded sandy loams, occur mainly on valley slopes, escarpments and highly fractured sandstone outcrops. The topography is mainly irregular, steeply sloping and hilly. About 7,450 acres were mapped.

The vegetation is mainly lodgepole pine, poplar and alder. There are many barren spots.

Underlying the thin leaf litter this soil has a thick leached (Ae) horizon and a moderately well developed Bt horizon overlying weathered sandstone. There is considerable variation in the amount of stone in the profile, but generally the lower part of the profile is more than 50 percent unweathered rock.

The profile of a typical sandy loam is described as follows:

Horizon	Depth Inches	
L-H	2 – 0	Dark-brown forest litter. pH 6.8.
Ae1	0 – 3	Light-gray (10YR 7/2, dry) sandy loam. Weak, platy structure; loose. pH 5.8.
Ae2	3 – 9	Light brownish gray (10YR 6/2, dry) and light-gray (10YR 7/2, dry) sandy loam. Weak, platy structure; loose. pH 6.0.
AB	9 – 16	Light yellowish brown (10YR 6/4, dry) sandy loam and loam. Weak, medium, subangular blocky structure; friable. pH 5.4.
Bt	16 – 24	Brown (10YR 5/3, dry) clay loam. Moderate, medium, subangular blocky structure; slightly hard when dry. pH 5.4.
IIC	24+	Dark grayish brown sandstone. pH 5.4.

Use

Shearerdale soils are nonarable. They are shallow, and poorly suited for either herbage or trees. Indirectly, some of the soil areas are important in that they overlie strata sufficiently permeable to be developed as aquifiers.

ON GRAY AND DARK-GRAY MIXED TILL AND SHALE, SOMEWHAT SALINE

Boundary Series (Bd)

The Boundary soils are undifferentiated Podzolic soils developed on clay deposits north of Boundary Lake.

These soils occupy high ridges at elevations ranging from 2,500 to 3,000 feet or more. The mapped area, 22,625 acres, extends northward beyond the surveyed area as well as into Alberta.

The soils have heavy stands of spruce, lodgepole pine and poplar. The land consists of gently to moderately sloping ridges and knolls with long smooth slopes. Peat deposits and small lakes occupy the depressions. The surface drainage is rapid on the upper slopes and slow in the depressions. Intermediate slopes are moderately well drained. Internal drainage is slow and even restricted.

The soils have a thick surface organic mat, and a thick gray and dark-gray Ae horizon. The B horizon is brown and finer in texture than the horizons above and below. Salts or lime accumulations were not encountered in the subsoil at depths of 72 inches.

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

Horizon	Depth Inches	
L-F	2 – 0	Partly decomposed plant residues. pH 5.2.
Ah	0 – 3	Light brownish gray (10YR 6/2, dry), brown (10 YR 5/3, moist) silt loam. pH 5.2.
Ae1	3 – 6	Very pale brown (10YR 8/4, dry), pale brown (10YR 6/3, moist) silty clay loam. Moderate, thin platy structure; very friable. pH 5.3.
Ae2	6 – 8	Very pale brown (10YR 7/3, dry), light yellowish brown (10YR 6/4, moist) clay. Weak, thin platy structure; very friable. pH 5.3.
AB	8 – 13	Very pale brown (10YR 7/3, dry), pale-brown (10YR 6/3, moist) clay. Strong, medium, subangular blocky and weak platy structure; firm. pH 4.7.

Horizon	Depth Inches	
BA	13 – 18	Light-gray and very pale brown (10YR 7/2, 7/4, dry), brown (10YR 5/3, moist) clay. Moderate, medium, subangular blocky structure; firm. pH 4.7.
Bt	18 – 26	Very pale brown (10YR 7/4, dry), brown (10YR 5/3, moist) clay. Strong, medium blocky and subangular blocky structure; few clay skins evident; firm; roots few. pH 4.8.
BC	26 – 35	Very pale brown (10YR 7/4, dry) grayish-brown (10YR 5/2 moist) clay. Strong, medium blocky structure; many small, irregular-shaped peds resembling weathered shale; very firm. pH 4.7.
CB	35 – 40	Light-gray and light brownish gray (10YR 7/2, 6/2, dry), dark grayish-brown (10YR 4/2, moist) clay. Strong, medium blocky structure; firm. pH 4.5.
C	40 +	Uniform dark-gray clay, very similar to that in CB horizon. pH 4.2.

Use

Boundary soils have not been cultivated but were tentatively rated as fair arable soils. That fertility is low is apparent from the exchange capacity and very low base saturation. Fine textures, poor physical condition, slow internal drainage, hazard of frost and high clearing costs are other adverse factors.

Soils Developed on Organic Materials

The organic soils occupy the very poorly drained depressions found throughout the surveyed area and occur in association with almost all the soils mapped. These soils, derived from plant remains, vary in composition, depth, and degree of decomposition. For this report, organic soils are those having an accumulation of organic matter more than 12 inches thick.

Two series were mapped: Eaglesham and Kenzie.

On dark-brown and black fine peat developed mainly from sedges and coarse grasses

Eaglesham Series (Eg)

This organic soil consists largely of the fibrous remains of sedges, coarse grasses and woody materials. About 41,440 acres were mapped.

The native vegetation consists mainly of sedges and coarse grasses, with varying amounts of dwarf birch, spirea and willows.

The horizons were separated mainly by stage of decomposition and color.

A typical profile is described as follows:

Horizon	Depth Inches	
L	0 – 12	Brown and dark-brown, partly decomposed sedges, coarse grasses, and rushes. pH 5.6.
FH	12 – 20	Black, moderately well decomposed plant remains; few original fibers recognizable; friable. pH 7.0.
IIC	20+	Dark-gray clay; usually mottled. pH 7.5.

The peat is rarely more than 36 inches thick and is usually saturated with water.

Most Eaglesham soils are too poorly drained to be suitable for cultivation. When drained, the shallower areas may be used to good advantage for forage crops or pasture.

ON BROWN AND DARK-BROWN COARSE PEAT DEVELOPED MAINLY FROM SPHAGNUM MOSS

Kenzie Series (Kz)

This organic soil consists of peat formed largely from sphagnum. It occupies deep, flat-bottomed depressions or basinlike areas and is the main soil on about 217,245 acres. Much of this acreage occurs on the broad, flat uplands in the extreme northeast part of the surveyed area.

The vegetation is variable and includes many species. The sphagnum moss may grow alone or in association with sedges. The upperstory usually consists of labrador tea, black spruce and willow; the plant association appears to be determined by the local level of the water table.

The surface horizon, 3 to 5 inches deep, is brown fibrous moss. The underlying materials vary, but generally consist of mixed moss, sedge and woody remains. In many places this horizon is several feet thick.

The profile of a typical moss peat is described as follows:

Horizon	*Depth Inches*	
L	0 – 3	Living sphagnum moss, fibrous and spongy. pH 4.5.
F1	3 – 9	Yellowish-brown peat, fairly well decomposed. pH 4.0.
F2	9 – 19	Dark-brown peat consisting of semidecomposed moss, twigs and leaves; free water at a depth of 12 inches. pH 4.5.
FH	19 – 30	Dark-brown, decomposed moss; few recognizable plant remains. pH 4.5.
H	30 – 36	Gray-brown muck, underlain by mottled, very fine sand overlying till. pH 5.0.

Use

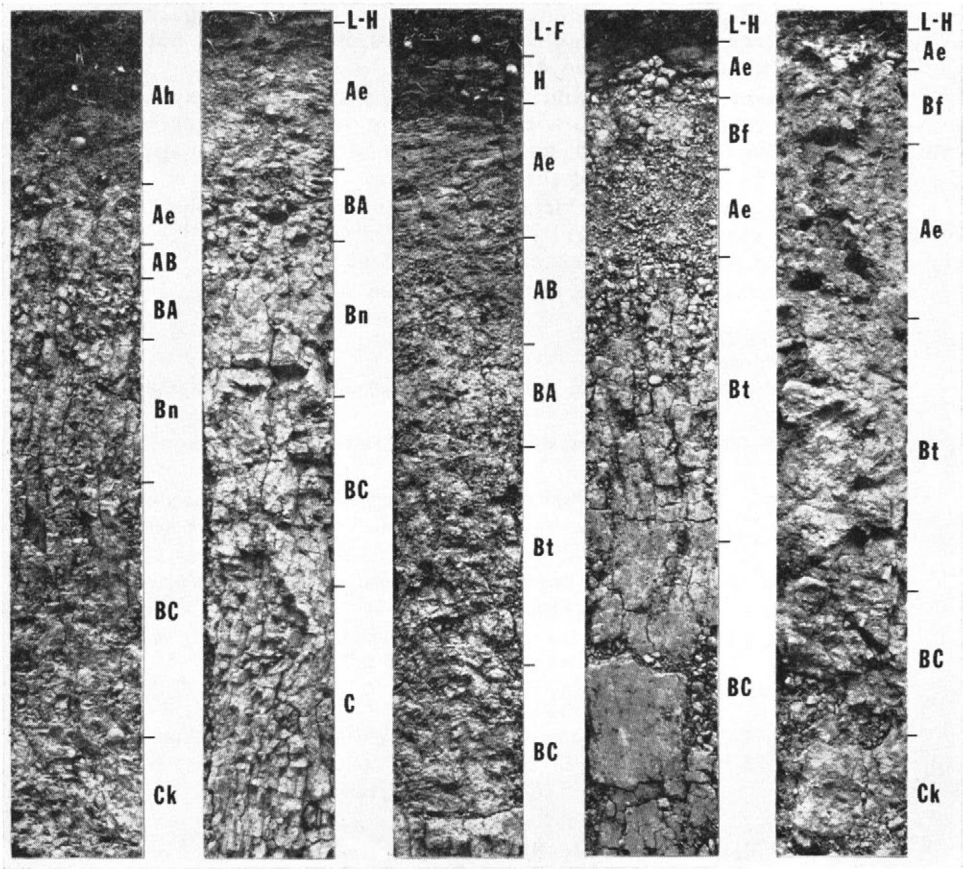
Kenzie soils are not developed for agriculture and are inferior agricultural soils. They should be left in their native state to provide forest products and wildlife sanctuaries. Many are valuable water reservoirs.

Eroded, Steeply Sloping and Broken Land

The eroded, steeply sloping and broken land includes a complex of miscellaneous land types. About 439,060 acres were mapped.

This land is generally under forest but many south-facing slopes support a grass cover. These areas have some value for pasture.

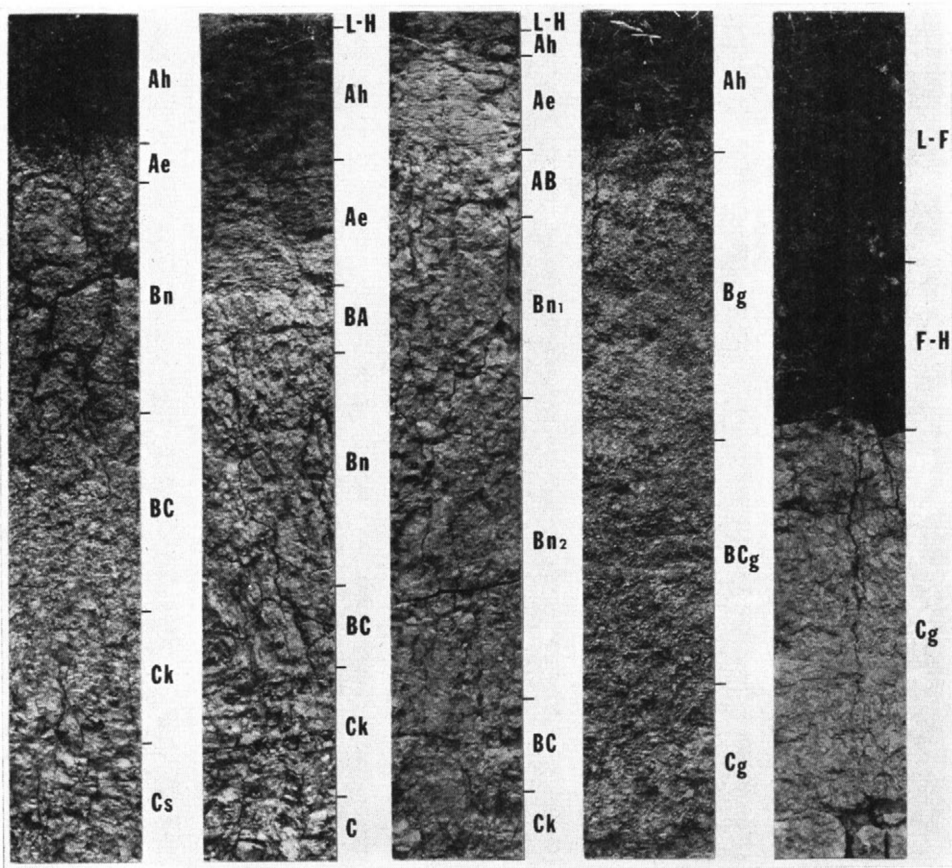
Soils Developed on Glacial Till



Mytron Series	Alcan Series	Boundary Series	Fellers Series	Moberly Series
Black Solod	Gray Wooded Solod	Undiffer-entiated Podzolic	Bisequa Gray Wooded	Bisequa Gray Wooded

Figure 10.—Profiles of 20 soil series representative of the surveyed area.

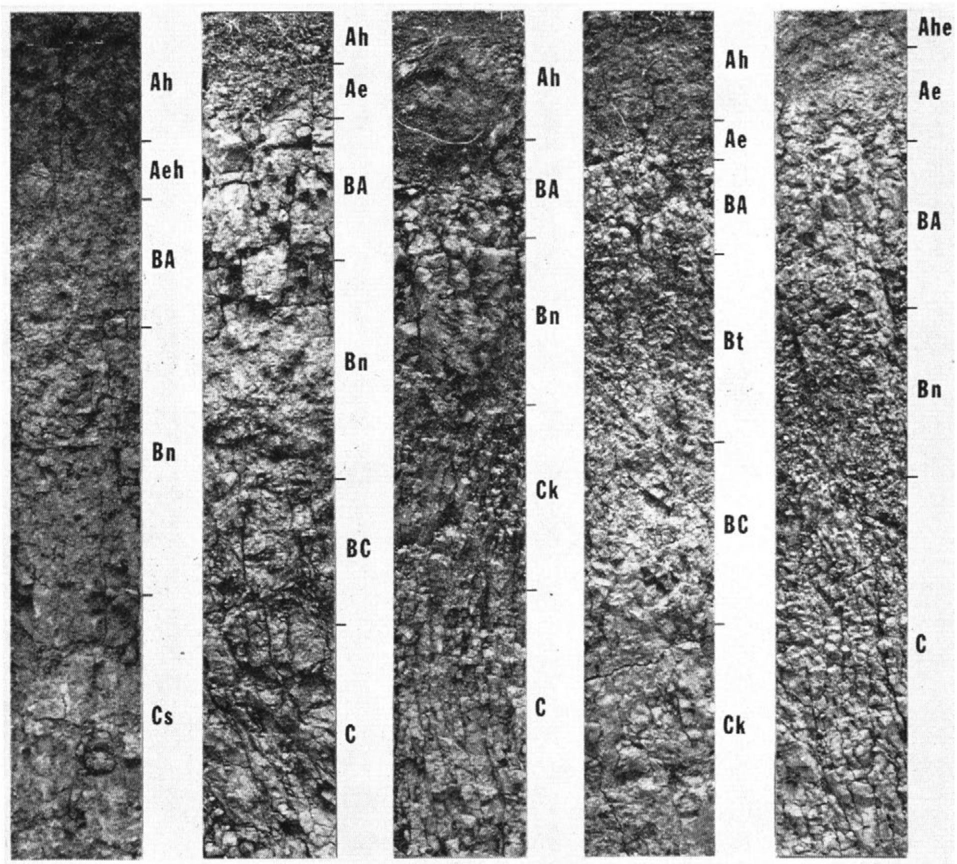
Soils Developed on Saline Lacustrine Deposits and Lacustro-Till



Rycroft Series	Esher Series	Donnelly Series	Goose Series	Eaglesham Series
Black Solodized Solonetz	Dark Gray Solod	Gray Wooded Solod	Orthic Meadow	Fibrous Peat

Figure 10.—Profiles of 20 soil series representative of the surveyed area—Cont.

Soils Developed on Lacustrine Deposits



Roseland Series
Black Solod

Doig Series
Dark Gray Solod

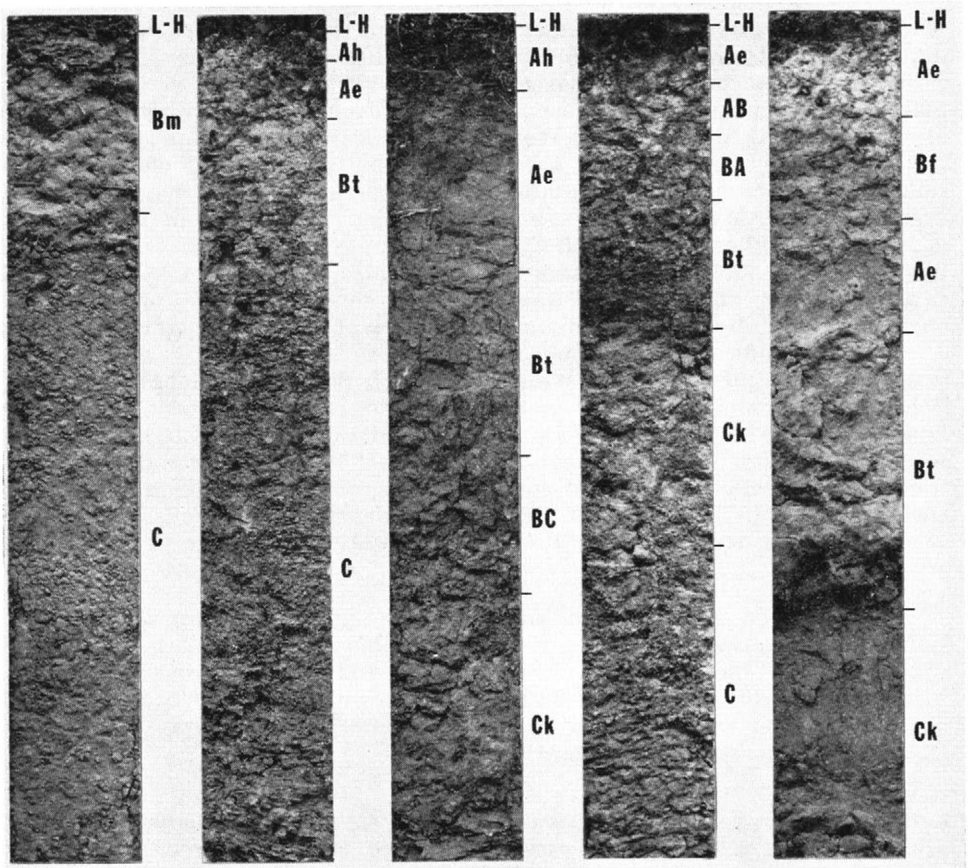
Arras Series
Dark Gray Solod

Devereau Series
Dark Gray Wooded

Beatton Series
Gray Wooded Solod

Figure 10.—Profiles of 20 soil series representative of the surveyed area—Cont.

Soils Developed on Calcareous Alluvial and Lacustrine Deposits



Branham Series	Widmark Series	Tangent Series	Sukunka Series	Sundance Series
Orthic Brown Wooded	Degraded Brown Wooded	Dark Gray Wooded	Orthic Gray Wooded	Bisequa Gray Wooded

Figure 10.—Profiles of 20 soil series representative of the surveyed area—Conc.

ANALYSES OF REPRESENTATIVE SOILS

Chemical Analyses

Representative soils of the surveyed area were analyzed chemically. Tables 8 to 10 indicate differences between the horizons and changes that have taken place in the parent materials as a result of weathering and other influences.

Use

Organic Matter

Organic matter is a necessary component of all fertile soils and has important effects on chemical, physical and biological properties. The mineralization of organic matter releases nutrients in available form for the growing plant. This mineralization releases not only nitrogen and other nutrients but also by-products that act as solvents on the insoluble mineral soil particles.

Also, organic matter may significantly alter the physical character of a soil. For instance, it induces granulation and therefore aeration and improved drainage—conditions that are essential for high production in fine-textured soils. On the other hand, in the form of humus, it serves beneficially as a binding agent for coarse-textured soils. It also increases moisture-holding capacity, depth of color, and therefore soil temperature. It operates both chemically and physically in holding available plant nutrients against leaching.

Table 8 indicates that the soils of the surveyed area vary widely in organic matter content. For instance, the Black Solodized Solonetz and Black Solod soils are high in organic matter, averaging over 14 percent in the plow layer. On the other hand the Gray Wooded and Low Humic Eluviated Gleysol soils, though high in organic matter in the L-H horizons, are notably low in the upper 6 inches of mineral soil. As much of the organic matter in the surface litter (L-H) horizons is lost during clearing, these soils will require careful management to make them commercially productive.

Nitrogen

The nitrogen contents of the various soils (Table 8) indicate a wide variation not only between the soils of different subgroups but also between those within groups. The Black Solodized Solonetz and Black Solod soils are high in nitrogen in the plow layer and even deeper. The Gray Wooded soils are notably low, particularly in the Ae horizons, and the Dark Gray Wooded and Dark Gray Solod soils are intermediate.

Phosphorus

The total phosphorus content for each of nine representative soils is given in Table 8. The Black soils, represented by the Mytron, Rycroft and Landry series, have a relatively high total content. The Gray Wooded soils, represented by Sundance, Beryl, Kathleen, and Moberly, are low in total phosphorus and will undoubtedly require periodic applications of phosphate fertilizer.

Base Exchange

Exchange capacity largely determines the ability of a soil to hold nutrients such as potassium, calcium and magnesium against leaching, and to maintain a balance between the nutrients so held and those in solution. It thereby tends to stabilize the supply of nutrients throughout the growing season.

The degree to which the exchange complex is saturated with bases affects the physical character of a soil, particularly such qualities as granulation and tendency to puddle. The degree of base saturation also plays an important role in acidity and alkalinity, the mechanism functioning as a buffer.

Base exchange depends on the clay and humus fractions of a soil and, since these vary markedly in kind and in quantity, one may expect a wide variation in exchange capacity within the soils of any area. Obviously, too, the degree of base saturation is influenced by the parent material as well as by the soil itself.

Table 8 shows that most of the soils except the sandy ones have good exchange capacity. The Black Solodized Solonetz and Black Solod soils, represented by the Rycroft, Landry, Mytron, Rolla and Roseland series, have a high exchange capacity and are well saturated with bases throughout their profiles. The Dark Gray Wooded and Dark Gray Solod soils are similar. The surface horizons of the Gray Wooded, Gray Wooded Solod, and Bisequa Gray Wooded soils are only moderately well saturated through their subsoils are well saturated. One soil, Alces fine sandy loam, an Orthic Podzol, has a low exchange capacity and a low base saturation, and evidently has low inherent fertility. The Gleysolic soils, namely Goose, Codner, Snipe, Coleman and Prespatou, vary widely in cation exchange capacity and base saturation.

Noteworthy also is the high exchangeable magnesium in the B horizon of the Solodized Solonetz and Solod soils, particularly where it exceeds 50 percent of the total cation exchange capacity. The conductivity values indicate that the lower B and C horizons are somewhat saline.

The values for exchangeable potassium are highest in the Ah horizons of all soils for which determinations were made. This suggests that all the soils are well to moderately well supplied with potassium.

Soil Acidity

pH is a measure of the intensity of acidity and is expressed in units ranging from 1 to 14. A soil at pH 7.0 is neutral, that is, it is neither acid nor alkaline. As the units decrease from 7 to 1, acidity increases rapidly so that a soil at pH 5 is 10 times as acid as one at pH 6.0 and one at 4 is 10 times as acid as one at 5, and so on. Similarly, alkalinity increases with increasing units from 7 to 14.

Ordinarily, soil acidity is not directly harmful to plants but indirectly it may interfere with the biological changes taking place in the soil and with the liberation of nutrients for the growing plant. The most favorable pH for most farm crops is one between 6.1 and 7.0. When acidity drops much below 6.0, applications of lime are often necessary to ensure high-quality production of most crops. Once the pH drops to 4 or thereabouts, soils are so acid that they are unable to support the usual types of farm crops.

Table 8 and the profile descriptions indicate a wide range in acidity not only between soil series but also between the horizons within series. Alces fine sandy loam is extremely acid (pH 3.9) and this, combined with very low base saturation as already noted, indicates that the soil is inherently low in fertility and incapable of economic production until these weaknesses are corrected. At the other extreme is Landry silt loam, which is only slightly acid and has a high base saturation. It is naturally fertile and can be kept so with little difficulty. Most of the soils analyzed (Table 8) vary from medium to strongly acid; they have reasonably high base saturation and so, doubtless, will not respond to applications of lime. When brought under cultivation, however, they will require careful management to maintain their productivity.

Silicon, Iron, Aluminum, Titanium, Calcium and Magnesium

Table 9 gives the silicon, iron, titanium, calcium and magnesium contents in the various horizons of soils representing the main subgroups found in the area.

The basic elements, iron, aluminum, titanium, calcium and magnesium, show movement from the A to the B horizon. Calcium and magnesium, being more readily soluble than iron or aluminum, move more readily to the lower horizons. Where extreme leaching occurs, as in coarse-textured soils, under humid conditions much of the calcium and magnesium may pass through the solum while iron and aluminum commonly accumulate in the B horizon.

Table 8.—Some Chemical Characteristics of Horizons of Representative Soils

Horizon	Depth inches	pH	Organic matter %	Nitrogen %	Phosphorus %	Exchangeable cations, me./100 g. Calcium	Magnesium	Potassium	Sodium	Cation exchange capacity	Base saturation %	Conductivity mhos/cm.
Black Solodized Solonetz Soils												
Rycroft Series												
Ah1	0-2	5.9	14.86	0.90	0.10	27.4	5.6	1.5	0.2	43.9	79.0	
Ah2	2-6	5.5	10.92	0.68	0.06	20.6	9.3	0.7	0.3	43.9	70.4	
AB	6-8	5.3	6.55	0.23	0.09	11.8	7.7	0.3	0.4	27.8	72.3	
Bn	8-15	5.8	4.22	0.23	0.07	16.9	13.6	0.5	1.0	36.2	88.4	
BC	15-25	7.7	3.47	0.16	0.07	22.7	11.2	0.4	1.2	25.2	100.0	
Ck	25-27	7.8	3.13	0.13	0.07							
Cs	27+	7.8	3.23	0.13	0.07							
Black Solod Soils												
Landry Series												
Ah1	0-6	6.5	12.29	0.70		25.6	7.7	1.2	0.4	38.1	91.8	0.5
Ah2	6-9	6.3	6.26	0.32		12.9	8.1	0.7	0.3	25.7	85.7	0.4
Ae	9-11	6.0	1.96	0.11		4.3	3.4	0.2	0.2	10.4	82.8	0.3
Bn	14-21	6.5	2.86	0.16		11.6	16.0	0.3	2.3	31.1	97.1	0.9
Csk	34+	7.8	2.49	0.14								6.1
Mytron Series												
Ah	0-5	5.6	13.45	1.01	0.09	16.0	4.9	0.2	0.2	28.7	74.2	0.4
Ae	5-7	5.2	3.17	0.14	0.04	7.1	3.6	0.1	0.3	16.6	68.1	0.2
AB	7-12	4.7	2.52	0.14		7.4	6.2	0.2	0.6	23.4	61.5	0.3
Bn	12-16	4.6	2.29	0.13	0.04	7.9	9.8	0.3	1.3	30.9	62.5	0.3
BC	16-22	4.9	1.34	0.13	0.04	9.6	13.6	0.3	1.9	33.1	76.7	0.6
CB	22-28	6.6	1.79	0.13		11.2	14.8	0.3	2.1	27.9	100.0	0.9
Ck	28-31	7.5	1.88	0.10	0.06							1.7
Roseland Series												
Ah	0-5	6.2	16.97	0.91		23.4	10.8	2.0	0.2	49.2	74.0	0.1
Ae	5-8	5.4	4.68	0.27		14.1	14.8	0.8	0.3	43.7	68.6	0.2
Bn	14-24	5.1	2.90	0.17		13.0	14.8	0.6	0.5	42.4	68.2	0.3
Cs	24-36	7.4	2.22	0.15		23.5	11.6	0.5	0.8	26.1	100.0	1.2
C	36+	7.6	1.82	0.12		33.7	13.2			25.6	100.0	3.4

Rolla Series

Ah1	0–4	6.4	19.70	1.00		26.2	15.9	0.7	0.2	30.1	100.0	0.2
Ah2	4–11	6.0	7.67	0.42		10.9	12.1	0.3	0.2	30.4	77.3	0.1
Ae	11–15	6.0	2.85			6.5	12.5	0.2	0.2	23.8	81.5	0.1
Bn	15–20	6.8	3.58			9.8	16.9	0.4	0.4	31.9	86.2	0.2
Ck	20–24	8.4				17.6	13.5	0.3	0.5	21.4	100.0	0.5

Dark Gray Solod Soils

Murdale Series

Ah1	0–2	6.4	16.05	0.65		20.7	8.9	0.8	0.2	40.2	76.1	0.1
Ah2	2–5	6.1	4.89	0.35		9.8	5.5	0.5	0.2	25.1	63.5	0.1
Ae	5–6	5.3	1.77			2.4	3.0	0.1	0.2	12.2	46.7	0.0
BA	7–15	4.6	1.70			2.9	8.4	0.2	0.6	28.3	42.5	0.0
Bn	15–26	4.6	1.43			3.4	10.7	0.2	0.9	28.6	53.1	0.0
BC	26–31	4.4				3.7	12.4	0.1	1.5	25.6	69.1	1.0
Cs	31+	5.6										4.7

Esher Series

Ah	0–4	6.6	10.61	0.77	0.06	24.9	4.9	0.4	0.2	42.0	72.4	0.2
Ae	4–7	6.6	1.79	0.16	0.04	5.0	2.9	0.3	0.1	12.8	64.8	0.1
AB	7–9	5.7	1.93	0.18	0.04	4.5	4.8	0.2	0.1	13.8	69.6	0.0
Bn	9–19	6.8	2.07	0.12	0.04	8.2	9.9	0.4	0.2	27.0	69.3	0.0
BC	19–24	7.8	2.94	0.12	0.06	9.3	13.5	0.4	0.4	30.5	77.4	0.1
Ck	48+	8.0			0.06	25.7	9.9	0.2	0.4	13.6	100.0	3.6

Doig Series

Ah	0–4	5.3	15.97	0.63		14.4	9.2	1.9	0.2	45.0	57.1	0.1
Ae	4–7	4.4	3.17	0.19		7.3	7.2	0.4	0.3	35.2	43.2	0.0
AB	7–11	4.4	2.88	0.18		9.1	10.2	0.4	0.5	42.2	47.9	0.0
Bn	11–19	4.4	2.40	0.20		9.7	11.9	0.4	0.5	39.4	57.1	0.2
BC	19–32	4.6	2.09			11.1	14.2	0.4	0.8	34.9	75.9	0.3
Cs	32+	7.3	1.73									3.6

Arras Series

Ah1	0–2	6.8	12.94	0.60		17.7	11.1	1.3	0.1	35.1	86.0	0.2
Ah2	2–5	6.5	5.40	0.35		9.7	8.5	0.8	0.1	21.7	77.3	0.1
Ae	5–8	6.2	1.37	0.16		2.5	3.2	0.2	0.1	9.5	63.2	0.0
BA	8–11	5.7	2.20	0.17		5.2	10.8	0.2	0.4	25.7	64.6	0.1
Bn	11–18	6.7	2.03	0.13		10.1	15.2	0.3	0.9	33.2	79.8	0.5

Table 8.—Some Chemical Characteristics of Horizons of Representative Soils—Cont.

Horizon	Depth inches	pH	Organic matter %	Nitrogen %	Phosphorus %	Exchangeable cations, me./100 g. Calcium	Magnesium	Potassium	Sodium	Cation exchange capacity	Base saturation %	Conductivity mhos/cm.
Gray Wooded Solod Soils												
Alcan Series												
Ahe	0-1	6.7	4.41	0.15		16.2	6.7	0.8	0.2	23.1	100.0	0.2
Ae	1-4	5.2	0.38	0.04		1.8	1.9	0.2	0.1	8.3	48.2	0.0
AB	4-7	4.8	0.68	0.06		3.8	5.3	0.3	0.1	17.7	53.7	0.0
BA	7-10	4.8	0.75	0.07		4.9	7.5	0.3	0.1	22.0	58.2	0.0
Bn	10-24	4.6	0.85	0.07		6.8	9.7	0.2	0.1	25.6	65.6	0.0
BC	24-31	4.0	0.72	0.07		6.6	9.1	0.2	0.1	21.6	74.1	0.0
C	31+	5.0	0.77			5.4	9.4	0.1	0.1	17.0	88.2	0.1
IIC	120	7.0										1.9
Donnelly Series												
Ae	1-9	5.1	1.20	0.05	0.04	3.3	1.60	0.2	0.1	7.4	70.3	
AB	9-11	4.6	1.45	0.12	0.04	7.8	5.30	0.6	0.2	17.0	81.8	
Bt	11-18	4.4	1.50	0.10	0.05	10.9	8.90	0.6	0.6	26.8	78.4	
BC	28-33	4.6	1.60	0.10	0.08	14.2	10.20	0.5	0.5	28.0	90.7	
C	50+	8.1			0.08							
Dark Gray Wooded Soils												
Devereau Series												
Ahe	0-4	6.3	7.44	0.42		15.6	3.3	1.0	0.1	28.5	70.2	0.1
Ae	4-7	6.3	1.57	0.12		7.7	2.2	0.4	0.1	14.8	70.0	0.1
BA	7-11	5.4	1.93	0.15		12.8	4.4	0.4	0.1	26.9	65.8	0.0
Bt	11-19	6.1	1.98	0.16		20.1	6.5	0.3	0.2	34.8	77.8	0.1
Ck	25+	8.3										0.8
Orthic Gray Wooded Soils												
Kathleen Series												
Ah	0-2	7.1	8.48	0.51	0.10	18.3	5.3	1.8	0.1	30.0	85.0	0.3
Ae	2-5	6.9	1.93	0.13	0.03	10.0	2.8	0.7	0.1	18.2	74.7	0.1
AB	5-7	6.4	1.98	0.16		12.1	4.4	0.6	0.1	23.1	74.4	0.1
Bt1	7-13	5.6	2.10	0.12		14.2	5.9	0.3	0.1	29.8	68.8	0.0
Bt2	13-17	7.5	2.13	0.13	0.04	21.0	8.4	0.2	0.1	29.6	100.0	0.4
Ck	22-32	8.4	1.84		0.07							

						Sukunka Series						
Ae	0–2	6.6	0.67	0.05		3.1	1.8	0.3	0.1	6.5	81.5	0.1
AB	2–4	6.4	1.44	0.09		6.0	3.1	0.6	0.1	11.4	86.0	0.1
BA	4–7	5.7	1.30	0.13		9.0	6.6	0.6	0.1	19.7	82.7	0.1
Bt	7–12	5.6	1.71	0.17		14.5	15.0	0.4	0.2	28.6	100.0	0.2
						Bisequa Gray Wooded Soils						
						Moberly Series						
Ae	0–3	5.6	2.30	0.08	0.05	4.2	0.6	0.4	0.1	5.9	89.8	
Bf	3–6	5.9	0.78	0.05	0.05	4.1	0.7	0.3	0.1	5.5	94.5	
Ae	6–13	5.8	1.15		0.04	4.4	0.6	0.3	0.1	5.9	91.5	
Bt	13–18	5.7	1.61	0.09	0.05	10.4	1.5	0.3	0.2	12.3	100.0	
Ck	24+	7.8	1.29	0.08	0.08							
						Sundance Series						
Ae	0–2	6.7	0.97	0.04	0.05	3.1	0.4	0.1	0.1	4.2	88.1	
Bf	2–6	6.4	0.43	0.03	0.10	1.5	0.8	0.1	0.1	3.8	65.8	
Ae	6–14	6.7	0.46	0.04	0.06	2.3	0.8	0.1	0.1	3.8	86.8	
Bt	14–20	7.0	1.06	0.06	0.06	5.2	1.6	0.1	0.1	8.4	83.3	
						Fellers Series						
Ae	0–3	5.8	2.86	0.10		6.1	2.5	0.3	0.1	13.2	68.9	0.1
Bf	3–7	4.5	0.99	0.07		7.0	7.0	0.3	0.1	28.0	51.4	0.0
Ae	7–9	4.5	0.87	0.06		8.1	8.6	0.3	0.2	31.0	55.5	0.0
Bt1	9–14	4.2	0.46	0.05		10.3	10.4	0.4	0.3	36.0	59.4	0.0
Bt2	14–23	4.4	0.26	0.05		11.4	11.5	0.3	0.2	35.1	66.7	0.0
Bt3	23–30	4.1	0.80	0.05		12.9	12.4	0.3	0.3	34.1	76.0	0.1
BC	30–39	5.1	0.59			14.4	10.1	0.3	0.3	32.6	77.0	0.1
CB	39–53	6.8				15.0	10.9	0.3	0.3	29.3	90.4	0.1
						Brunisolic Gray Wooded Soils						
						Lynx Series						
Bf	0–4	6.6	1.26	0.05								
Ae	4–8	6.6	0.48	0.04		4.5	0.7	0.1	0.0	5.8	91.4	
Bt	8–10	6.0	0.92	0.10		16.8	1.2	0.3	0.1	20.7	88.9	
BC	10–12	6.8	1.02	0.08		17.6	1.2	0.2	0.1	20.7	92.3	

Table 8.—Some Chemical Characteristics of Horizons of Representative Soils—*Conc.*

Horizon	Depth inches	pH	Organic matter %	Nitrogen %	Phosphorus %	Exchangeable cations, me./100 g. Calcium	Magnesium	Potassium	Sodium	Cation exchange capacity	Base saturation %	Conductivity mhos/cm.
						Podzol Soils						
						Alces Series						
Ae	0–3	3.9	1.67	0.07		1.3	1.3	0.1	0.0	9.2	29.3	
Bf1	3–7	4.3	0.77	0.04		0.8	0.6	0.1	0.0	6.1	24.6	
Bf2	7–12	4.7	0.41	0.04		1.3	0.6	0.1	0.0	4.9	40.8	
BC	12–20	5.0	0.44	0.03		1.3	1.1	0.1	0.1	5.0	50.0	
CB	20–35	4.7				2.7	0.8	0.1	0.1	10.2	36.3	
C	35+	4.7				2.3	1.8	0.1	0.1	13.5	31.8	
						Undifferentiated Podozolic Soils						
						Boundary Series						
Ah	0–3	5.2				3.0	1.4	0.6	0.1	17.8	33.7	0.1
Ae	3–8	5.3	1.42	0.08		1.1	1.0	0.3	0.1	9.9	25.3	0.1
AB	8–13	4.8	1.16	0.10		1.8	1.6	0.4	0.1	19.7	19.9	0.0
BA	13–18	4.8	1.07	0.10		1.8	1.8	0.4	0.1	20.9	19.6	0.0
Bt	18–26	4.7	0.99	0.00		1.7	1.8	0.3	0.1	21.7	18.0	0.1
BC	26–35	4.3	1.03	0.09		1.5	1.8	0.2	0.1	22.5	16.0	0.1
CB	35–40	4.2	0.93	0.08		1.6	1.9	0.2		20.5	18.5	0.2
C	40+	4.2				1.4	1.9	0.2	0.2	20.5	19.0	0.3
						Low Humic Eluviated Gleysol Soils						
						Snipe Series						
Ah	0–2	5.4	10.63	0.45		16.4	6.3	1.6	0.1	32.2	75.8	
Aeg	2–6	5.2	1.07	0.56		2.0	1.7	0.2	0.0	5.0	78.0	
BAg	6–14	4.5	1.20	0.12		11.4	9.4	0.7	0.2	24.4	88.9	
Btg	14–22	4.3	1.20	0.10		14.6	11.0	0.4	0.2	27.6	94.9	
BCg	22–25	4.6	0.99	0.10		17.4	12.2	0.3	0.3	32.4	93.0	
Cg	25–36	5.6				16.8	10.2	0.4	0.3	28.0	99.0	

				Buick Series							
Aeg	0–4	6.3	0.97								
BAg	4–5	6.0	1.04								
Btg	5–25	4.5	0.66								
BCg	25–33	4.3									
Ck	33–39	4.5									
				Coleman Series							
Ah	0–1	6.0	10.48	0.64	0.04	20.2	3.1	2.1	0.2	37.5	68.3
Aeg	1–3	6.1	4.14	0.26	0.05	15.5	3.3	1.1	0.2	26.9	74.7
BAg	3–9	5.7	2.62	0.20	0.02	15.1	6.9	1.1	0.2	29.4	79.2
Btg	9–14	6.3	2.34	0.19	0.02	17.1	8.2	0.6	0.6	29.7	89.2
Ck	14+	8.0	2.21	0.14	0.02	31.6	7.8	0.4	0.4	29.7	100.0
				Orthic Meadow Soils							
				Codner Series							
Ah	0–5	6.0	5.21	0.45	0.11	15.4	3.1	1.4	0.1	26.9	74.3
ABg	5–8	6.3	2.03	0.07	0.06	3.3	1.1	0.3	0.0	5.7	82.4
Bg	8–15	6.6	0.49	0.04	0.06	2.9	0.9	0.2	0.0	4.6	87.0
IICg	15+	7.0	1.48	0.14	0.07						
				Goose Series							
Ah	0–4	6.8		0.74	0.17	22.4	15.1	0.3	0.3	44.0	86.6
Bg	4–9	5.8		0.33	0.10	11.7	9.5	0.2	0.1	21.6	99.5

The movements to and from the various horizons are indicated in Table 9. For instance, Rycroft and Landry, Black Solodized Solonetz and Black Solod soils respectively, have undergone slight leaching except for calcium and magnesium. Doig, a Dark Gray Wooded Solod, shows more evidence of leaching. This is apparent also from a study of the morphological features.

In Alces fine sandy loam, an Orthic Podzol soil, considerable leaching is shown by the loss of iron and aluminum in the A horizon and accumulation of these in the B horizon. This movement of iron and aluminum is most apparent in Podzolic soils.

Minor Elements

Minor elements have recently received increased attention because deficiencies of one or more of thes elements are becoming more frequent and striking responses to application of deficient elements are common.

Boron

Boron-deficient soils are common in many areas in British Columbia. Woodbridge[8], for instance, reported that the available boron in Okanagan soils varies from 0.09 to 0.33 p.p.m., and that at least 0.5 p.p.m. is required to protect apple trees from boron-deficiency symptoms. Fennel[9] reported values for the same region varying from 0.05 to 0.04 p.p.m. and, using sunflower as a test plant, concluded that a soil content below 0.6 p.p.m. indicates a deficiency. On the other hand, Dregne and Powers[10] concluded that, for healthy growth of alfalfa in the Pacific northwest of the United States, a soil content of 1 p.p.m. of available boron is necessary.

Fennel and Laird[11] reported that the boron contents (p.p.m.) of several Peace River soils in each of two subgroups averaged as follows:

	Cultivated layer		*Parent material*	
Soil subgroup	*Available*	*Total*	*Available*	*Total*
Black Solod	2.42	68.7	1.00	72.5
Gray Wooded Solod ..	1.45	61.0	1.12	60.8

On the basis of the standards reported, the two subgroups are abundantly provided with available boron.

Manganese

Chemical studies[12] have indicated a wide range in manganese content of British Columbia soils. In the Peace River area, analyses of 13 profiles showed that the total manganese content of the A horizons ranged from 66 to 1150 p.p.m., and the available content from 5.6 to 33.6 p.pm. The ranges for total and available manganese in the C horizons were similar. The Peace River values are somewhat lower than those for most parts of British Columbia, but they compare very favorably with those for other countries. Evidently the soils in the surveyed area have adequate amounts of both total and available manganese.

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[8] Woodbridge, C. G. The boron content of some Okanagan soils. Sci. Agr. 20: 257-265. 1940.

[9] Fennel, E. J. M.S.A. thesis. Department of Agronomy (Soils), University of British Columbia. Unpublished. 1947.

[10] Dregne, A. E., and W. L. Powers. Boron fertilization of alfalfa and other legumes in Oregon. J. Am. Soc. Agron. 34: 902-912, 1942.

[11] Fennel, E. J., and D. G. Laird. Boron contents of British Columbia soils. 6th Pacific Sci. Cong., pp. 42-47. 1949.

[12] Baker, J. Distribution of manganese in British Columbia soils: M.S.A. thesis. Department of Agronomy (Soils), University of British Columbia. Unpublished. 1947.

Table 9.—Total Contents of Some Elements in Horizons of Representative Soils

Percentages of Ovendry Weights

Horizon	Depth Inches	Silicon	Iron	Aluminum	Titanium	Calcium	Magnesium
			Black Solodized Solonetz Soils				
			Rycroft Series				
Ah	0– 6	26.54	3.36	7.92	0.42	—	0.70
AB	6– 8	29.59	3.90	9.15	0.52	0.35	0.77
Bn	8–15	26.64	4.48	11.29	0.48	0.42	1.06
BC	15–25	26.11	3.96	9.92	0.46	2.72	1.06
Ck	25–27	27.18	4.08	9.04	0.42	3.47	2.32
Cs	27+	25.60	4.27	9.63	0.42	3.93	1.37
			Black Solod Soils				
			Landry Series				
Ahl	0– 3	27.00	3.58	7.63	0.41	1.06	0.90
AB	6– 9	29.86	4.02	8.38	0.49	0.66	0.91
Bn	13–19	26.85	4.83	9.70	0.41	0.59	1.18
Ck	19–23	27.50	4.56	9.56	0.40	1.87	1.34
C	30+	27.82	4.08	8.80	0.39	3.20	1.24
			Dark Gray Solod Soils				
			Doig Series				
Ah	0– 4	27.96	3.14	3.34	0.49	0.43	0.68
Ae	4– 7	29.10	4.00	10.85	0.52	0.35	0.86
AB	7–11	27.72	4.76	11.33	0.56	0.36	1.02
Bn	11–19	27.47	9.16	7.98	0.57	0.24	1.06
BC	19–32	27.38	4.78	11.34	0.58	0.29	1.12
Cs	32–38	26.24	4.65	10.28	0.59	2.12	1.12
C	38–41	27.38	6.41	8.70	0.52	2.82	1.20
			Gray Wooded Solod Soils				
			Alcan Series				
Ahe	0– 1	32.16	2.46	5.17	0.37	0.80	0.56
Ae	1– 4	37.72	2.52	4.78	0.42	0.18	0.46
Bn	10–24	32.97	3.42	8.28	0.43	0.18	0.75
CB	24–31	32.40	3.96	8.26	0.52	0.09	0.84
C	31+	32.62	3.96	8.06	0.42	0.44	0.67
			Brunisolic Gray Wooded Soils				
			Lynx Series				
Bf	0– 4	35.68	2.55	5.92	0.47	0.80	0.63
Ae	4– 8	35.35	6.60	3.40	0.47	0.63	0.70
Bt	8–10	31.49	8.34	5.12	0.42	0.50	0.79
BC	10–13	38.44	5.38	9.64	0.47	0.84	1.14
Ck	13–29	17.82	2.70	5.62	0.32	15.12	1.74
			Bisequa Gray Wooded Soils				
			Moberly Series				
Ae	0– 3	39.66	1.94	3.43	0.36	0.20	0.24
Bf	3– 6	38.57	3.09	4.72	0.37	0.24	0.37
Ae	6–13	38.13	2.86	4.27	0.41	0.22	0.35
Bt	13–18	35.28	3.24	6.73	0.40	0.45	0.58
BC	18–24	34.02	3.37	6.35	0.36	0.48	0.58
Ck	24+	33.92	2.87	5.40	0.35	2.49	0.78

Table 9.—Total Contents of Some Elements in Horizons of Representative Soils—*Conc.*

Percentages of Ovendry Weights

Horizon	Depth Inches	Silicon	Iron	Aluminum	Titanium	Calcium	Magnesium
			Sundance Series				
Ae	0–2	43.17	0.85	2.09	0.21	0.14	0.14
Bf	2–6	41.99	1.69	2.70	0.23	0.30	0.22
Ae	6–14	41.68	1.58	2.80	0.23	0.25	0.16
Bt	14–20	38.44	2.76	4.52	0.26	0.31	0.40
			Beryl Series				
Ae	0–2	41.62	1.21	3.14	0.34	0.14	0.20
Bf	2–5	39.40	2.38	4.18	0.34	0.14	0.34
Ae	5–8	40.05	2.02	3.49	0.42	0.06	0.40
Bt	8–10	31.60	4.11	8.49	0.38	0.34	0.98
IIC	16+	27.69	4.92	10.98	0.40	0.60	1.09
			Podzol Soils				
			Alces Series				
Ae	0–3	40.62	1.07	2.89	0.43	0.17	0.14
Bf1	3–7	39.50	3.82	2.54	0.46	0.07	0.30
Bf2	7–12	40.46	2.09	3.36	0.36	0.08	0.25
BC	12–20	40.22	2.32	3.49	0.39	0.13	0.26
CB	20–35	37.98	2.94	4.62	0.44	0.14	0.34
C	35+	36.07	3.59	5.37	0.46	0.08	0.40

Copper

The copper contents [13] of some soils in the Peace River area have been reported as follows:

Soil series	*Horizon*	*Total copper (p.p.m.)*
Rycroft	A	37
	C	42
Mytron	A	45
	C	39
Arras	A	26
	C	33
Esher	A	37
	C	36
Alcan	A	15
	C	20
Davis	A	14
	C	18

The soils appear to be well supplied with copper.

Mechanical Analyses

The sand, silt and clay contents were determined on selected soil profiles to give a representative coverage of the main soil series in the area.

Table 10 clearly indicates the downward movement of the clay fraction. The leached horizons are lowest in clay content, and the B horizons are higher than the C horizon.

[13] Clark, J. S. A method for the estimation of copper and its application in British Columbia. M.S.A. thesis. Department of Agronomy (Soils), University of British Columbia. Unpublished. 1947.

Table 10.—Mechanical Compositions of Representative Soils

Percentages of Total Weights

Horizon	Depth Inches	Sand 2.0–0.05 mm.	Silt 0.05–0.002 mm.	Clay Less than 0.002 mm.	Texture
		Black Solod Soils			
		Landry Series			
Ah1	0– 6	33	30	37	Clay loam
Ah2	6– 9	27	38	35	Clay loam
Ae	9–11	30	50	20	Silt loam
Bn	14–21	23	8	69	Clay
		Mytron Series			
Ah1	0– 6	48	16	36	Sandy clay
Ah2	6– 8	31	35	35	Clay loam
Ae	8–10	29	34	37	Clay loam
Bt	16–21	24	16	60	Clay
CB	21–28	21	17	62	Clay
		Dark Gray Solod Soils			
		Murdale Series			
Ah1	0– 2	32	45	23	Loam
Ah2	2– 5	29	46	25	Loam
Ae	5– 6	29	54	17	Silt loam
BA	7–15	14	35	51	Clay
Bn	15–26	17	37	46	Clay
BC	26–31	19	33	48	Clay
Cs	31–54	19	42	39	Silty clay loam
		Gray Wooded Solod Soils			
		Alcan Series			
Ae	1– 4	26	59	15	Silt loam
BA	7–10	13	37	50	Clay
Bn	10–24	12	38	50	Clay
CB	31–72	2	42	56	Silty clay
		Hanshaw Series			
Ae	2– 6	57	9	34	Sandy clay loam
BA	6–11	26	23	51	Clay
Bt	11–17	16	21	63	Clay
BC	17–23	21	23	56	Clay
		Gray Wooded Soils			
		Kathleen Series			
Ahe	0– 2	15	52	33	Silty clay loam
Ae	2– 5	10	51	39	Silty clay loam
AB	5– 7	5	39	56	Silty clay
Bt	13–17	6	37	57	Silty clay
Ck	22–32	8	40	52	Silty clay
		Bisequa Gray Wooded Soils			
		Sundance Series			
Ae	0– 2	57	37	6	Sandy loam
Bf	2– 6	69	28	3	Sandy loam
Ae	6–14	76	20	4	Loamy sand
Bt	14–20	58	26	16	Sandy loam
Ck	20–24	79	17	4	Loamy sand

Table 10.—Mechanical Compositions of Representative Soils—*Conc.*

Percentages of Total Weights

Horizon	Depth Inches	Sand 2.0-0.05 mm.	Silt 0.05-0.002 mm.	Clay Less than 0.002 mm.	Texture
			Moberly Series		
Ae	0- 3	37	52	11	Silt loam
Bf	3- 6	34	55	11	Silt loam
Ae	6-13	49	36	15	Loam
Bt	13-18	33	41	26	Loam
Ck	24+	39	39	22	Loam
			Fellers Series		
Ae1	0- 3	34	54	12	Silt loam
Bf	3- 7	21	38	41	Clay loam
Ae	7- 9	15	36	49	Clay
Bt1	9-14	16	35	49	Clay
Bt2	14-23	14	39	49	Clay
Bt3	23-30	16	40	47	Clay
BC	30-39	17	41	44	Clay
CB	53-57	18	42	42	Clay
			Undifferentiated Podzolic Soils		
			Boundary Series		
Ah	0- 3	22	48	30	Silt loam
Ae1	3- 6	20	53	27	Silty clay loam
Ae2	6- 8	20	46	34	Clay
AB	8-13	11	41	48	Clay
BA	13-18	11	38	51	Clay
Bt	18-26	14	28	58	Clay
BC	26-35	17	24	59	Clay
CB	35-40	16	27	57	Clay

From a practical standpoint the most important physical features of a soil are porosity, percolation rate, moisture-holding capacity, plasticity, and temperature relationships. These factors, together with organic matter content, determine not only the suitability for specific crops but also management practices.

Soils that are high in clay may be difficult to work, slow to drain and "cold." Maintaining an adequate supply of organic matter will improve their tilth and permit better drainage and aeration.

Soils that are low in clay are easily cultivated but are susceptible to drought and tend to drift. These soils, such as the Davis, Tangent and Toad series, must be farmed carefully. Organic matter is needed to bind the loose soil aggregates and increase water-holding capacity.

Porosity and Permeability

Soil permeability determines the movement of air and water through a soil mass. It is governed by the size of the pores rather than by total porosity. Clays have a large number of small pores (capillary porosity), and therefore high water-holding capacity and slow permeability. Sands have large pores (noncapillary porosity), and therefore rapid permeability and low moisture-holding capacity. An ideal soil should have the pore spaces about equally divided between large and small pores, and therefore satisfactory percolation, air drainage, and moisture-holding capacity.

Table 11 gives some comparisons between total and noncapillary porosity of the surface and subsurface horizons of representative soils.

The A horizons (upper 10 inches) have the highest porosity. The B horizons are the least readily permeable, the noncapillary porosity rarely exceeding 10 percent of the total porosity. In no soil does the noncapillary porosity approach 50 percent of the total.

The percolation rates (Table 11) also show that these soils, as a whole, are nearly impermeable.

Table 11.—Porosity, Percolation Rates and Specific Gravities of Horizons of of Representative Soils

Horizon	Depth Inches	Porosity, % Total	Porosity, % Noncapillary[1]	Percolation rate[1] in./hr.	Specific gravity Apparent	Specific gravity Real
			Black Solod Soils			
			Landry Series			
Ah	0- 6	65.78	6.12	1.8	0.77	2.52
Ae	6- 9	59.24	15.13	3.3	1.20	2.70
AB	9 13	53.85	12.54	2.4	1.24	...
Bn	13 19	52.86	13.29	0.6	1.31	2.68
C	23+	49.21	5.85	0.3	1.46	...
			Mytron Series			
Ah	0 6	74.30	10.40	3.7	0.69	2.36
Ae	8 10	50.70	14.00	1.8	1.34	2.71
BA	13 16	51.90	8.25	0.5	1.40	2.73
Bn	17 21	52.78	14.38	1.8	1.39	2.77
C	38+	49.89	17.18		1.34	2.76
			Dark Gray Solod Soils			
			Esher Series			
Ah	0 6	66.0	6.4			
Ae	6 12	47.8	5.8	2.0		
BA	12 18	47.7	4.3	0.3	1.55	2.71
Bn	18 24	50.6	3.3	0.3	1.52	2.80
C	31+	53.6	6.4	0.2	1.51	2.75
			Arras Series			
Ah	0- 5	62.1	12.3		0.94	2.49
Ae	5- 8	52.5	12.1		1.20	2.69
AB	8-11	51.3	10.9		1.36	2.71
Bn	11 18	52.4	9.4	2.8	1.47	2.78
C	22+	47.9	6.2	0.8	1.52	2.80
			Gray Wooded Solod Soils			
			Donnelly Series			
Ah	0- 1	56.0	9.1	1.6		
Ae	1- 9	36.1	2.8	0.8		
BA	9 11	48.0	2.4	0.1		
Bn1	11 18	51.5	3.8	0.2		
Bn2	18 28	48.9	4.6	-		

[1]Through saturated, undisturbed cores 3 inches in diameter and under a ½-inch head of water.

Table 12.—Approximate Acreages of the Soils According to Topography

Soil subgroup	Soil series	Level to very gently sloping 0.0-2.0%	Smooth, gently to moderatley sloping 2.0-9.0%	Irregular, gently to moderately sloping 2.0-9.0%	Smooth, steeply sloping 9.0-15.0%	Irregular, steeply sloping 9.0-15.0%	Very steeply sloping and hilly over 15.0%	Total acreage
Eluviated Black	Peoria	3,260	710		1,575			5,545
Rego Black	Taylor	8,510	3,860					12,370
Black Solodized Solonetz	Roycroft	35,055						35,055
Black Solod	Landry	2,835	57,375			4,470	785	65,465
	Mytron		3,165		3,185	1,475	755	8,580
	Rolla	5,180	620			1,080		6,880
	Roseland			8,880	8,740			17,620
Dark Gray Solod	Albright	180	4,260			2,840	330	7,610
	Arras	5,035		18,250				23,285
	Doig	5,305	9,610	9,380	8,745			33,040
	Esher	9,735	30,075			8,645	60	48,515
	Falher	19,505	2,935	2,725				25,165
	Murdale	260	11,875		385	15,385	1,310	29,215
Gray Wooded Solod	Alcan	115,735	408,600		109,830	36,325	270,460	940,950
	Beatton	10,785	32,255	2,790		2,270		48,100
	Donnelly	51,445	38,405			1,935		91,785
	Hanshaw	2,630	12,655	225		3,520		19,030
	Hazelmere	2,370	17,640		2,560	920	5,585	29,075
	Nampa	1,780	3,050					4,830
Orthic Gray Wooded	Clouston	2,150	355			535	12,675	15,715
	Codesa	35,025	18,965	500		5,720	1,470	61,680
	Davis	2,325	14,795		16,910			34,030
	Demmitt	3,035	8,895			3,995		15,925
	Kathleen	3,400	13,330	18,050		1,120		35,900
	Shearerdale					260	7,190	7,450
	Sloane	10,800	690	7,310		1,400		20,200
	Sukunka	5,385	1,180	5,900				12,465
Dark Gray Wooded	Belloy	865	2,140					3,005
	Devereau	9,640	22,985	32,045	8,000	1,830		74,500
	Grouard	3,580	2,220					5,800
	Judah	1,290	5,230	44,700	360			51,580
	Tangent	170	695	2,235				3,100
Brunisolic Gray Wooded	Lynx	37,370	29,125	90,365	9,640	17,235		183,735

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Bisequa Gray Wooded	Beryl	27,260	81,970	33,965				143,195
	Fellers	200	36,380		3,005	28,670	88,485	156,740
	Moberly	22,150	56,865		139,420	15,305	510,450	744,190
	Sundance		20,760	44,220		5,300		70,280
	Toad	450		27,830				28,280
	Twidwell	100		11,930	2,280	11,080		25,390
Undifferentiated Podzolic Soils	Boundary	7,035	15,590					22,625
Orthic Podzol	Alces	4,070	7,320					11,390
	Tremblay		2,880				5,870	8,750
Bisequa Podzol	Groundbirch	575	1,240	29,500		2,955		34,270
Orthic Brown Wooded	Branham	2,100	23,760	880	4,880			31,620
Degraded Brown Wooded	Clayhurst	6,855	8,295	1,685		190		17,025
	Pingel	2,030						2,030
	Widmark	1,200		7,480				8,680
Mull Regosol	Farrell	2,410	830					3,240
Orthic Meadows	Codner	20,295	7,555					27,850
	Goose	49,020						49,020
Undifferentiated Regosolic	Alluvial	55,535	865		355	1,630	1,785	60,170
Calcareous Meadow	Centurion	12,540						12,540
Peaty Meadow	Prestville	10,150						10,150
Humic Eluviated Gleysol	Prespatou	61,505						61,505
Low Humic Eluviated Gleysol	Buick	18,285						18,285
	Coldstream	8,365						8,365
	Coleman	2,045						2,045
	Snipe	62,365	2,015					64,380
Organic	Eaglesham	40,095	1,345					41,440
	Kenzie	195,810	18,310	3,125				217,245
Eroded, steeply sloping and broken land								439,060
Water								66,145
Total area								4,363,105

AGRICULTURAL PROBLEMS

Soil Erosion

Soil erosion is a serious problem in the Peace River area of British Columbia. Already gully erosion has caused the loss of many acres of productive land. Sheet erosion, though not so spectacular as gully erosion, is even more serious. Already the surface soil from many fields has been largely removed, leaving behind little more than subsoil (B horizon) even on land of only 1 to 2 percent slope.

Climate contributes to erosion throughout the area. Chinooks, for instance, are not uncommon and are sometimes responsible for the very sudden appearance of spring. Then large masses of snow disappear rapidly and the huge volumes of water overtax the capacities of most road ditches and natural water runways. These become turbulent streams and do serious damage unless soil surfaces are protected by vegetation, and the culverts and ditches are adequate.

Heavy rainfalls, which are not uncommon throughout the summer, aggravate the tendency of many soils to erode and often cause severe erosion, particularly on bare soils. In 1946, near Dawson Creek, 11 percent of the top 6 inches of soil disappeared from a 10-acre field of Landry soil in less than 1 hour. This field, on a 1 to 2 percent slope, was in fallow, and had been subjected to a rainfall of 2½ inches in 30 minutes.

Erosion is increasing throughout the surveyed area. If the soils are to be maintained at their present productivity levels, practices that retard runoff and erosion, such as strip cropping, contour tillage, and grassing or reforesting natural water runways, must be adopted.

Water Supplies

Scarcity of water for both livestock and household use is a major problem in rural communities throughout much of the surveyed area. Farmers as a rule are forced to depend on artificial ponds, or "scoopouts," to provide water for livestock and domestic use. Recently Mathews[14] surveyed ground-water supplies in the area. He concluded that ground water is readily obtainable only in the western part, where comparatively little farming is now done. In the areas that have farm lands, water-bearing strata occur at such depths, or the water is of such doubtful quality, that sinking of farm wells cannot be recommended.

Land Clearing and Land Use

The solution of one problem often introduces or aggravates another, and this is well illustrated in the Peace River area of British Columbia. Slow, cumbersome and laborious methods for land clearing have been replaced by heavy tractors with brush cutting and piling attachments. This method is rapid and relatively inexpensive but it has not always been efficient for bringing land under cultivation.

The trend, unfortunately, in land clearing is towards indiscriminate removal of all vegetation, and this is one of the major factors accelerating gully erosion. Natural water runways are bared to accelerated runoff during the freshet season and during heavy rains. Sooner or later a heavy storm causes a gully, which then grows more and more rapidly. Prevention through maintenance of native vegetation is the cheapest remedy for gully erosion.

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[14] Mathews, W. H. Ground water paper. No. 3. British Columbia Department of Mines Victoria. 1955.

Maintenance of trees near natural water reservoirs contributes much to water conservation and should be fully appreciated by prospective settlers, and by farmers already living in areas where ground water supplies are scarce or absent.

The importance of maintaining a part of every section, or even every quarter section, under forest cannot be overemphasized. Besides controlling erosion and conserving water, trees meet the needs for fuel, fencing and, in some instances, building material. Already the lack of farm woodlots is being seriously felt in many communities.

Maintenance of Soil Fertility

The Black Solodized Solonetz and Black Solod soils are among the most fertile in the surveyed area. They are high in organic matter and nitrogen and reasonably high in phosphorus, potash and base saturation.

These soils have been are are being used largely for growing wheat and coarse grains, and are summerfallowed about once every three years. This sequence of crops often rapidly dissipates organic matter and nitrogen and aggravates the tendency to erode.

The cropping practices should be revised to provide a rotation favoring the maintenance of soil fertility and conservation of soil and moisture. This involves a change from so-called grain farming to some other type such as livestock farming or seed production. Livestock farming would mean growing legumes and grasses instead of grains, and eliminating fallow. This would do much to stabilize these soils and maintain their productivity.

The Gray Wooded soils vary greatly in fertility. Most are strongly acid and low in nitrogen, phosphorus and organic matter. They have a low base exchange as well as low base saturation. Unfortunately, there appears to be no entirely satisfactory system of farming these soils to improve their fertility. Experiments conducted at the University of Alberta, on somewhat similar soils, stress the need for fertilizers and for rotations that include legumes. Field trials carried out at the Beaverlodge experimental farm show similar results. Livestock farming, which returns some nutrients to the soil, is almost essential if these soils are to be maintained above submarginal levels. This, along with extensive use of legumes and phosphate fertilizers, should build up the fertility of most of these soils.

Pests and Weeds

Pests include wireworms, cutworms and occasionally grasshoppers. Though these may sometimes do some damage locally, they are not a general menace unless entirely ignored. The introduction of mixed farming in place of grain farming will doubtless reduce damage appreciably.

The weed problem is serious but is capable of solution since effective herbicides have now come into common use.

For more information on pest and weed control the operator should consult his district agriculturist.

Frost Hazard

Aside from the danger of late-spring and early-fall frosts throughout the area, the hazard of frost varies from district to district, and some localities are recognized as frost pockets. Since damage by frost may well determine success or failure on a farm, a prospective settler should study very carefully any acreage that he may propose to take up or purchase.

SOIL RATINGS

In the descriptions of the soils, ratings are given for productivity. These ratings are based on field observations of the soils, soil-plant relationships, and chemical and physical analyses of representative soil samples. These interpretations are concerned with suitability of the soils for different crops, soil-management problems and productivity.

The ratings are for the soil series, not the mapping units. In using the map it is important to recognize each series within the mapping unit. For full information about a particular soil one should refer to the description. **All the ratings are based on soils with level to gently rolling topography; if the topography is less favorable for farming, the rating is lower.**

Soils Suitable for Cultivated Crops

Good to Very Good Arable Land

The soils in this group have medium to fine texture and are well to imperfectly drained. They have high natural fertility and high moisture-holding capacity. They are moderately well supplied with organic matter and plant nutrients. They are well adapted to grains and forage crops, but good farming practices are essential to keep the land productive and to control wind and water erosion.

The following series are in this group:

Albright	Mytron	Rycroft
Esher	Peoria	Roseland
Falher	Rolla	Taylor
Landry		

Fairly Good to Good Arable Land

The soils in this group are moderately productive but have some management problems that are usually more difficult to apply and maintain than those in very good arable land. They have moderate to high fertility and high water-holding capacity. They tend to become hard when dry, especially if the organic matter content is low. Some are subject to periodic waterlogging in spring and in very wet seasons. All are subject to wind and water erosion. Grasses and legumes should be grown in rotation with grain crops. All crops are likely to respond to application of nitrogen and phosphorus fertilizers.

The following series are in this group:

Arras	Donnelly	Murdale
Belloy	Hanshaw	Nampa
Devereau	Hazelmere	Tangent
Doig	Judah	

Fair to Fairly Good Arable Land

The soils in this group are moderately productive but have severe limitations that reduce the choice of crops or require special management practices. The limitations may result from limited fertility, coarse texture, susceptibility to wind and water erosion, high lime content, or poor drainage.

The following series are in this group:

Alcan	Codesa	Lynx
Alces	Davis	Sloane
Beatton	Demmitt	Sukunka
Beryl	Farrell	Toad
Boundary	Kathleen	Widmark
Branham		

Poor to Fair Arable Land

The soils in this group have severe soil or climatic limitations and are only suited for a few crops. The limitations include low fertility, coarse texture, stoniness, poor drainage and unfavorable topography or climate. These soils are suitable mainly for growing forage crops.

The following series are in this group:

Buick	Fellers	Prespatou
Clayhurst	Groundbirch	Snipe
Coleman	Grouard	Sundance
Clouston		

Soils Not Suited for Cultivated Crops

Pasture or Woodland

Soils in this group have soil and climatic limitations that make them unsuitable for cultivated crops. They are infertile, very poorly drained, gravelly, stony or very steeply sloping. They are suited mainly for grazing, hay production or forestry.

The following series are in this group:

Codner	Goose	Shearerdale
Centurion	Kenzie	Tremblay
Eaglesham	Prestville	Twidwell

GLOSSARY

Aeolian materials—Materials transported and deposited by wind. The sands are commonly in dunes.

Alluvial fan—A fan-shaped outwash at the toe of a gully where it debouches onto flatter ground.

Available nutrients—Plant nutrients in soluble form, or readily available for absorption by plant roots.

Boulders—Rock fragments over 2 feet in diameter.

Calcareous material—Material containing a high percentage of calcium carbonate; it visibly effervesces when treated with hydrochloric acid.

Cobbles—Rock fragments from 3 to 10 inches in diameter.

Complex—Two or more soil series that are so intimately mixed that it is impractical to separate them at the scale of mapping used.

Consistence (soil)—The mutual attraction of the particles in a soil mass, or their resistance to separation or deformation. It is described in terms such as loose, soft, friable, firm, hard, sticky, plastic or cemented.

Delta—An alluvial deposit at the mouth of a river emptying into a lake or sea.

Drift—Material of any sort moved from one position to another. The term most commonly refers to glacial drift, or material deposited by glacial action. Glacial drift includes unstratified glacial deposits, or till, and stratified glacial outwash.

Exchange capacity—A measure of the absorptive capacity of a soil for cations, or the amount of cations that can be absorbed by a given amount of soil, expressed in milliequivalents per 100 grams of soil. A soil with a fairly high exchange capacity is preferred to one with a low capacity because it retains more plant nutrients and is less subject to leaching or exhaustion.

Erosion—The wearing away of a land surface by running water, wind or other agents.

Sheet—Removal of a nearly uniform layer of material from the land surface.

Rill—Erosion that produces small channels that can be obliterated by tillage.

Gully—Erosion that produces channels too large and deep to be obliterated by tillage. Ordinarily they carry water only during and immediately after rains or thaws.

Flood plain—The nearly flat surface subject to overflow along stream courses.

Friable—Easily crushed in the fingers, nonplastic.

Glacial till—An unstratified mixture of stones, sand, silt, and clay transported and deposited by glaciers.

Glaciofluvial material—Material produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. These deposits are stratified and may be in the form of outwash plains, deltas, kames, eskers, and kame terraces.

Gravel—Rock fragments from 2 mm. to 3 inches in diameter.

Horizon—A layer in the soil profile approximately parallel to the land surface and having more or less well defined characteristics that have been produced by soil-building processes.

The major organic horizons are defined as follows:

L—An organic layer characterized by an accumulation of organic matter in which the original structures are definable.

F—An organic layer characterized by an accumulation of partly decomposed organic matter in which the original structures are discernible with difficulty.

H—An organic layer characterized by an accumulation of decomposed organic matter in which the original structures are undefinable.

The major mineral horizons are defined as follows:

A—A mineral horizon or horizons formed at or near the surface in the zone of maximum removal of materials in solution and suspension and/or maximum in situ accumulation of organic matter. It includes (1) horizons in which organic matter has accumulated as a result of biological activity (Ah); (2) horizons that have been eluvivated of clay, iron, aluminum and/or organic matter (Ae); (3) horizons dominated by 1 and 2 above but transitional to the underlying B or C (AB or A and B); (4) horizons markedly disturbed by cultivation or pasturing (Ap).

B—A mineral horizon or horizons characterized by one or more of the following: (1) an illuvial enrichment (exclusive of dolomite or salts more soluble in water) of silicate clay, iron, aluminum, or organic matter (Bt, Bf, Bh, Bfh); (2) a concentration of weathering products believed to have been formed in situ (Bt); (3) removal of dolomite and salts more soluble in water (Bm); (4) an oxidation of sesquioxides that give a conspicuously darker, stronger, or redder color than overlying and/or underlying horizons in the same sequum (Bmf); (5) a prismatic or columnar structure characterized by the presence of exchangeable sodium (Bn).

C–A mineral horizon or horizons comparatively unaffected by the soil-forming processes operative in A and B, excepting (1) the process of gleying and (2) the accumulation of dolomite and salts more soluble in water.

If two contrasting layers are derived from different materials, the roman numeral II is prefixed to the name of the lower layer.

The mineral horizons described in this report are denoted by the following lower-case suffixes:

s–A horizon with salts, including gypsum, more soluble than carbonates.

e–A horizon characterized by removal of clay, iron, aluminum or humus. Usually lighter-colored than the layer below.

f–A horizon enriched with hydrated iron.

g–A horizon characterized by reduction and gray colors, often mottled.

h–A horizon enriched with organic matter. It must show at least one Munsell unit of value darker than the horizon immediately below.

j–A symbol showing that a characteristic is weakly expressed.

k–A horizon containing carbonate.

m–A horizon slightly altered by soil-forming processes to give a change in color and/or structure (mellowed).

n–A horizon with distinctive morphological and physical characteristics as show by black or dark colorations or coatings on the surfaces of the peds and characterized by prismatic or columnar structure and hard to very hard consistency when dry. It contains more than 12 percent exchangeable sodium or more than 50 percent exchangeable sodium plus magnesium.

p–A layer disturbed by man's activities, i.e., by cultivation and/or pasturing.

t–A horizon enriched with silicate clay.

Horizon boundary—Boundaries between horizons vary in distinctness and in relief. The distinctness depends partly upon the contrast between the horizons and partly upon the thickness of the boundary itself. The thickness of boundaries between soil horizons is described as follows:

Abrupt – – less than 1 inch

Clear – – 1 to 2 inches

Gradual – – 2½ to 5 inches

Diffuse – – more than 5 inches

Humus—The well-decomposed, practically stable part of the organic matter in a soil.

Impervious materials—Materials that resist the passage of drainage water and plant roots.

Kame—A more or less conical hill, usually of gravel or sand, deposited as a small delta or in a depression along an ice front or in a crack or hole within the ice.

Kettle—A closed depression created by the melting of buried or partly buried blocks of ice after sedimentation has ceased.

Lacustrine materials—Materials deposited by lake waters and exposed by lowering of the water level or by elevation of the land. They are usually varved.

Moraine—Unstratified materials deposited by a glacier.

Mottles—Irregular spots or streaks, usually yellow or orange, sometimes blue. Mottling indicates poor aeration and lack of good drainage.

Muck—A fairly well decomposed organic soil high in mineral content, dark in color and accumulated under conditions of imperfect drainage.

Nutrients (plant)—The elements taken in by the plant and essential to its growth. These include nitrogen, phosphorus, calcium, magnesium, potassium, sulphur, iron, manganese, copper, boron and perhaps others obtained from the soil; and carbon, hydrogen and oxygen, obtained largely from the air and water.

Organic soil—Any soil composed mainly of organic material.

Parent material—The unaltered or practically unaltered mineral material from which the solum develops.

Peat—Unconsolidated soil material consisting largely of undecomposed or partly decomposed organic matter accumulated under conditions of excessive moisture.

Ped—A soil aggregate.

Percolation—Downward movement or flow of water through the soil when it is saturated.

Permeability—The ease with which air, water, or plant roots penetrate into or through the soil to all parts of the profile. Classes of permeability are: slow, moderate and rapid.

pH—The intensity of acidity or alkalinity expressed as the logarithm of the reciprocal of the hydrogen-ion concentration. With this notation, pH 7 is neutral; lower values indicate acidity, higher values alkalinity.

The classes of acidity are as follows:

Slightly acid	pH 6.1 to 6.5
Medium	5.6 to 6.0
Strongly	5.1 to 5.5
Very strongly	4.5 to 5.0
Extremely	below 4.5

The classes of alkalinity are:

Mildly alkaline	pH 7.4 to 7.8
Moderately	7.9 to 8.4
Strongly	8.5 to 9.0
Very strongly	above 9.0

Podzolization—The process by which, under good or imperfect drainage, forested soils develop light-colored eluviated (Ae) horizons and illuvial (B) horizons with accumulations of sesquioxides, organic matter, clay, or any combination of these.

Profile—A vertical section of a soil through all its horizons and extending into the parent material.

Relief—The elevations or inequalities of the land surface when considered collectively. Minor surface inequalities are called microrelief.

Rooting zone—That portion of the soil in which the growth of roots is not inhibited. Root growth may be prevented by an impermeable horizon, a free water table or a coarse-textured, droughty horizon.

Solum—The part of the soil profile that is above the parent material and in which the soil-forming processes take place. It comprises A and B horizons.

Stones—Rock fragments over 10 inches in diameter. The term *boulder* is sometimes used for fragments over 2 feet in diameter.

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

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

Platy—having thin, plate-like aggregates with faces mostly horizontal.

Prismatic—having vertical prisms with well-defined faces and angular edges.

Blocky—having block-like aggregates with sharp, angular corners.

Subangular blocky—having block-like aggregates with rounded and flattened faces and rounded corners.

By convention one describes an aggregate in the order of grade, class and kind.

Two examples of this convention are:

strong medium blocky; moderate coarse granular.

Stratified—Composed of or arranged in strata or layers. The term is applied only to parent materials. Layers produced in soils by the processes of soil formation are called *soil horizons,* those in the parent material being called *strata.* Thin horizontal strata are often called *laminae,* strata up to about 12 inches thick are *bands,* and those over 12 inches thick are, in this report, called *beds.*

Terrace—A flat or undulating plain bordering a river or a lake. Many streams are bordered by a series of terraces at different levels, indicating flood plains at successive periods. Older terraces that become hilly through dissection by streams or wind action are still regarded as terraces.

Texture—The percentages of sand, silt and clay in a soil determine its texture. The ranges of each in the various textural classes are shown in Figure 11. The abbreviations used in the figure for the textural classes are: C, clay; SiC, silty clay; SC, sandy clay; SiCL, silty clay loam; CL, clay loam; SCL, sandy clay loam; Si, silt; SiL, silt loam; L, loam; SL, sandy loam; LS, loamy sand; S, sand.

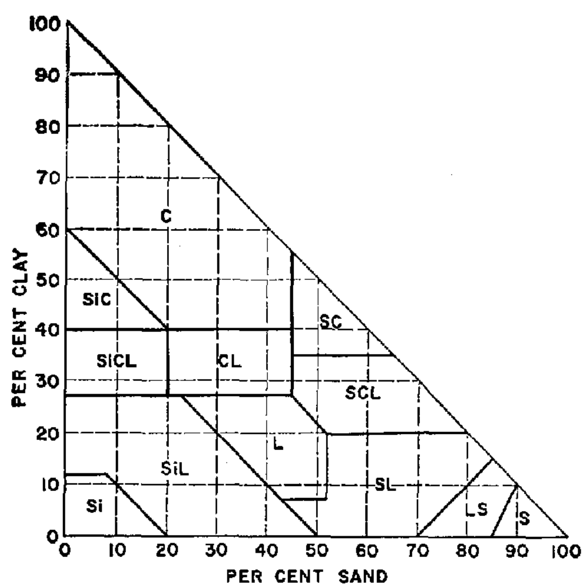

Figure 11.—Percentages of clay and sand in the main textural classes of soils; the remainder of each class is silt. See Toogood, J. A., Can. J. Soil Sci. 38: 54-55, 1958. The limits between classes are as in *Soil Survey Manual,* U.S.D.A. Handbook 18, 1951.

Till—*See* Glacial till.

Till plain—A level or undulating land surface covered by glacial till.

Topography—In this report the soil slope may be smooth or irregular and the slope classes are defined as follows:

Level or very gently sloping	0.0 — 2.0 percent
Gently and moderately sloping	2.0 — 9.0 percent
Steeply sloping	9.0 — 15 percent
Very steeply sloping to hilly	over 15 percent

Varves—A succession of thin layers of material, usually coarse grained at the base and fine grained at the top. They are generally found in glacial lake deposits.

Water table—The upper limit of ground water in the soil profile or underlying material.

Weathering—The physical and chemical disintegration and decomposition of rocks and minerals.

ANALYTICAL METHODS

The physical and chemical analyses were performed in the Soil Survey Laboratory at the Research Station, Vancouver, by the following methods:

Physical Analyses

1. Mechanical analyses-By the hydrometer method of Day. Report of the committee on physical analyses. Soil. Sci. Soc. Amer. Proc. 20: 167-169. 1956.

Chemical Analyses

Reaction (pH)–By the glass electrode on a soil–water (1:1) paste. Doughty, J. L. The advantages of a soil paste for routine pH determination. Sci. Agr. 22: 135-138. 1941.

Organic matter–By the modified wet combustion method of Wakely. Peech, M., and others, ed. Determination of organic matter, methods of soil analysis for soil fertility investigations. U.S. Dept. Agr. Circ. No. 757, pp. 5-7. 1947.

Total nitrogen–By the Kjeldahl method. Prince, A. L. Determination of total nitrogen, ammonia, nitrates and nitrites in soils. Soil Sci. 59: 47-48. 1945.

Total elemental analyses–By the standard methods as outlined by W. O. Robinson with the following modifications: Sesquioxides from the silica determination were analyzed for iron with a Jones reductor and for titanium with a spectrophotometer. Aluminum was reported as the difference between the sesquioxides and the sum of the iron and the titanium. Robinson, W. O. Fusion analysis. Soil Sci. 59: 7-11. 1945.

Total exchange capacity–By the method of Peech. Peech, M., and others, ed. Methods of soil analysis for soil fertility investigations. U.S. Dept. Agr. Circ. No. 757, pp. 9-10. 1947.

Exchangeable cations–By the method of Peech with the following modifications: Calcium, potassium and sodium were determined with a Perkins Elmer flame photometer. Magnesium plus calcium was determined by Versene titration with Erichrome Black T indicator. Exchangeable calcium was subtracted from this determination to give the exchangeable magnesium. Peech, M., and others, ed. Methods of soil analysis for soil fertility investigations. U. S. Dept. Agr. Circ. No. 757, pp. 12-24. 1947.

Conductivity–Determined on a saturated soil paste with a standard Wheatstone Bridge. United States Salinity Laboratory Staff, Riverside, California. Diagnosis and improvement of saline and alkali soils. U.S. Dept. Agr. Agriculture Handbook No. 60, p. 84. 1954.