Soil Survey of Edmonton Sheet (83-H)

by

W. E. BOWSER, A. A. KJEARSGAARD, T. W. PETERS
and R. E. WELLS

CANADA DEPARTMENT OF AGRICULTURE
In Co-operation With
THE RESEARCH COUNCIL OF ALBERTA
And
THE UNIVERSITY OF ALBERTA, EDMONTON

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1962

Alberta Soil Survey
Report No. 21

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The following personnel assisted in this survey: Messrs. J. N. Leat, J. A. McKeague, J. A. Carson, S. Pawluk, Wm. Owen, J. de Vries, and A. Quadri; Mrs. Alice Bembridge assisted in the arrangement and compilation of the report.

Some soil surveying was done on the Edmonton sheet in 1930 by Dr. J. D. Newton and Dr. A. Leahey. The authors wish, at this time, to recognize this initial work and to take this opportunity to pay tribute to the contributions of these two men in the field of Pedology.

Dr. Newton was a member of the Department of Soils, University of Alberta, from 1922 until he retired in 1959. Throughout this period he maintained an active participation in the work of the Alberta Soil Survey and did much to encourage the cooperative arrangement under which it operates.

Dr. Leahey is a member of the Research Branch, Canada Department of Agriculture, Ottawa. He has been primarily responsible for the development of the system of classification now used by all the Canadian Soil Surveys and has, also, done much to make the Canadian Soil Survey known and respected beyond our borders.

INTRODUCTION

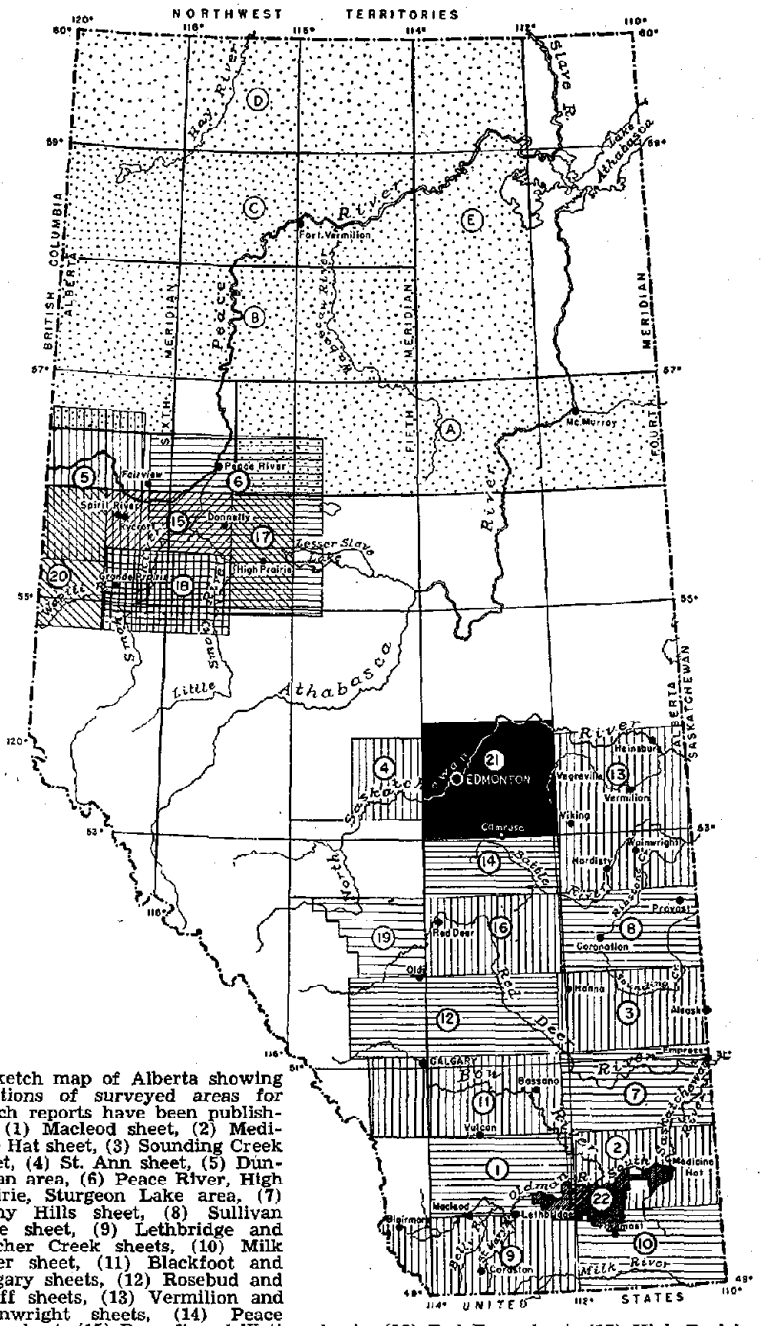
This report, covering the soils of the Edmonton sheet area, has been compiled from—(1) detailed reconnaissance and reconnaissance field surveys that traversed the area at distances not greater than one mile apart; (2) chemical and physical analyses of representative profiles; (3) a detailed study of the air photo coverage; and (4) summary data relating to the vegetative cover, the bedrock and surficial geology, meteorological reports and census data.

There are two parts to this report. The first is the map and the report proper. These give the areal location of, and the pedological data pertaining to, each soil type. The second is the Characteristics, Management and Use Table. In this table the physical, chemical, meteorological and geographical characteristics are translated into factors that effect the use of the land and are presented in terms that can be practically applied. It represents our present interpretation of these data. Although most of the recommendations will not change, new information or changed economic conditions may make some modifications necessary.

Six colored profile reproductions are included in this report. It is hoped that these, marked to show the various horizon separations, will be helpful in reading the report. Quantity lots of these colored prints can be purchased from the University Department of Extension. Descriptive material was put on the back of the prints so that they could be used when separated from this report. Also, a short non-technical bulletin has been prepared. This bulletin, together with the soil map, the colored profile plates, and the charcateristics and use table will be distributed within the map area.

The soils of the Edmonton sheet area range from non-arable to excellent arable: however, nearly 70 per cent of the area is fairly good arable land or better. The gross annual production from these soils is upwards of $75,000,000—and the maximum potential could be considerably higher. Few farms in the area have been cultivated for more than 75 years—most have been cultivated for less than 50 years. Analyses indicate that already there is some loss of fertility over much of the area, and in some places the loss has been substantial. In addition, during the last 15 years, thousands of acres of good soil—some among the richest in the world—have been permanently removed from agriculture by the sprawling tentacles of twentieth century development. On the world scene, the need to produce more food will become increasingly urgent with each succeeding decade. At home, maintaining a high level of agricultural production is vital to our economy. Our soil must be a continuing resource. Its conservation, therefore, is everybody's business—a business that should be given the highest priority.

PLATE I



Sketch map of Alberta showing locations of surveyed areas for which reports have been published: (1) Macleod sheet, (2) Medicine Hat sheet, (3) Sounding Creek sheet, (4) St. Ann sheet, (5) Dunvegan area, (6) Peace River, High Prairie, Sturgeon Lake area, (7) Rainy Hills sheet, (8) Sullivan Lake sheet, (9) Lethbridge and Pincher Creek sheets, (10) Milk River sheet, (11) Blackfoot and Calgary sheets, (12) Rosebud and Banff sheets, (13) Vermilion and Wainwright sheets, (14) Peace Hills sheet, (15) Rycroft and Watino sheets, (16) Red Deer sheet, (17) High Prairie and McLennan sheets, (18) Grande Prairie and Sturgeon Lake sheets, (19) Rocky Mountain House sheet, (20) Beaverlodge and Blueberry Mountain sheets, (A) Preliminary 58-1, (B) Preliminary 59-1, (C) Preliminary 60-1, (D) Preliminary 61-1, (E) Preliminary 62-1, (21) (In Black) Edmonton sheet.

NOTE: Reports for areas 1 to 9 inclusive are out of print, but may be obtained on loan from the University Extension Library, University of Alberta, Edmonton.

Soil Survey of the Edmonton Sheet (83-H)

DESCRIPTION OF THE AREA

The Edmonton map sheet 83-H is located in east central Alberta, and comprises an area approximately 80 miles east and west by 70 miles north and south. It consists of townships 47 to 57 inclusive from the west half of range 14 west of the 4th meridian west to the 5th meridian (see Plate 1). The town of Vegreville is on the eastern edge of the sheet; the town of Stony Plain on the western edge. The city of Edmonton is in the west central portion of the mapped sheet. More specifically, the mapped area lies between 53° and 54° north latitude and 112° and 114° west longitude.

The soil map for the area described above covers 149 townships, or parts thereof, amounting to approximately 3,600,000 acres.

HISTORICAL DEVELOPMENT

The North Saskatchewan River was the main thoroughfare for the early explorers and fur traders. In 1755 Anthony Hendry of the Hudson's Bay Company visited what is now Central Alberta and made his return journey to Hudson Bay via the North Saskatchewan River. The Nor'West Company built Fort Augustus in 1794 and the Hudson's Bay Company built Edmonton House in 1795—both at the confluence of the Sturgeon and North Saskatchewan Rivers (near present Fort Saskatchewan). Both moved to the present site of Edmonton within ten years.

The first "survey" of the area was made in 1858 and '59 by Captain Palliser and his party of scientists. They had been sent by the British Government to assess the potentialities of the Canadian West. Of the North Saskatchewan River area he wrote: "There extends here a rich and vast prairie interspersed with woods and forests." There were other resources. Coal was mined from the river banks to use at Fort Edmonton and by 1864 Tom Clover and two others were panning for gold in the gravel bars just below the Fort.

Wheat was grown at Fort Edmonton as early as 1846. However, the first agriculture to be practised on a farm scale was at the St. Albert Mission in the Sixties. By 1890 Fort Edmonton had reached the status of a town and there was considerable farming being carried on in the immediate vicinity, mainly in the Clover Bar district to the east—in all, about 10,000 acres were cultivated.

The C. and E. Railway from Calgary reached Edmonton in 1892. This marked the beginning of accelerated settlement. By 1894 there were over 1,000 French Canadians settled in the St. Albert-Morinville area. Beginning in 1896 and continuing for over a decade there was a large influx of immigrants from Central Europe to the area between Fort Saskatchewan and Vegreville. By 1900 there

were approximately 100,000 acres cultivated in what was known as the Edmonton District. The Canadian Northern Railway arrived in Edmonton, from the east, in 1905, and the Grand Trunk Pacific in 1909; the former via Vegreville and the latter via Wainwright and Tofield. The lure of free homestead land drew thousands of settlers to the areas opened up by these railway lines. By 1920 there were nearly one million acres cultivated in the Edmonton sheet area; by by 1950 this had increased to two and one-quarter million (see cultivation map centre page). Today railway lines and paved roads radiate out from Edmonton and good secondary roads service all the market towns. No place in the area is more than ten miles from rail facilities and few places are more than three or four miles from a gravelled road.

Today there are over 10,000 farm operators in the Edmonton sheet area. The average size of farm is 300 acres with an average of almost 70 per cent of the acreage improved. There is very little unoccupied land. There has been only a slight increase in average size of farm since 1920. However, this figure may be influenced by the material increase in small farm holdings in the area adjacent to Edmonton. Until 1925 oats occupied more acreage than any other crop. Between 1925 and 1950 wheat was the dominant crop. Since the latter date there has been a greater acreage of barley than any other crop. The increase in barley, however, has been mainly in the western half and wheat is still dominant in the eastern portion of the area. Overall, hays account for about seven or eight per cent of the cultivated acreage with over ten per cent in the western half and four to five per cent in the eastern half. About twenty-five per cent is in fallow each year.

There are about 150,000 head of cattle in the area, a large percentage of which are dairy cows. There are an equal number of swine, but approximately only 10,000 sheep.

In the first quarter of this century coal mining, particularly in the vicinity of Edmonton, was an important industry. In the Nineteen Twenties gas was discovered and in 1947 oil was discovered near Leduc. Since this latter date there has been an intensive oil exploration and drilling programme. Today hundreds of oil and gas wells dot the west half of the map area. This has sparked a large industrial development—particularly in the Edmonton area. As a result a significant acreage of the highly productive Chernozemic soil areas in the district have been engulfed.

DRAINAGE

The Edmonton sheet area is drained by the North Saskatchewan River system. The divide between the above and the Athabaska River drainage cuts through the extreme northwestern corner of the map area.

The North Saskatchewan River traverses the area from the southwest to the northeast. It flows in a U-shaped valley that averages 250 feet deep and a valley floor about one-half mile in

width. Approximately the lower half of the valley wall is cut through bedrock.

Whitemud Creek from the south and Sturgeon River from the north are the main tributaries in the western portion of the map area. Ross and Pointe-aux-Pins Creeks drain the moraine east of Edmonton. Beaverhills Creek is a high water outlet of Beaver Hills Lake and drains the relatively level Solonetzic area in the east central portion of the map sheet. Vermilion River drains the extreme eastern portion. It empties into the North Saskatchewan approximately 60 miles east of the map sheet. These tributary streams are mainly seasonal. They have cut deep channels for five to ten miles back from the river; the remainder of their course is near the general land elevation. One exception to this should be noted: Blackmud Creek flows into the North Saskatchewan immediately west of the city of Edmonton. It flows in an ice front drainage channel that, during the time of the ice retreat, drained the Edmonton area to the southeast.

There are numerous sloughs and shallow lakes in the area. Big Lake, near St. Albert, is in the Sturgeon River Valley and is actually part of the river. Manawan (Egg) Lake in the northwest portion, and some of the small lakes along the west side of the map area, are sufficiently permanent to support resort development. There are numerous lakes in the morainic area east of Edmonton: Cooking Lake in Range 21 and Tawayik Lake in Elk Island Park are popular resort lakes. Bittern Lake in the extreme south central portion is quite saline. Coal Lake, west of Bittern Lake, lies in the southern end of Blackmud Creek channel. During high water it will drain north to the north Saskatchewan River and south to the Battle River. Beaverhills Lake in the east central portion is quite shallow. It fluctuates considerably in size. Most of the above lakes have high water outlets to the rivers; the smaller sloughs and lakes are inland basins. Many of the sloughs in the east third of the area are saline and water usually lies in these for a brief period in the spring. Wild barley and coarse sedges are the main vegetative growth in these depressions.

RELIEF

The Edmonton map sheet lies on the third prairie Steppe. Topographically it can be divided into three main areas. The east third—that is, the area east of a line through Tofield and Lamont—is level to undulating and contains many shallow depressional areas. The centre third that lies south of the North Saskatchewan River is covered mainly by the Cooking Lake moraine. This area is undulating to hilly, primarily of the knob and kettle variety. The western third of the area is level to gently rolling. Most of this portion has been subjected to post glacial wind and water deposition and the slopes of the low hills are long and smooth. There is a small area of rolling to hilly land in townships 53-54 ranges 27 and 28. This is the beginning of a large moraine to the west.

There are no prominent elevations in the area. The highest point is in the moraine in township 54 range 27—an elevation of slightly over 2,600 feet. A small area northwest of Hay Lakes is also near the 2,600 foot elevation. The lowest elevation is in the North Saskatchewan River valley in the extreme northeast corner —approximately 1,900 feet. The railway elevations from west to east are as follows: Spruce Grove 2,326 feet, Edmonton 2,175 feet, Tofield 2,295 feet, Chipman 2,197 feet, and Vegreville 2,084 feet. Redwater in the north has an elevation of 2,075 feet and Kavanagh in the southwest an elevation of 2,500 feet.

Four topographical classes are shown on the soil map by means of hatching, namely: level and undulating, gently rolling, rolling, and hilly. The data in Table 1 gives the acreage and percentage distribution of these topographic classes.

TABLE 1.—Acreage and Percentage Distribution of the Topographical Classes in the Edmonton Sheet.

	Acreage	% of Area
Level and undulating	2,631,000	72.0
Gently rolling (5 to 9 per cent slopes)	423,000	11.6
Rolling (10 to 15 per cent slopes)	294,000	8.1
Hilly (over 15 per cent slopes)	14,000	0.4
Water	254,000	7.0
Rough broken land	34,000	.9
Total	3,650,000	100%

CLIMATE

The climate of the Edmonton sheet area is continental; characterized by relatively warm summers and cold winters. The mean summer temperature, May to September inclusive, is 56°F. July is the warmest month averaging 61.5°F. The mean winter temperature, November to March inclusive, is 16°F. April and October each average 40°F. January is the coldest month, averaging 6°F. Extreme winter lows rarely fall below —40°F. and extreme summer highs rarely go above 90°F. The average frost free period (above 32°F.) is about 100 days with an extreme variation from about 50 to 150 days. At Edmonton the average date of the last spring frost is in the last week of May and the average date of the first fall frost is in the first week of September. These dates vary locally, depending on elevation, air drainage, and tree protection. The growing or vegetative season, calculated on a mean daily temperature of 42°F., is about 175 days.

The mean annual precipitation is from 16 to 18 inches—increasing from east to west. At Edmonton the past 75 years has averaged 17.5 inches with extremes of 9 and 30 inches. However, in 75 per cent of the years the total precipitation was between 14 and 21 inches. June, July, and August are the months of highest rainfall, totalling an average of just over 9 inches. Analyses of data for a 30 year period show that the water deficit for the growing season at Edmonton has varied from 0.2 inches to 8.5 inches: this assumes a 4 inch available storage capacity. The average is just under 5 inches. Data from other stations on the map area indicate that there is a small increase in deficit going from northwest to south-

east. It is apparent, however, that the various soil types have different storage capacities and this causes greater variations in deficit than does the average climatic difference. This is more fully discussed by A. H. Laycock, University of Alberta, in a paper prepared for the Prairie Provinces Water Board.

Approximately 70 per cent of the precipitation falls as rain—the remainder as snow, usually when the ground is frozen. The average annual snowfall at Edmonton is just over 50 inches, varying from 10 to 90 inches. October and April each receive an average of 5 inches of snow in addition to some precipitation as rain. The November to March precipitation is almost exclusively as snow. Summer rains are generally of the low intensity variety. The probability of over one inch of rain falling in less than one hour, in Edmonton, is only one year out of five. The maximum precipitation in any one 24 hour period has not exceeded 5 inches.

Wind velocity averages just under 10 miles per hour with little variation throughout the year. The dominant wind direction is from the northwest. There is an average of about 2,175 hours of sunshine per year. This is 45 per cent of possible; during the growing season about 60 per cent of possible is received.

The area can be considered as being between dry and moist subhumid. There is no pronounced permanent water table. Soil-wise there is a zone of salt and of lime accumulation: these represent the average depth to which the rain penetrates.

VEGETATION

Although two-thirds of the surveyed area is now cultivated there is still sufficient virgin land remaining to permit a vegetative cover characterization on the basis of "presettlement" conditions.

Viewed broadly there is a gradual change in the type of native vegetative cover going from east to west—from open parkland to continuous forest. Moss* describes the parkland as a broad tension belt between the prairie association of the semi-arid southeast portion of the province and the poplar association of the sub-humid northwest. The parkland area is dominated by Chernozemic soils which suggests that it formed under a grass vegetation; this vegetative cover, according to Moss, is the rough fescue (Festuca scabrella) association. He suggests that the groves of aspen poplar that dot the area were established possibly in comparatively recent times. The periodic burning of the prairie could have been one of the main deterrents to the establishment of trees. There is, in this area, a fairly large acreage of Solonetzic soils and an additional acreage of soil that can be considered as intergrades between the Solonetzic and Chernozemic Orders. It is suggested that the salt originally in the solum of these soils would be a deterrent to the establishment of tree growth.

The poplar association which dominates the morainic area

*For a more complete description the reader is directed to the work of E. H. Moss, in particular the Botanical Review, Vol. XXI, November, 1955, pages 493 - 567.

around Cooking Lake and in the northwest portion of the surveyed area, is, according to Moss, divided into two consociations—the aspen consociation and the balsam consociation. The aspen (Populus tremuloides) favors the slightly dryer sites and the balsam (Populus balsamifera) the slightly more humid sites. Therefore it is mainly the aspen that has invaded the prairie and is the principal tree in the parkland. The balsam is more prevalent in the west. Moss states that the white spruce (Picea glauca) association is commonly found in habitat similar to those occupied by the balsam poplar consociation and therefore tends to invade the poplar area in these places. Grey Wooded soils dominate in the areas covered by the poplar association. Dark Grey Chernozemic and Dark Grey Wooded soils tend to occur where the parkland and continuous poplar meet.

Other vegetative associations occur in the area but of much more limited areal extent. The most important of these are the bogs (muskegs). These are characterized by Sphagnum moss with Labrador tea (Ledum greenlandieum) as the principal shrub.

In concluding this brief description of the native vegetative cover of the Edmonton sheet it must be pointed out that in referring to plant associations by single dominant species it is recognized that many other plants are present. There are literally hundreds of other species of plant, including shrubs, grasses, herbs, mosses and lichens.

THE SOIL'S PARENT MATERIAL

The extreme southwest corner of the Edmonton sheet is underlain by Tertiary bedrock—the **Paskapoo** formation (see plate 2). This formation, composed of sandstones and soft shales, is primarily of fresh water origin. It is relatively salt free and is fairly calcareous.

The remainder of the area is underlain by Upper Cretaceous bedrock. Going from west to east—which is also from youngest to oldest—the uppermost rock formations are: **Edmonton,** a brackish water formation composed of bentonitic sandstones, sandy shales, bentonitic clays and coal seams; **Bearpaw,** a marine deposition composed primarily of dark colored shales with some bentonite and salt; **Pale Beds,** a fresh and brackish water deposition composed of bentonitic sandstones, carbonaceous shales with coal seams, ironstone nodules and gypsum crystals; **Birch Lake,** a fresh and brackish water formation composed of crossbedded sandstones with shale and nodular sandstone lenses; and **Grizzly Bear,** a marine formation that is composed primarily of dark shales with ironstones. The last two formations just touch the northeast corner of the map sheet but extend for some distance eastward.

The Laurentide ice sheet covered the entire area. It moved in a general southerly direction and mixed material of local origin with materials transported over long distances. The till mantle left varies considerably in thickness. In the east third of the map area it is very thin; in places under five feet. A series of deep holes (up to

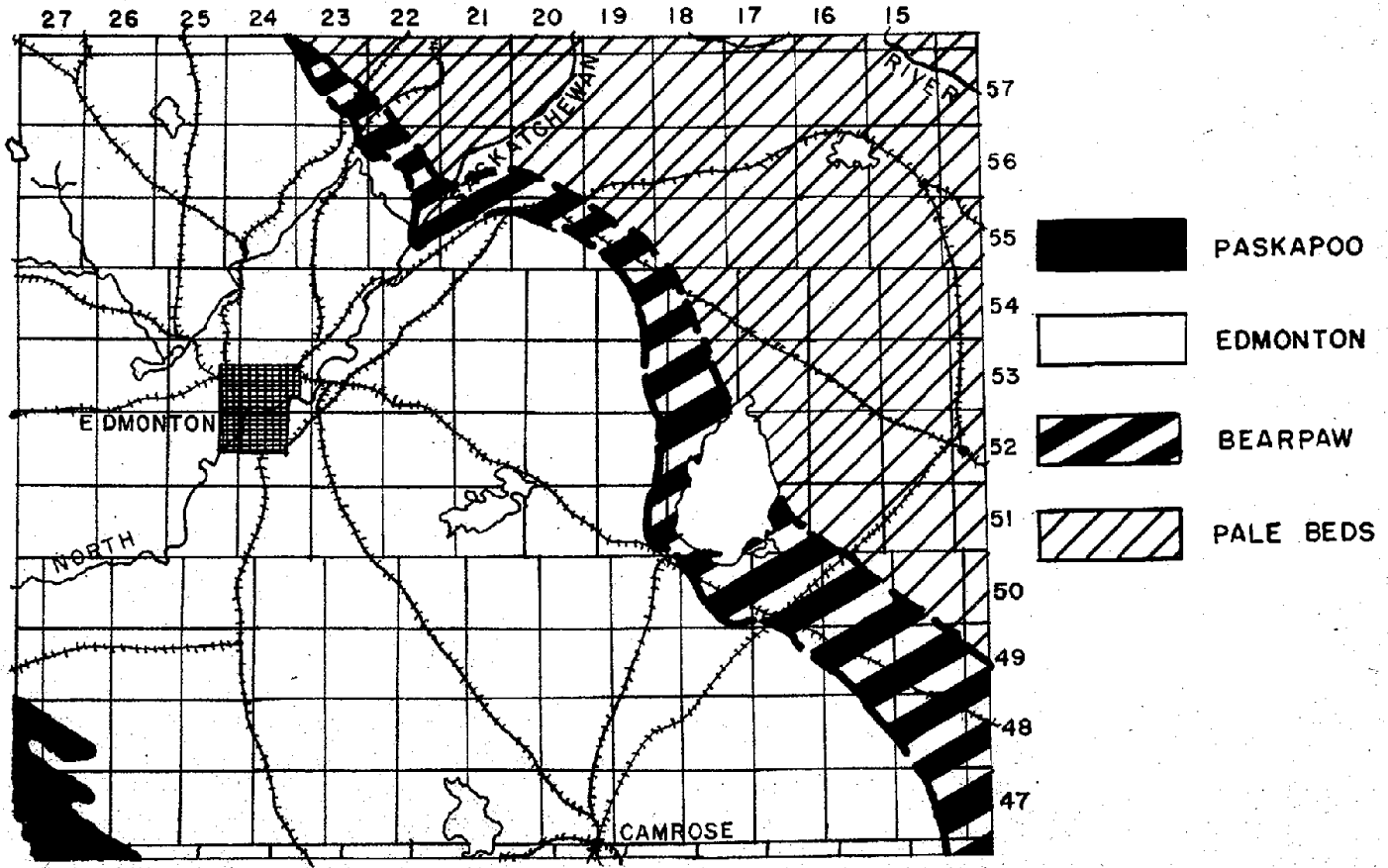


Plate II—Geology of Edmonton Sheet.

Information from Geological Survey of Canada Reports

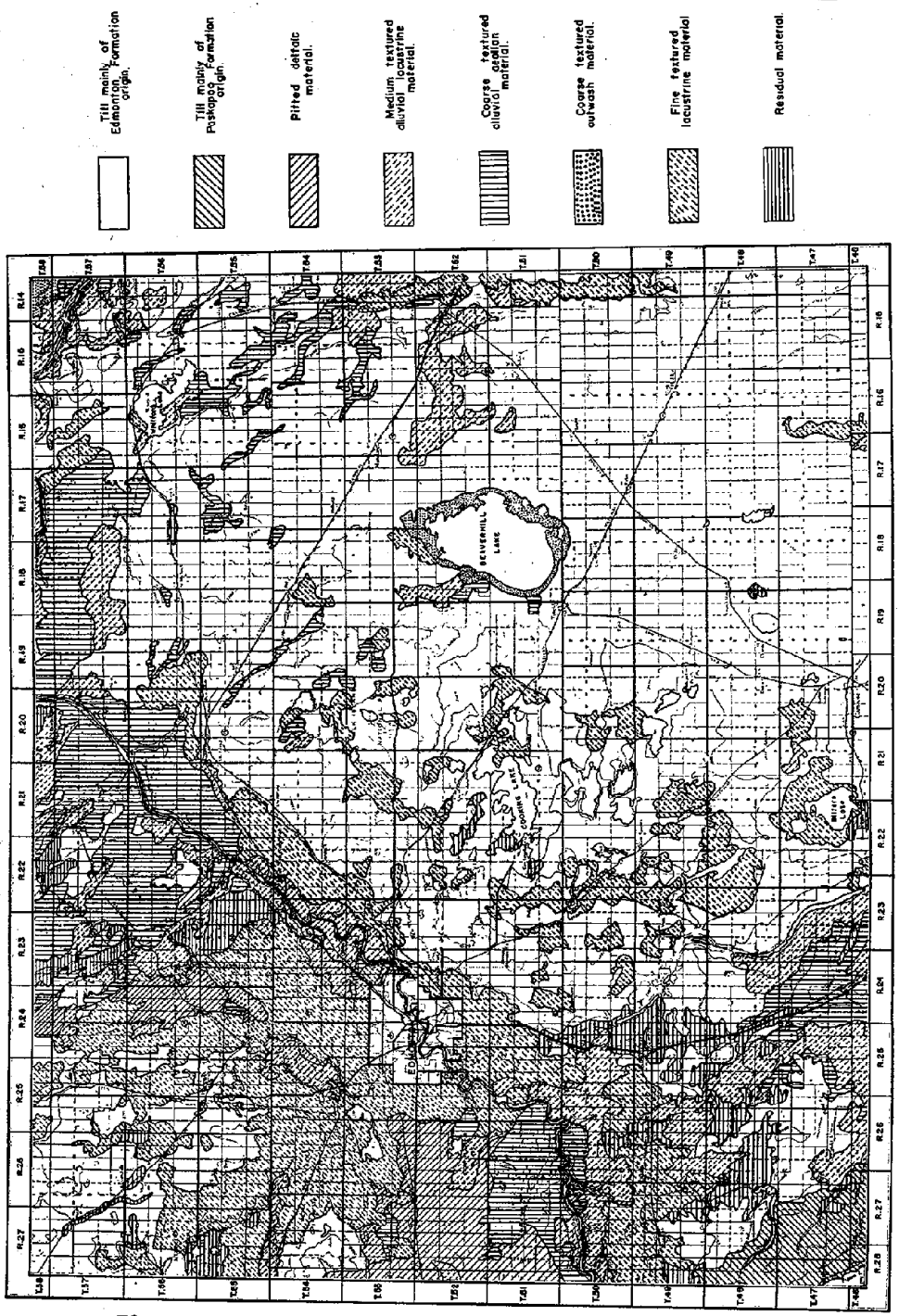


Plate III—The Parent Material of the Soils of the Edmonton Sheet

50 feet) were dug along a traverse that extended over this relatively level plain from the Cooking Lake moraine to Vegreville. It was found that where the underlying bedrock was less than ten feet from the surface Solonetzic soils dominated; where the bedrock was more than 20 feet from the surface Chernozemic soils dominated. In the western two-thirds of the map area the till mantle is considerably deeper; rarely being less than 25 feet. A local exception to the above is an area south of Edmonton that is primarily Kavanagh loam—a Solonetzic soil. In this soil area the bedrock is practically to the surface.

The composition of the till varies from place to place due primarily to the nature of the underlying bedrock. Generally, however, it is of a clay loam texture; it is slowly to very slowly permeable; and is usually quite sticky. It contains erratics that include: gravels of Rocky Mountain origin that presumably were carried down during preglacial and interglacial times by stream action; stones of Precambrian origin brought in by the ice sheet from the Precambrian Shield to the north and east; and fragments of coal, ironstone, shale, and sandstone, possibly of local origin. There are also some limestone and dolomite erratics that could have been ice transported from the Palaeozic formations that fringe the Precambrian Shield. All the till contains diffused calcium and magnesium carbonate—usually from one to three per cent.

Much of the area has been subjected to post glacial sorting. There are, therefore, local areas of lacustrine, alluvial, and aeolian deposits. Some of the material in these areas is of relatively local origin; material that has been washed or otherwise carried out of adjacent till. Some of these areas, however, are composed primarily of material carried down from the mountains by post glacial stream action. A few of these latter ones are quite calcareous, indictating their source as the dolomite formations of the Rocky Mountains. Plate 3 and Table 2 show the areal location and acreage of the surficial deposits in the Edmonton sheet area as determined by the Soil Survey.

See the glossary for a brief definition of the surface deposits as recognized by the Soil Survey in the Edmonton sheet area.

TABLE 2.—Acreages of the Various Surficial Deposits as Found in the Edmonton Sheet.

	Acreage	Percent of Area
Till	1,798,000	49.2
Lacustrine	548,000	15.0
Alluvial lacustrine	334,000	9.2
Alluvial aeolian	258,000	7.1
Aeolian	34,000	.9
Residual	145,000	4.0
Pitted Deltaic	75,000	2.1
Alluvium	16,000	.4
Water	254,000	7.0
Outwash	10,000	.3
Organic	109,000	3.0
Erosion	34,000	.9
Miscellaneous	35,000	.9
	3,650,000	100.0

THE SOILS OF THE EDMONTON SHEET AREA

The soils of this map area are classified according to the system of classification outlined by the National Soil Survey Committee of Canada in 1960. The soil horizon designations are as defined by this Survey Committee (See glossary at end of report for soil horizon nomenclature.) Table 3 classifies the soil series into their respective Sub-Groups, Groups, and Orders. Table 4 lists the series under type of parent material on which they were formed.

In general, the Solonetzic soils are concentrated in the east third of the map area and along a strip running north and south from Edmonton. The Podzolic soils occur in the moraine around Cooking Lake and along the western edge of the map area. The remainder is primarily Chernozemic soil. The Gleysolic soils occupy the poorly drained, usually depressional, areas throughout the mapped sheet.

In this section of the report all the soil series that occur in the mapped area are described. The descriptions are confined to profile characteristics plus other pertinent pedological data and are of virgin profiles. It is recognized that cultivation brings about certain changes in a soil—some of these changes are visible to the eye. For example, some of the clearly defined subdivisions in the A horizon of virgin Podzolic and Solonetzic profiles cannot be seen after the surface has been mixed by cultivation. In this area subsoil horizons have remained, visibly, unaltered. The physical and chemical changes brought about by cultivation vary from slight to very significant. The following are illustrative: (1) The Orthic black soils that have been under better than average management have changed little; however, those that have been under a grain—fallow rotation for a long period have possibly lost surface organic matter, and may have lost some of their original granular structure; (2) some coarse textured soils may have lost surface soil through wind erosion; some of the fine textured soils, as well as those with a slowly permeable subsoil close to the surface, may have lost some surface soil through water erosion; (3) some of the Grey Wooded soils that have been under better than average management may now have a higher organic matter content and a better structure in the A horizon than they originally had.

The profile colors are as determined by Munsell color values on air dry soils unless otherwise stated. The section that follows this contains tables reporting analytical data for the major soil types. Data relating to land use are summarized in table form: this table is in the map pocket. A glossary of terms is to be found at the end of this report.

TABLE 3.—Classification of Soils as Mapped on Edmonton Sheet 83-H

ORDER	GREAT GROUP	SUB-GROUP	SERIES
Chernozemic Soils Soils with Chernozemic Ah horizons and B or C horizons of high base saturation with a cationic ratio of calcium to other ions significantly greater than one. Well to imperfectly drained soils developed under xero- or mesophyllic grasses and forbs or under grassland forest transition.	**Black Soils** Soils with Ah or Aa horizons with dry color Munsell values darker than 3.5. Usually associated with a mesophyllic vegetation of grasses and forbs.	**Orthic Black** Profile type:— Ah, Bm or Btj, Ck, C	Didsbury Beaverhills Penhold Navarre Peace Hills Ferintosh Elnora Irma
		Gleyed Black Profile type:— Ah, Bgkj, Ckg, C	Penhold meadow Peace Hills meadow
		Eluviated Black (previously called Solodic) Profile type:— Ah, Ae or Ahe, Bt, Ck, C	Augus Ridge Malmo Ponoka
		Gleyed Eluviated Black Profile type:— Ah, Ae or Ahe, Btgj, Ckg, C	Angus Ridge meadow Ponoka meadow
	Dark Grey Soils The virgin A horizon will have a color on the surface of the peds comparable to the Dark Brown or Black soils (values darker than Munsell 4.5) but will crush or rub out to a greyer or browner color of higher value or chroma. The structure may be blocky to platy crushing to a granular condition. These soils should have an Ah horizon, or L-H and Ah horizons of sufficient thickness and darkness in color to give an Aa horizon with a range of Munsell values darker than 5.5. These soils support a vegetation characteristic of grassland and forest vegetation transition areas.	**Orthic Dark Grey** (previously called Degrading Black) Profile type:— Ah, Ahej or Ahe, Btj, Ck, C	Falun Winterburn Rimbey Mico

TABLE 3.—Classification of Soils as Mapped on Edmonton Sheet 83-H—Continued

ORDER	GREAT GROUP	SUB-GROUP	SERIES
Solonetzic Soils Soils with Solonetzic or disintegrating Solonetzic B horizons which have an exchangeable base status in which the ratio of calcium to magnesium and sodium is usually one or less, or which have 15 percent exchangeable sodium, with saline subsoils. Well to imperfectly drained soils developed under a vegatative cover of grasses, forbs or trees.	**Alkali Solonetz** The Bn horizon is strongly expressed, has an alkaline reaction and may contain free carbonates. The upper C is dominantly saline and usually calcareous.	**Black Alkali Solonetz** Profile type:— Ah, Bnt, Csk, C	Whitford
	Solonetz The Bnt horizon has a neutral or slightly acid reaction. The upper C is usually saline, calcareous and gypsiferous. A thin or weakly expressed Ae may be present.	**Black Solonetz** *Profile type:— Ah, (Ahej), Bnt, Csk, C	Duagh
	Solodized Solonetz The Ae is well developed and acidic in reaction and the Bnt horizon has a strongly expressed white capped columnar structure varying from acidic to alkaline in reaction. The upper C is usually saline, calcareous and gypsiferous.	**Black Solodized Solonetz** Profile type:— Ah, Ae, Bnt, Csk, C	Camrose Wetaskiwin Armena Killam Kopernick Gadsby **Kavanagh
		Dark Grey Solodized Solonetz Profile type:— (L-H), Ah, Ae or Ahe, Bnt, Csk, C	Thorsby
		Grey Wooded Solodized Solonetz Profile type:— L-H, (Ahj), Ae, AB, Bnt, Csk, C	Dnister Ministik Kawood
	Solod The Ae is well developed and acidic in reaction, a transition AB horizon expressing disintegration of the upper part of the Solonetzic B is characteristic. The Btn may be relatively thin. The upper C horizon is usually calcareous and saline.	**Black Solod** Profile type:— Ah, Ae, AB, Bnt, Csk, C	Daysland Botha Kapona

Podzolic Soils Well and imperfectly drained soils developed under forest having light colored eluviated horizons and illuviated horizons with accumulations of sesquioxides, organic matter or clay, or any combination of these.	**Grey Wooded Soils** Soils with organic horizons (L-H), with light colored eluvial horizons and with illuviated horizons in which clay is the main accumulation product. Developed on basic materials. The solum generally has a medium to high degree of base saturation.	**Orthic Grey Wooded** Profile type:— L-H, (Ah), Ae, (AB), Bt, Ck, C	Cooking Lake Breton Maywood Tolman Glory Modeste Culp
		Dark Grey Wooded Profile type:— L-H, Ah or Ahe, Ae, (AB), Bt, Ck, C	Uncas Macola Carvel Leith Holburn
	Podzol Soils Soils with organic horizons (L-H), with light colored eluvial horizons and with illuviated horizons in which organic matter and sesquioxides are the main accumulation products. The solum is generally moderately to strongly unsaturated.	**Minimal Podzol** Profile type:— L-H, Ae, Bfj, C	Edwand
Gleysolic Soils Soils with organic horizons (up to 12 inches thick) or with an Ah horizon or with both, or without these surface horizons but some organic material dispersed throughout the mineral soil. The subsoils usually show gleying and are dull colored but may have brighter colored prominent mottles. Soils associated with wetness. They have developed under various climatic and vegetative conditions and in the presence of a high or highly fluctuating water table.	**Meadow** Soils with a dark colored Ah horizon more than 2 inches thick which grades into a dull colored horizon or horizons that may or may not show gleying, May have organic horizons not exceeding 12 inches in thickness. These soils have developed under grasses, sedges, and swamp forests.	**Peaty Meadow** Profile type:— L-H, Ah, Bg, C	Codner Prestville
		Saline Meadow Profile type:— (L-H), Ahsj, Bgs, Cs	Navarre meadow
	Gleysol Soils with organic horizons less than 12 inches thick or without these horizons and with a strongly gleyed mineral horizon or horizons. May have a thin Ah horizon up to 2 inches thick. No noticeable eluvial or illuvial horizons. These soils have developed under swamp forest, heath or swamp vegetation.	**Peaty Gleysol** Profile type:— L-H, (Ah), Bg, Cg	Undifferentiated
	Eluviated Gleysol Soils with organic horizons (up to 12 inches thick) or with an Ah horizon or with both but with a mottled Aeg horizon and a mottled Bg horizon. These soils have developed under grasses, sedges and swamp forest.	**Low Humic Eluviated Gleysol** Profile type:— (L-H), (Ah), Aeg, Bg, C	Demay

*Where brackets appear around a horizon designation under "Profile type" it indicates that this horizon may not be present.
**Includes Black and Dark Grey Solodized Solonetz and Solonetz.

TABLE 3.—Classification of Soils as Mapped on Edmonton Sheet 83-H—Continued

ORDER	GREAT GROUP	SUB-GROUP	SERIES
Regosolic Soils Well and imperfectly drained soils which lack discernible horizons or in which horizon development is limited to non-Chernozemic organic mineral surface horizon (Ah) or to organic surface horizons (L-H) less than 12 inches thick.	**Regosol** Only one Great Group recognized to date.	**Orthic Regosols** Profile type:— (Ahj), C	Bittern Alluvium Dune sand Beach sand
Organic Soils Soils that contain at least 20 percent organic matter, are 12 inches or more in depth and have no horizon development in the mineral substratum other than gleying.		Undifferentiated sedge and moss peats.	

TABLE 4 - Classification of the Soils of the Edmonton Sheet (83-H) as Related to Parent Materials

Order	Great Group	Sub-group	Parent Material						
			Glacial Till	Alluvial Lacustrine	Lacustrine	Alluvial Aeolian	Outwash	Residual	Pitted Deltaic
Chernozemic	Black	Orthic Black	Didsbury Beaverhills Elnora	Penhold	Navarre	Peace Hills Irma	Ferintosh		
		Eluviated Black	Angus Ridge	Ponoka	Malmo				
		Gleyed Black		Penhold Meadow		Peace Hills Meadow			
		Eluviated Gleyed Black	Angus Ridge Meadow	Ponoka Meadow					
	Dark Grey	Orthic Dark Grey	Falun	Rimbey	Mico				Winterburn
Solonetzic	Alkali Solonetz	Black	Whitford						
	Solonetz	Black			Duagh				
	Solodized Solonetz	Black	Camrose Kopernick Killam	Armena	Wetaskiwin Gadsby			Kavanagh	
		Dark Grey	Thorsby						
		Grey Wooded	Dnister		Ministik			Kawood	
	Solod	Black	Daysland	Kapona	Botha				
Podzolic	Grey Wooded	Orthic Grey Wooded	Cooking Lake Breton	Tolman	Maywood	Culp		Modeste	Glory
		Dark Grey Wooded	Uncas	Holburn	Macola	Leith			Carvel
	Podzol	Minimal Podzol					Edwand		
Gleysolic	Meadow	Peaty Meadow		Codner	Prestville				
		Saline Meadow			Navarre				
	Eluviated Gleysol	Low Humic	Demay						
*Regosolic	Regosol	Orthic Regosol			Bittern Beach Sand				

*Dune Sand is of aeolian deposition and Alluvium is primarily of alluvial deposition.

CHERNOZEMIC SOILS

Nineteen soil series (under five Sub-Groups) of the Chernozemic Order have been recognized in the Edmonton sheet area. They occupy a total of 1,808,000 acres; this is one-half of the mapped area. They occur in the grassland and parkland regions and practically all are within the main Black Soil zone. The Chernozemic soils of this area are, in general, good to excellent arable lands. They were initially very fertile soils. However, since most of these soils have been cultivated for at least fifty years, some are now sufficiently low in readily available plant nutrients that significant responses are being obtained from the application of chemical fertilizers.

Following are profile descriptions of the soil series belonging to the Chernozemic Order.

Didsbury Loam (Db.L):

Didsbury loam is an Orthic (thick) Black soil developed on a fairly uniform till; the surface one or two feet is somewhat sorted and relatively free of stones. The dark colored Ah horizon is usually over 18 inches in depth. The A and B horizons often contain numerous abandoned animal burrows and these may be filled with calcareous material from the C horizon. It is an imperfectly to well drained soil.

The following is a generalized description of a Didsbury loam:

Ah	0-24″	Very dark brown (10YR 2/2) loam; loose granular to weakly prismatic in the lower part of the horizon. pH 7.6
Bm	24-36″	Light yellowish brown (2.5Y 6/4) loam to clay loam; massive to weak fine subangular blocky; a gradual change from Ah to Bm. pH 8.2
C	at 36″+	Light olive brown (2.5Y 5/4) loam to clay loam; massive to weak subangular blocky; low lime content. pH 8.2

Lime appears to fluctuate somewhat during the season; rising during the wet period and receding in the dry period.

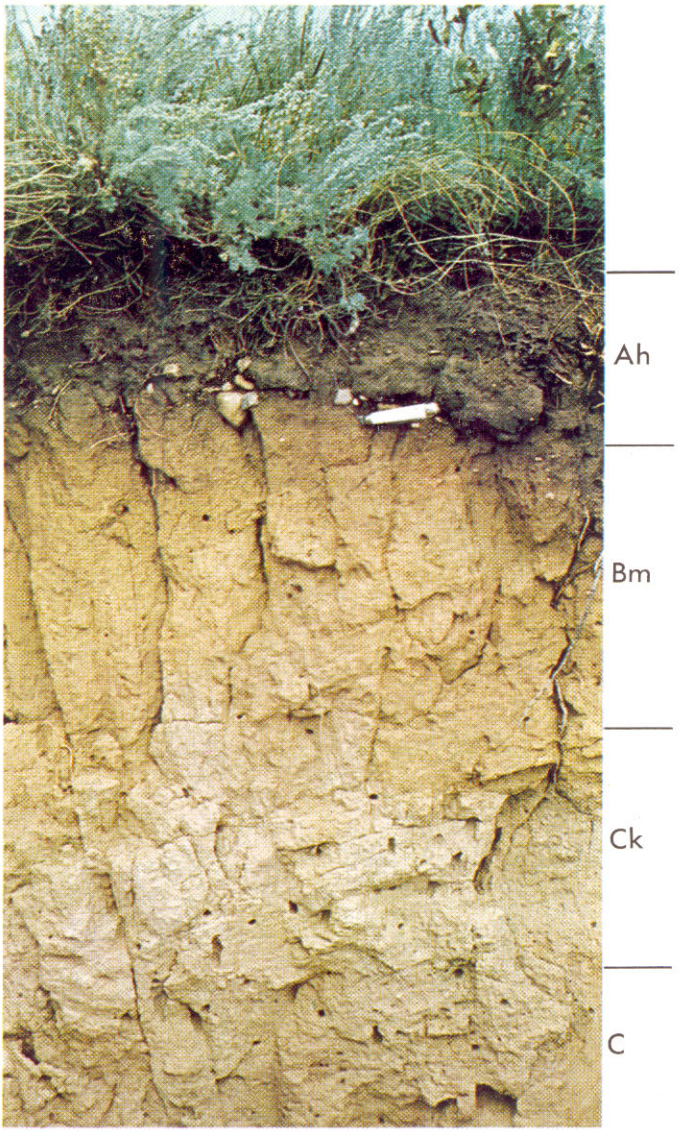
The topography is level to gently undulating. The macro-external drainage is not too well developed, hence low imperfectly drained spots are of common occurrence.

Beaverhills Loam (Bh.L):

Beaverhills loam is a well drained Orthic Black soil developed on till. There are stones throughout the profile.

The following is a generalized description of a Beaverhills loam:

Ah	0-10″	Very dark brown to black (10YR 2/2 - 2/1) loam; granular to weak prismatic structure. pH 5.9
Btj	10-20″	Dark brown (10YR 4/3) clay loam; prismatic to coarse blocky, friable; few stones; some slight organic staining on the surface of the peds. pH 6.0
Bm	20-30″	Dark yellowish brown (10YR 4/4) clay loam; weak prismatic to weak coarse blocky, friable. pH 7.3
Ck	at 30″	Dark grey brown (10YR 4/2) clay loam; massive; lime flecks; stones. pH 7.9
C	at 40″	Brown (10YR 5/3) clay loam; massive to weak coarse blocky; lime flecks, ironstones and coal flecks. pH 7.8



Orthic (thin) Black

ORTHIC (THIN) BLACK

This Orthic Black is an AIRDRIE loam. It is developed on medium textured (loam) material that contains stones. It occurs on gently undulating to rolling topography.

Distinguishing features:

1. A dark colored surface horizon four to seven inches thick (Ah).
2. A fairly firm, prismatic structured, brown subsoil (Bm).
3. A pronounced limey horizon at 18 to 24 inches from the surface (Ck).

Use:

This soil was initially well supplied with most of the plant food elements. After being farmed for some years, it will however, usually respond to nitrogen and phosphorus fertilizers. It is generally a good soil for wheat. Coarse grains and hays can also be grown.

Climate:

Mean annual precipitation—15 to 17 inches.

Mean annual temperature—36 to 38 degrees F.

Mean May to September temperature— 55 degrees F.

Native Cover:

Open parkland; medium tall grasses and scattered willow and poplar groves.

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The topography is undulating to hilly. The profile is somewhat thinner on the steeper slopes of the hilly areas. Trees have invaded the uncultivated areas; particularly the northern slopes. It is believed that this invasion has been in fairly recent times.

Elnora Loam (El.L):

Elnora loam is a well drained Orthic (thin) Black soil developed on till similar to that in the Beaverhills soils. However, it is found under slightly more arid conditions which is reflected in a thinner surface layer.

The following is a generalized description of an Elnora loam:

Ah	0- 6″	Very dark brown to black (10YR 2/2 - 2/1) loam; weak, coarse prismatic. pH 6.0
Btj	6-14″	Brown to dark brown (10YR 5/3 - 4/3) clay loam; medium prismatic; hard. pH 5.8
Bm	14-20″	Brown to yellowish brown (10YR 5/3 - 5/4) clay loam; weak prismatic to weak coarse blocky; friable. pH 6.4
Ck	at 20″	Dark grey brown (10YR 4/2) clay loam; massive; lime flecks and stones, pH 7.9
C	at 30″	Brown (10YR 5/3) clay loam; massive to weak coarse blocky; coal, ironstones and lime flecks. pH 8.2

The topography is undulating to hilly. Since this soil is under a slightly drier climate than Beaverhills there has been less tree invasion in the hilly areas.

Penhold Loam (Pe.L):

Penhold loam is a well drained Orthic Black soil. The parent material is of stone free alluvial lacustrine deposition and is relatively high in calcium carbonate and quite low in water soluble salt content. The Ck horizon may show some varving.

The following is a generalized description of a Penhold loam:

Ah	0-16″	Black (10YR 2/1) loam; weak coarse prismatic to granular. pH 6.3
Btj	16-26″	Yellowish brown (10YR 5/6) silt loam; medium subangular blocky. pH 7.0
Ck	at 26″+	Olive brown (2.5Y 4/4) silt loam to silty clay loam; massive to weak subangular blocky; soft. pH 8.1

The topography is level to undulating. This soil usually occurs (on a macro basis) in basin-like areas. Most of the areas are near major river courses. This suggests that the parent material may have originated from dolomitic deposits of the Rocky Mountains.

Penhold Meadow (Pe.M):

Penhold Meadow is a Gleyed Black soil often occurring in association with Penhold loam. It differs from Penhold loam in that the B horizon is usually greyer in color, often iron stained and the structure is somewhat less distinct. Free carbonate is often found in the B and lower portion of the Ah horizon, especially during wet periods of the year. It occurs on level to depressional topography.

Navarre Silt Loam and Silty Clay Loam (Nv.SiL, SiCL):

The Navarre soils are imperfectly to well drained Orthic Black to Saline Black soils developed on slightly saline, stone free, lacustrine parent material. Some lime carbonate and water soluble salt may occur as high as the upper B horizon but usually no excessive salt concentrations are found within three feet of the surface.

The following is a generalized description of a Navarre silty clay loam:

Ah	0-15″	Very dark grey to black (10YR 2/1) silty clay loam; granular; depth of Ah may be up to 20 inches. pH 6.3
AB	15-18″	Grey brown (10YR 5/2) silty clay; granular to fine subangular blocky. pH 6.6
Btj	18-30″	Light brownish grey (2.5Y 6/2) silty clay; fine subangular blocky. pH 7.2
Ck	30-50″	Dark greyish brown (2.5Y 4/2) silty clay loam; massive. pH 7.6
C	at 50″	Brown (10YR 5/3) silty clay loam; massive, may be varved. pH 7.6

Salt concentrations are often noted in the road cuts. These are possibly the result of seepage from the surrounding higher land.

The topography is level to very gently undulating.

Peace Hills Sandy Loams and Loamy Sands (Ph.FSL,SL,CSL,LFS,LS,CLS):

Peace Hills soils are well to excessively drained Orthic Black soils of coarse texture developed on alluvial aeolian parent material. They are stone free. The main Peace Hills areas occur along the immediate post-glacial drainage channels. The aeolian portions are the result of subsequent wind action.

The following is a generalized description of a Peace Hills sandy loam:

Ah1	0-15″	Very dark grey (10YR 3/1) sandy loam; weak coarse prismatic to loose granular. pH 7.2
Ah2	15-18″	Dark greyish brown (10YR 4/2) sandy loam; weak coarse prismatic to weak platy. pH 7.0
Btj	18-30″	Yellowish brown (10YR 5/4) sandy loam; irregular prismatic to medium subangular blocky. pH 6.3
C	30-48″	Brown (10YR 5/3) loamy sand; weak coarse prismatic to single grain; discontinuous Ck horizon. pH 7.7
IIC	at 48″	Grey brown to yellowish brown (10YR 5/2 - 5/4) clay loam; massive to subangular blocky till; depth to this horizon varies. pH 7.6

The loamy sand profile of this soil series has a thinner Ah than the sandy loam and also has a thin Bm or Btj horizon. The topography is gently undulating to hilly; often dune-like. Under native conditions these soils supported some tree growth and considerable shrub growth.

Peace Hills Meadow (Ph.M):

Peace Hills Meadow is a Gleyed Black soil developed on alluvial aeolian parent material. This soil is characterized by a thick black Ah horizon underlain with a dark grey, often iron stained, Bmg horizon. Free carbonate may be found in the lower Ah or Bm depending upon the wetness of the season. These soils are usually interspersed throughout the Orthic Black areas. They were orginally grass covered.

Irma Coarse Sandy Loam (I.CSL):

A well to excessively drained Orthic (thin) Black soil of coarse texture. This is the thin Black counterpart of Peace Hills. That is, it has developed under slightly more arid conditions than Peace Hills.

Ah1	0- 5″	Black (10YR 2/1) sandy loam (often coarse); coarse weak prismatic to loose. pH 6.1
Ah2	5-10″	Dark brown (10YR 4/3) sandy loam; coarse prismatic; soft. pH 6.1
Btj	10-30″	Brown to yellowish brown (10YR 5/3 - 5/4) loam to sandy loam; medium prismatic, slightly hard. pH 6.5
Ck	at 30″	Grey brown (10YR 5/2) sandy loam; loose, single grain; medium lime carbonate content. pH 8.2
C	at 36″	Brown (10YR 5/3) sandy loam to loamy sand; loose, single grain.

Till may be found at depths of 30 to 40″. The topography is gently undulating to rolling, often dune-like.

Ferintosh Loam, Sandy Loam, Coarse Sandy Loam (Fth.L, SL, CSL):

These are excessively drained Orthic Black soils of coarse texture developed on outwash material.

The following is a generalized description of a Ferintosh sandy loam:

Ah	0- 6″	Black (10YR 2/1) sandy loam; loose to weak granular.
Btj	6-12″	Dark brown (10YR 4/3) loam to clay loam; weak prismatic.
IIB	at 12″	Gravel.

The thickness of the Ah varies from 6 to 16 inches. The nearer the gravel to the surface the thinner the Ah. The Btj varies considerably, 2 to 12 inches. The depth to gravel varies from 8 to 24 inches. The lime horizon is usually in the gravel; the lime collecting on the underside of the pebbles.

The topography is level to gently undulating and is sometimes cut by erosion channels; usually these soils occur on level bench lands along drainage ways.

Angus Ridge Loam (Ar.L):

This is a well drained Eluviated Black soil of medium texture developed on till. Beaverhills and Camrose soils are often geo-

Figure 1.—Typical field pattern in the Black Soil Zone. This is an area of Angus Ridge loam. These soils are very fertile—good management will keep them that way.

graphically associated with Angus Ridge soils. Generally, the Beaverhills soil occupies the upper portion of the slope, Angus Ridge soils the middle of the slope, and Camrose loam the lower portion of the slope. In the large Solonetzic area in the eastern portion of the Edmonton sheet these soils are intimately associated whereas in the western portion areas of one soil type often occur.

Many of the Angus Ridge profiles, morphologically, have characteristics of a Solod. In some of these the parent material has a salt content intermediate between Beaverhills and Camrose.

The following is a generalized description of the Angus Ridge loam:

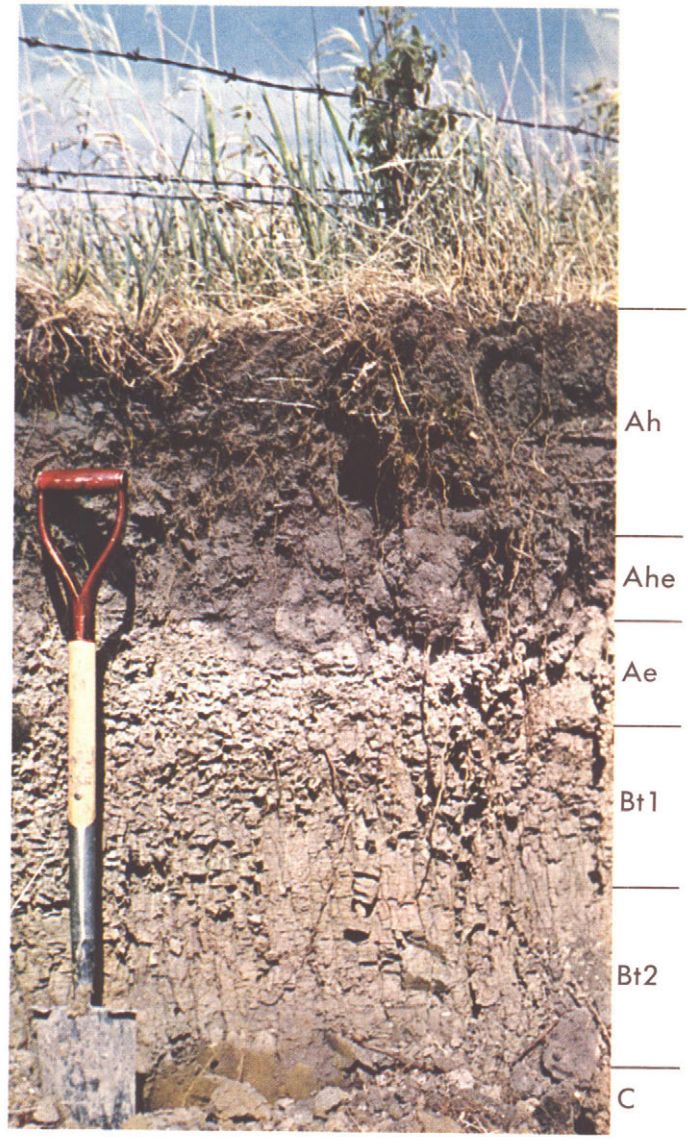
Ah	0-14″	Very dark grey (10YR 3/1) loam; weak, coarse prismatic. pH 6.6
Ae	14-15″	Light brownish grey (10YR 6/2) loam to fine sandy loam; weak platy. pH 5.6
AB	15-24″	Brown to yellowish brown (10YR 4/3 - 5/4) clay loam; medium subangular blocky; somewhat vesicular. pH 5.6
Bt	24-32″	Brown to dark yellowish brown (10YR 5/4 - 4/4) clay loam; medium prismatic to subangular blocky; some organic staining. pH 5.2
Ck	at 50″	Dark greyish brown (10YR 4/2) loam to clay loam; massive to large subangular blocky; slightly hard; low to medium lime. pH 7.8

Stones are more frequent in the lower part of the profile. The Bt may be stained quite heavily with organic material. The Ae is often replaced by an Ahe.

The topography is undulating to rolling.

Angus Ridge Meadow (Ar.M):

Angus Ridge Meadow is a Gleyed Eluviated Black soil. It differs from the well drained Angus Ridge soil by having a thick



Eluviated Black

ELUVIATED BLACK

This Eluviated Black is an ANGUS RIDGE loam. It is formed on medium textured (loam to clay loam) material that contains stones. It occurs on level to rolling topography and is often associated with Orthic Black soils (these do not have a light colored subsurface horizon) and Solodized Solonetz soils (these have a hard round topped columnar subsoil.)

Distinguishing features:

1. A dark colored surface six to ten inches thick (Ah).
2. A light colored subsurface two to five inches thick (Ae).
3. A fairly firm, blocky structured subsoil (Bt).

Use:

Angus Ridge loam was originally fairly well supplied with plant food elements. After being farmed for some years it will, however, usually respond to the application of nitrogen and phosphorus fertilizers. It is adaptable to a wide range of crops.

Native Cover:

Parkland; tall grass, shrubs and deciduous trees.

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black Ah horizon, an Ae that is somewhat mottled, and the AB and Bt may be somewhat grey in color. The structure is less distinct than in a well drained Angus Ridge. This soil is found on level to depressional topography.

Ponoka Light Loam, Loam, Silt Loam (Pk.LtL, L, SiL):

Ponoka loams are well drained weakly Eluviated Black soils developed on alluvial lacustrine, medium textured, materials.

A generalized discription of a Ponoka loam is as follows:

Ah	0-18"	Black to very dark brown (10YR 2/1 - 2/2) loam; weak prismatic to granular; may vary from 12 to over 20 inches in depth. pH 6.5
Ae or Ahe	18-20"	Greyish brown to brown (10YR 5/2 - 5/3) loam to silt loam; weak platy. pH 6.3
Bt	20-28"	Yellowish brown (10YR 5/4) loam to clay loam; weak columnar to weak subangular blocky; friable; some slight organic staining on the surface of the peds. pH 6.5
Bm	28-40"	Brown to yellowish brown (10YR 5/3 - 5/4) loam to clay loam; weak prismatic to weak subangular blocky; friable. pH 6.8
Ck	at 40"+	Dark yellowish brown (10YR 4/4) sandy loam to clay loam; massive, friable; lenses of coarse and medium textured material. pH 7.6

Till is often encountered at depths of 30 to 36" below the surface. In these cases the Bm is usually quite thin and the lime horizon becomes II Ck. A coarse textured layer often separates the two types of deposition.

The topography is level to undulating. This soil is often found on the edge of basin-like areas; that is, on the edge of lacustrine basins. There is often a gradual change in texture across an area.

Ponoka Meadow (Pk.M):

Ponoka Meadow is a Gleyed weakly Eluviated Black soil. It has a thick black Ah horizon, an Ae horizon that is mottled, and a Bt horizon somewhat grey in color and with less distinct structure than exhibited by its well drained counterpart.

The topography is level to depressional.

Malmo Silt Loam, Silty Clay Loam (Mo.SiL, SiCL):

The Malmo series is a fairly well to well drained Eluviated Black soil developed on slightly saline lacustrine material.

A generalized description of a Malmo silty clay loam follows:

Ah	0-12"	Very dark brown to black (10YR 2/2 - 2/1) silty clay loam; granular to weak prismatic. pH 6.3
Ae	12-14"	Dark greyish brown to greyish brown (10YR 4/2 - 5/2) silty clay loam; medium platy to coarse weak blocky; a somewhat thicker Ahe may be present instead of an Ae. pH 5.5

Bt	14-36"	Dark brown to brown (10YR 4/3) clay; weak columnar to subangular blocky; slight staining near the top of this horizon. The lower part of this horizon can often be separated as Bm. pH 5.4
Ck	at 40"	Dark greyish brown (2.5Y 4/2) clay; massive; lime is usually low. pH 7.3
C	at 48"+	Dark greyish brown (2.5Y 4/2) clay; massive; may be varved; may contain some salt. pH 7.6

The underlying till is sometimes found within 36 inches of the surface although it more often is at depths of over five feet and a sand layer may separate the lacustrine clay from the till.

The topography is level to gently undulating. These soils are usually found in slightly basin-like areas, actually post glacial laking basins. Duagh and Wetaskiwin soils are often geographically associated with Malmo: the Malmo occupies the better drained positions. The subsoil contains varying amounts of salt and the exchangeable sodium averages 10 per cent.

Falun Loam (Fn.L):

Falun loam is a well drained Orthic Dark Grey soil developed on till. Under native conditions these soils supported a fairly heavy tree growth.

A generalized description of a Falun loam follows:

L-H	1- 0"	Loose leaf litter. pH 6.4
Ah	0- 4"	Black (10YR 2/1) loam; granular. pH 6.0
Ahe	4-10"	Dark greyish brown (10YR 4/2) loam; granular to weak platy. pH 6.3
AB	10-15"	Dark yellowish brown (10YR 4/4) clay loam; medium subangular blocky. pH 6.2
Bt	15-36"	Dark greyish brown (10YR 4/2) clay loam; prismatic to medium subangular blocky; the lower portion of this horizon is often a Bm. pH 6.5
Ck	at 48"	Dark brown (10YR 3/3) clay loam; massive to subangular blocky; lime flecks. pH 7.6
C	at 60".	Very dark grey brown (10YR 3/2) clay loam; massive to subangular blocky. pH 7.6

Stones are usually found scattered throughout the profile. The depth of the Ah and the Ahe varies considerably. Dark Grey Wooded soils are often associated with Falun: they occupy the hilltops and northern slopes. Generally, the Falun soil forms a transition from the Chernozemic areas to the Podzolic areas. The topography is undulating to hilly.

Rimbey Loam (Rb.L):

Rimbey loam is a well drained Orthic Dark Grey soil developed on alluvial lactustrine material. It is usually found close to the parkland-woodland boundary.

The following is a generalized description of a Rimbey loam:

Ah	0-10″	Dark greyish brown to dark grey (10YR 4/2 - 4/1) loam; loose to weak prismatic. pH 6.0
Ahe	10-11″	Light brownish grey (10YR 6/2) loam; granular to weak coarse platy. pH 6.0
Bt	11-18″	Brown to dark yellowish brown (10YR 5/3 - 4/4) silt loam; blocky. pH 5.8
Bm	18-28″	Yellowish brown to dark yellowish brown (10YR 5/4 - 4/4) silt loam; weak blocky to massive. pH 6.3
IIC	at 30-40″	Very dark greyish brown (10YR 3/2) loam to clay loam; till. pH 7.6

The Ah horizon may have grey colored blotches or may be quite uniformly dark grey in color. There is often a stony or sandy contact between the overlying, stone free, alluvial lacustrine material and the till. The lime horizon is usually in the till.

The topography is gently sloping to undulating.

Mico Silt Loam, Silty Clay Loam (Mc.SiL, SiCL):

The Mico series is a well drained Orthic Dark Grey soil developed on lacustrine material. In general, the Mico soils occur near the edges of the lacustrine basin; Malmo may occur towards the centre.

A generalized description of a Mico silty clay loam follows:

L-H	1- 0″	Loose leaf litter.
Ah	0- 3″	Black (10YR 2/1) silt loam to silty clay loam; loose granular.
Ahe	3- 6″	Very dark grey (10YR 4/1) silty clay loam; medium subangular blocky to coarse granular.
AB	6-7.5″	Greyish brown (10YR 5/2) clay loam to clay; subangular blocky; vesicular.
Bt	7.5-16″	Dark brown (10YR 4/3) clay; subangular blocky.
Bm	16-30″	Dark greyish brown (10YR 4/2) clay; massive to subangular blocky.
C	at 40″	Dark greyish brown (10YR 4/2) clay; massive; usually contains some lime.

The underlying till is often encountered between 40 and 50 inches from the surface. The clay immediately above the till is usually varved.

The topography is gently undulating to gently rolling; slopes are long and smooth.

Winterburn Loam, Light Loam, Fine Sandy Loam, Sandy Loam (Wb.L, LtL, FSL, SL):

These are well drained Orthic Dark Grey soils that have developed on medium to moderately coarse textured pitted deltaic material. In the native state the areas of Winterburn soil were covered with a mixture of poplar groves and shrub patches.

A generalized description of a Winterburn loam follows:

Ahej	0-18"	Very dark greyish brown (10YR 3/2) loam; weak coarse prismatic to fine granular. pH 6.2
Ahe	18-32"	Dark greyish brown (10YR 4/2) loam to sandy loam; medium granular. pH 6.1
Bt	32-40"	Dark yellowish brown (10YR 4/4) silt loam; prismatic to weak subangular blocky. pH 5.8
Bm	40-70"	Yellowish brown (10YR 5/4) silt loam; massive to weak subangular blocky. pH 6.1
C	70-80"	Brown (10YR 5/3) silt loam; layered. pH 6.2

No lime accumulation is found in this soil. The Ahe horizon often has a blotchy appearance due to uneven degradation. There is a distinct textural banding in the C horizon; this is indistinct in the upper horizons.

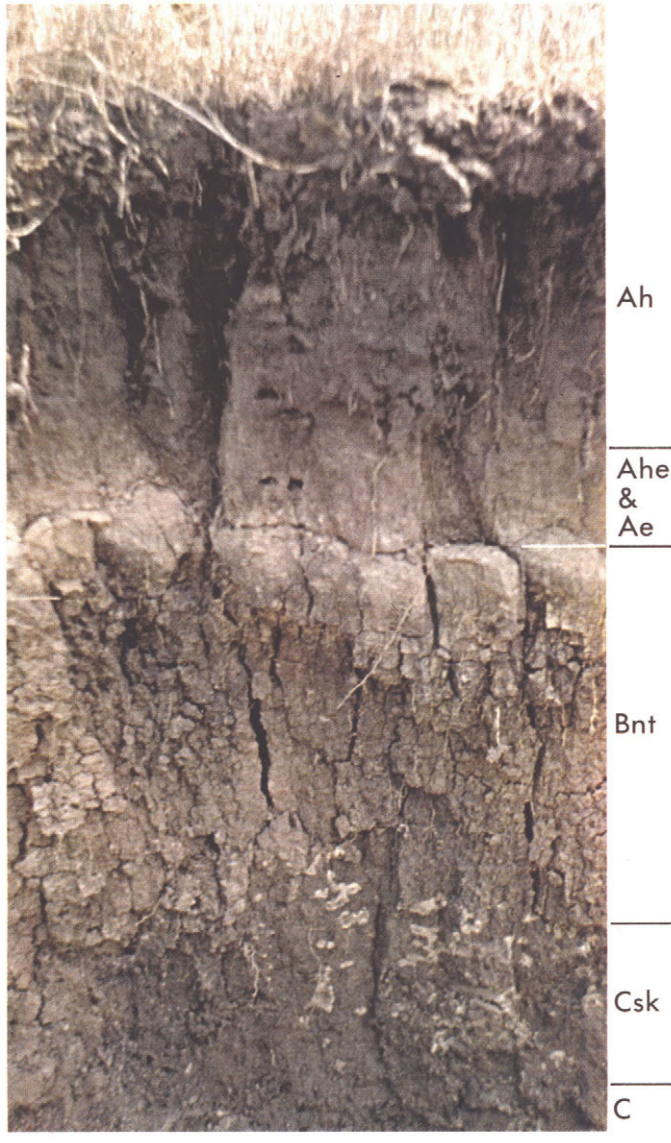
The topography is gently undulating to rolling; slopes are usually long and smooth.

TABLE 5.—Acreages of the Various Soil Series Mapped Under the Chernozemic Order.

Orthic Black Soils			
Didsbury series	3,000		
Beaverhills series	11,000		
Elnora series	8,000		
Penhold series	15,000		
Navarre series	40,000		
Peace Hills series	200,000		
Irma series	1,000		
Ferintosh series	7,000		
		285,000	
Gleyed Orthic Black Soils			
Penhold Meadow	4,000		
Peace Hills Meadow	8,000		
		12,000	
Eluviated Black Soils			
Angus Ridge series	710,000		
Ponoka series	296,000		
Malmo series	235,000		
		1,241,000	
Gleyed Eluviated Black Soils			
Angus Ridge Meadow	7,000		
Ponoka Meadow	3,000		
		10,000	
Orthic Dark Grey Soils			
Falun series	124,000		
Rimbey series	6,000		
Mico series	62,000		
Winterburn series	68,000		
		260,000	
Total acreage of Chernozemic Soils			1,808,000

SOLONETZIC SOILS

Sixteen soil series under six Sub-Groups of the Solonetzic Order have been recognized in the Edmonton sheet area. They occupy a total of 905,000 acres; this is one-quarter of the total. These soils occur as small patches throughout the Chernozemic soil areas and also as continuous areas of large size. The Solonetzic soils of this area are from poor to good arable lands. The Alkali Solonetz



Black Solodized Solonetz

BLACK SOLODIZED SOLONETZ

This Black Solodized Solonetz is a WETASKIWIN loam. It is formed on stone free fine textured (silty clay loam to silty clay) material. It occurs on level to gently undulating topography.

Distinguishing features:

1. A dark grey to grey black surface five to eight inches thick (Ah).
2. A grey, platy, subsurface horizon one to three inches thick (Ae).
3. A sharp break to a hard, round topped, columnar structured subsoil (Bnt).
4. At lower depths salt is usually visible.

Use:

This soil is fairly well supplied with the plant food elements although response is often obtained from nitrogen fertilizer. The hard subsoil takes water very slowly. Water erosion may be a problem on sloping land and level to depressional areas often flood. Also, crops tend to suffer from drought unless rains are fairly frequent. Hays and cereal crops are recommended.

Native cover:

Open parkland; tall grass, shrubs and small trees.

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and Solonetz soils are poor to fair; the Solodized Solonetz fairly good to good; and the Solod soils generally good. All the soils of this Order have a solonetzic B horizon that has a very low hydraulic conductivity: all contain salt in the C horizon. It is suspected that the chemistry of these soils is such that varying degrees of nutritional imbalances occur. In general, they do not produce as well as the geographically related Chernozemic soils but their relative productive capacity appears to vary from season to season.

Following are profile descriptions of the series of the Solonetzic Order:

Whitford Loam (Wf.L):

Whitford loam is a Black Alkali Solonetz developed on till: usually the till is a shallow covering over bedrock. Stones occur throughout the profile and salt incrustations collect on the road cut exposures. It is a fairly well to imperfectly drained soil.

The following is a generalized description of a Whitford loam:

Ah	0- 2″	Very dark grey brown (10YR 3/2) loam; loose; granular. pH 6.1
Bnt	2- 6″	Very dark grey brown (10YR 3/2) silty clay loam; strong very hard columnar with dark organic stainings. pH 7.3
Csk	6-30″	Light brownish grey to greyish brown (2.5Y 6/2 - 5/2) silty clay loam; massive. pH 7.9
C	at 30″+	Dark greyish brown (10YR 4/2); massive to pseudo blocky; till of loam to clay loam texture. pH 8.3

The topography is level to slightly depressional. Trees did not invade the grass on these soil areas.

Duagh Silt Loam, Silty Clay Loam, Silty Clay (Du.SiL, SiCL, SiC):

The Duagh soils are Black Solonetz developed on stone free lacustrine parent material. They are moderately well to imperfectly drained. A very thin Ae horizon may occur. These soils are usually intermixed with Wetaskiwin soils—the latter being in the slightly better drained position. Spots of saline meadow may occur throughout the Duagh areas.

Ah	0- 5″	Black to very dark grey (10YR 2/1 - 3/1) silty clay; loose granular. pH 5.3
Bntl	5-11 ″	Very dark greyish brown (10YR 3/2) clay; very hard columnar to coarse blocky; stained columns may have tapered tops. pH 5.8
Bnt2	11-19″	Brown to dark greyish brown (10YR 5/3 - 4/2) clay; blocky; less staining and definition of structure than in Bntl. pH 7.7
Csk	at 20″	Dark greyish brown (2.5Y 4/2) clay; massive to small blocky. pH 8.0
C	at 48″	Dark greyish brown (2.5Y 4/2) silty clay to clay; massive. pH 7.7

The topography is level to gently sloping: usually in basin-like areas. The native vegetative cover is mainly varieties of coarse grass.

Camrose Loam (Cam.L):

Camrose loam is a Black Solodized Solonetz developed on till. In this area the till is dominantly of Edmonton formation origin—it does contain some Bearpaw shale. Stones occur throughout the profile. It is a fairly well to well drained soil. In the native state the areas were mainly grasslands although poplar trees had invaded some of the northern slopes.

A generalized description of a Camrose loam follows:

Ah	0-10″	Very dark brown (10YR 2/2) loam; weak coarse prismatic to granular; the lower part of this horizon may be an Ahe. pH 6.0
Ae	10-12″	Grey brown (10YR 5/2) loam; platy. pH 6.6
Bnt1	12-20″	Dark brown (10YR 4/3) clay loam; strong round topped columnar that is very hard and stained. pH 7.3
Bnt2	20-26″	Dark yellowish brown (10YR 4/4) clay loam; hard columnar to blocky; stained. pH 7.3
Csk	26-50″	Dark greyish brown (2.5Y 4/2 - 10YR 4/2) loam to clay loam; massive; slightly hard; the depth to the Csk depends somewhat on the hydraulic conductivity of the B horizon. pH 7.8
C	at 50″	Dark greyish brown (10YR 4/2) loam; massive; slightly hard till. pH 7.7

The topography is undulating to gently rolling. Rarely do pure areas of Camrose exist. Sloughs occur throughout the area and Angus Ridge forms a varying percentage of the upland. The latter are usually on the topographic highs.

Killam Loam (Ki.L):

Killam loam is a thin Black Solodized Solonetz developed on till. The parent material of this soil is similar to that of Camrose loam. It has formed, however, in slightly more arid conditions. The horizons, particularly the Ah, are thinner than in the Camrose.

A generalized description of a Killam loam follows:

Ah	0- 6″	Black grading to dark brown (10YR 2/1 - 4/3) loam; weak prismatic to granular. pH 5.5
Ae	6-7.5″	Greyish brown (10YR 5/2) sandy loam; platy. pH 6.5
Bnt	7.5-15″	Very dark brown (10YR 2/2) clay loam; very hard columnar to blocky; stained. pH 7.7
Bntj	15-20″	Dark brown to brown (10YR 4/3 - 5/3) sandy clay loam; prismatic to subangular blocky. pH 7.6
Csk	at 20″	Dark greyish brown (10YR 4/2) loam to sandy clay loam; massive to weak subangular blocky. pH 8.1
C	at 30″+	Dark greyish brown (10YR 4/2) loam; massive; slightly hard till. pH 8.1

The topography is undulating to gently rolling.

Kopernick Clay Loam (Kn.CL):

Kopernick clay loam is a thin Black Solodized Solonetz developed on very compact till. It is a moderately well drained soil.

A generalized description of a Kopernick clay loam follows:

Ah	0- 3″	Black grading to dark brown (10YR 2/1 - 4/3) clay loam; weak prismatic to granular. pH 5.5
Ae	3- 4″	Greyish brown (10YR 5/2) loam; platy. pH 6.5
Bnt	4- 8″	Very dark brown (10YR 2/2) clay loam; columnar to coarse blocky; very hard and dense. pH 6.7
Bn	8-13″	Very dark brown (10YR 2/2) clay loam; strong prismatic to coarse blocky; very hard. pH 8.3
Csk	13-21″	Dark greyish brown (10YR 4/2) clay loam; massive. pH 8.8
C	at 21″	Dark greyish brown (10YR 4/2); massive till of clay loam texture. pH 8.5

The topography is undulating and contains many depressional spots.

Wetaskiwin Silt Loam, Silty Clay Loam, Silty Clay (Wkn.SiL, SiCL, SiC):

The Wetaskiwin soils are Black Solodized Solonetz developed on stone free lacustrine parent material. They belong to the same catena as the Duagh and Malmo soils and usually occur, topographically, between these two.

The following is a generalized description of a Wetaskiwin silty clay:

Ah	0- 6″	Very dark brown to black (10YR 2/2 - 2/1) silty clay; granular to weak prismatic. pH 5.7
Ac	6- 8″	Grey to grey brown (10YR 5/1 - 5/2) silty clay loam; platy. pH 5.6
Bnt	8-16″	Dark greyish brown (10YR 4/2) clay; hard columnar to fine blocky; stained. pH 6.5
Bn$\bar{t}j$	16-24″	Brown to dark greyish brown (10YR 5/3 - 4/2) clay; massive to coarse blocky. pH 7.4
Csk	at 24″	Dark greyish brown (2.5Y 4/2) silty clay; massive. pH 8.1
C	at 46″	Dark greyish brown (2.5Y 4/2) silty clay; massive. pH 7.9

The topography is level to gently undulating; on a macro scale usually a basin-like area.

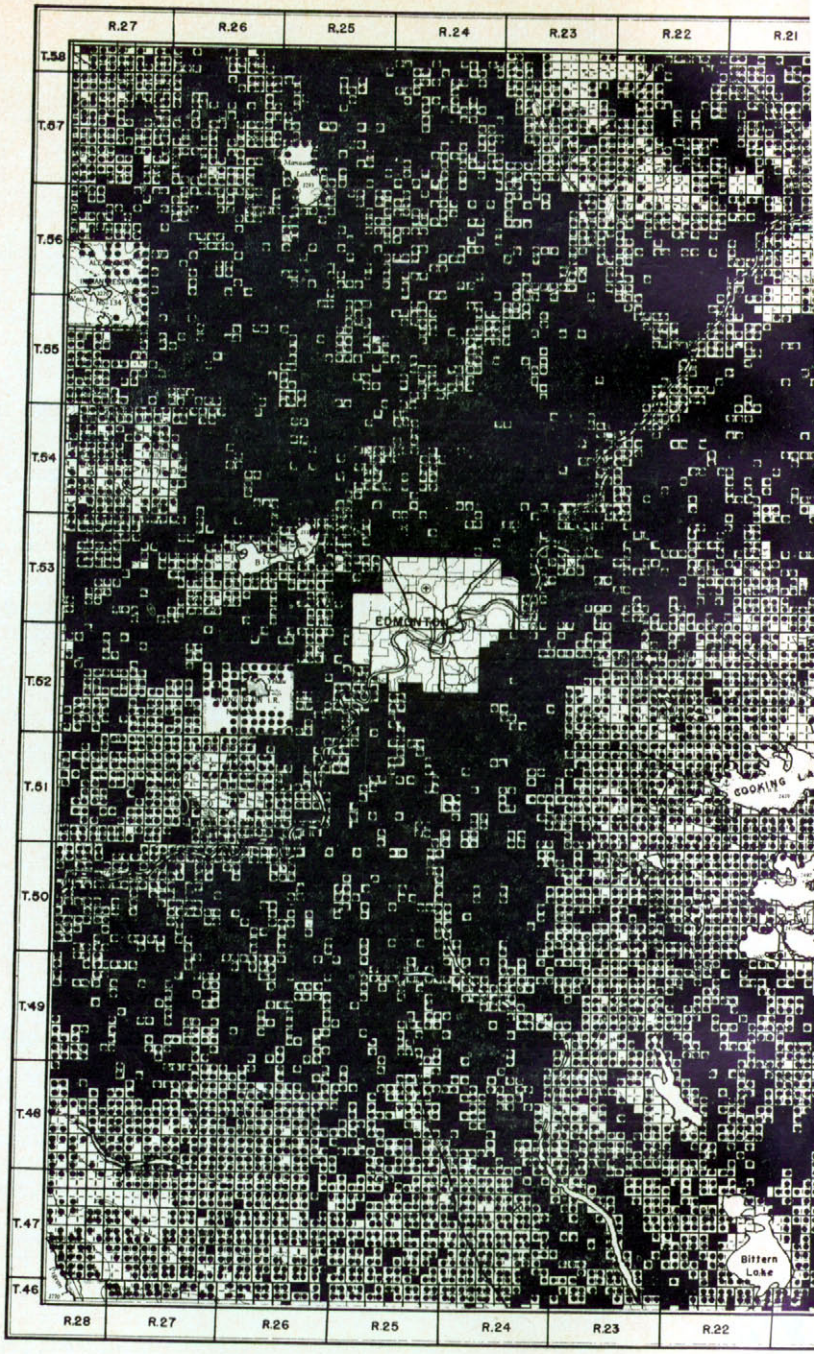
Gadsby Silt Loam (Gd.SiL):

Gadsby silt loam is a thin Black Solodized Solonetz soil developed on stone free lacustrine parent material. It is generally a well drained soil. A Cs horizon is often difficult to discern. However, some salt is usually found in the Ck horizon.

The following is a generalized discription of a Gadsby silt loam:

Ah1	0- 5″	Black (10YR 2/1) silt loam; weak prismatic to granular. pH 5.8
Ah2	5- 7″	Dark brown (10YR 4/3) silt loam; weak prismatic to granular. pH 5.8
Ae	7- 9″	Grey brown (10YR 5/2) very fine sandy loam; porous platy. pH 6.0

Present Cultivated and Virgin

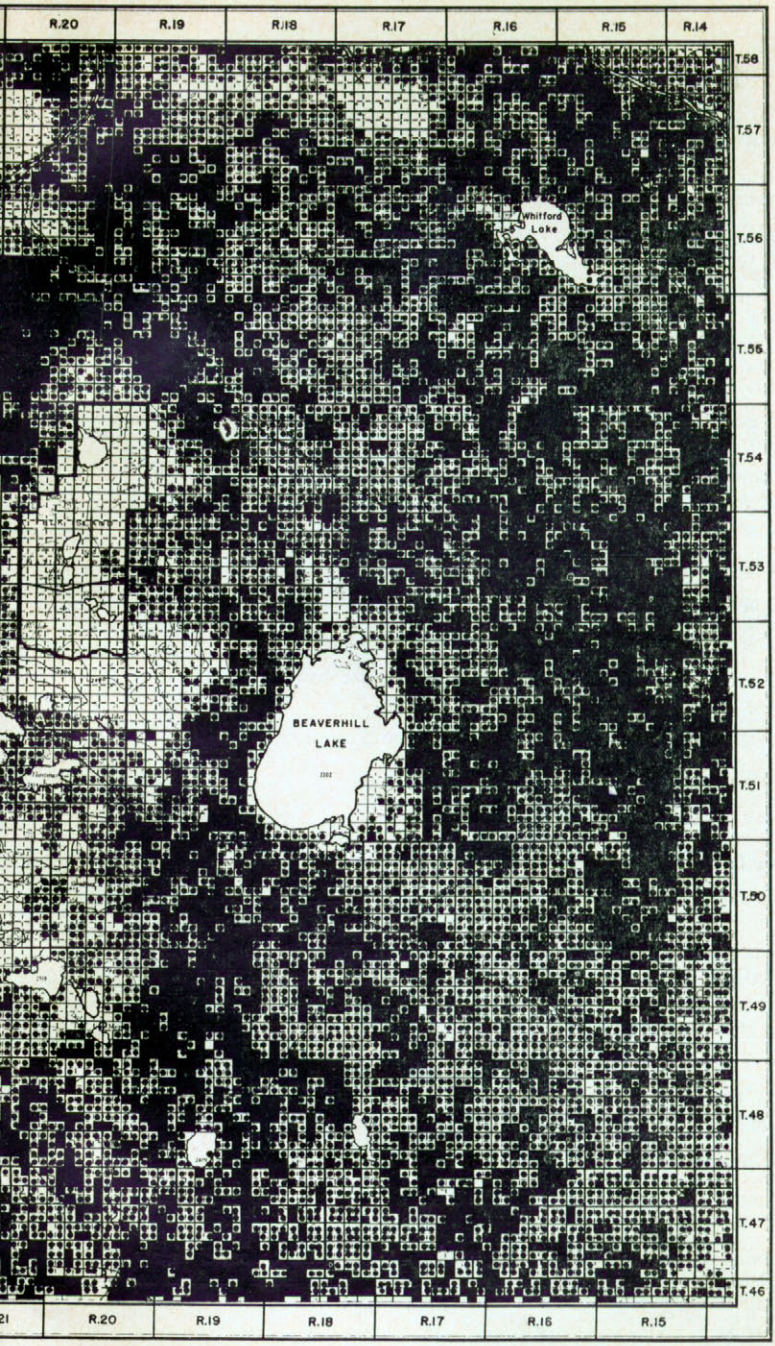


Completely Cultivated (120-160 acres

Partially Cultivated (10-120 acres)

Idle and Pasture

Lands of the Edmonton Sheet



Bnt	9-16″	Dark grey (10YR 4/1) clay; columnar to medium blocky; stained and very hard. pH 6.8
Bntj	16-24″	Dark grey brown (2.5Y 4/2) silty clay; massive to medium prismatic. pH 7.6
Ck	24-30″	Dark grey brown (2.5Y 4/2) silty clay; massive. pH 7.7
C	at 30″	Dark grey brown (2.5Y 4/2) silty clay; massive. pH 8.0

The topography is level to gently undulating: usually basin-like. Spots of saline meadow may occur in areas of Gadsby silt loam.

Armena Loam (Am.L):

Armena loam is a fairly well to well drained Black Solodized Solonetz soil developed on alluvial lacustrine parent material. The underlying till is usually within the solum and there is often a coarse textured layer at the contact. Intergrades between this soil and Ponoka loam occur.

A generalized description of an Armena loam follows:

Ah	0-12″	Black (10YR 2/1) loam to silt loam; weak prismatic; friable.
Ae	12-14″	Greyish brown (10YR 5/2) loam; weak platy.
Bnt	14-22″	Dark brown (10YR 4/3) clay loam; hard columnar to blocky; stained.
Bntj	22-30″	Yellowish brown (10YR 4/3) silt loam; massive.
IIC	at 30-36″	Till of loam texture.

The topography is level to gently undulating.

Kavanagh Loam (Kv.L):

Kavanagh loam is a Solonetzic soil developed on Edmonton formation bedrock. It is a complex and includes Black and Dark Grey Solodized Solonetz and Solonetz. The Solonetz profile has no Ae horizon and the solum is usually quite thin. Often these soils have the appearance of an Ah, IIBnt, profile. That is, it appears as though the parent material of the A horizon was a subsequent deposition, possibly aeolian.

The following is a generalized description of a Solodized Solonetz profile of the Kavanagh complex:

Ah	0- 6″	Very dark brown (10YR 2/2) loam; loose granular. pH 5.9
Ae	6- 7″	Light brownish grey (10YR 6/2) sandy loam to silt loam; platy. pH 6.4
Bnt	7-18″	Dark brown to brown (10YR 4/3 - 5/3) loam to sandy clay loam; flat topped columnar to blocky; very hard and often mottled. pH 6.7
Csk	18-24″	Greyish brown (10YR 5/2) loam to clay; massive to coarse blocky; this horizon is often difficult to identify. pH 7.8
C	at 24-36″	Weathered bedrock consisting of sandy and clayey shales. pH 7.8

The topography is level to gently rolling; usually with long, smooth slopes. In the native state it is grass covered. Scrub growth invaded a few spots and these may now support dwarf poplar. In these spots the B horizon is less hard.

Dnister Loam (Dn.L):

Dnister loam is a Grey Wooded Solodized Solonetz which intergrades to the Grey Wooded. It is developed on till and is moderately well to imperfectly drained. Often there is mottling in the Ae and AB horizons. This is possibly due to a temporary perched water table in the spring or during prolonged wet periods. The B horizon is very slowly permeable to water. The Ae tends to flow down on exposed road cuts in the spring: at this time the Ae may become water saturated and mobile while the Bt is still frozen.

The following is a generalized description of a Dnister loam:

L-H		A thin layer of leaf litter is usually present.
Ah	0- 1″	Very dark grey (10YR 3/1) loam to silt loam; loose to granular. pH 6.1
Ae	1- 7″	Very pale brown (10YR 7/3) loam; platy; distinctly mottled. pH 6.4
AB	7- 9″	Dark greyish brown (10YR 4/2) clay loam; coarse subangular blocky and vesicular; distinctly mottled; hard. pH 6.1
Bnt	9-20″	Very dark greyish brown (2.5Y 3/2) clay loam columnar to blocky; very hard and stained. pH 6.6
Btj	20-35″	Dark greyish brown (2.5Y 4/2) clay loam; massive to weak subangular blocky; may contain a little lime. pH 7.6
Ck	35-40″	Olive brown (2.5Y 4/4) clay loam; massive to weak subangular blocky; low lime content. pH 8.0
C	at 40″	Olive brown (2.5Y 4/4); massive, till of loam to clay loam texture. pH 8.0

The topography is gently undulating. Tree cover is light in these areas.

Ministik Clay Loam, Silty Clay Loam (Mk.CL, SiCL):

The Ministik soils are Grey Wooded Solodized Solonetz developed on lacustrine material. They are imperfectly to moderately well drained. The Ah varies in depth and there may be some L-H (leaf mat) present. In the native state tree cover was light.

A generalized description of the silty clay loam member follows:

Ah	0-2.5″	Very dark brown (10YR 2/2) silty clay loam; loose to granular. pH 6.1
Ahe	2.5- 4″	Dark grey (10YR 4/1) silty clay loam; coarse granular to weak platy. pH 5.3
Ae	4- 8″	Light grey (10YR 7/2) silty loam; may be mottled. pH 5.2
Bntl	8-16″	Very dark greyish brown (10YR 3/2) clay; large coarse columnar to medium subangular blocky; stained with organic matter; hard. pH 5.4

Bnt2	16-30″	Dark greyish brown (2.5Y 4/2) clay; large coarse columnar to medium subangular blocky; organic staining; structure somewhat less distinct than Bnt1. pH 7.0
Ck	at 30″	Light olive brown (2.5Y 5/4) silty clay loam; varved. pH 7.3
C	at 40″	Dark yellowish brown (10YR 4/4) clay; varves that usually become coarse textured towards the till contact (the till occurs at about 48 inches from the surface). pH 7.6

The topography is level to gently undulating: depressional spots occur throughout the areas.

Kawood Loam (Kw.L):

Kawood loam is a Grey Wooded Solodized Solonetz developed on residual material that is mainly Edmonton formation. It is an imperfectly to moderately well drained soil. Relatively unweathered bedrock can usually be seen in the road cut.

A generalized description of a Kawood loam follows:

L-H		A very thin layer of leaf litter may be present.
Ah	0- 1.5″	Very dark grey (10YR 3/1) loam to silt loam; loose granular; numerous grass roots. pH 5.8
Ae	1.5- 5″	Brown (10YR 5/3) loam; platy to single grain and vesicular; often mottled. pH 5.4
Bnt	5-13″	Dark yellowish brown (10YR 4/4) clay loam; hard columnar to medium subangular blocky. pH 4.8
C	13-20″	Brown (10YR 5/3) clay loam to loam; massive to small subangular blocky. pH 5.0

The topography is undulating to gently rolling, usually long uniform slopes. The native vegetative cover is shubs and stunted trees.

Thorsby Loam (Th.L):

Thorsby loam is an imperfectly drained to moderately well drained Dark Grey Solodized Solonetz soil developed on till that is mainly of Edmonton formation origin.

A generalized description of a Thorsby loam follows:

L-H		A very thin layer of leaf litter may be present.
Ah	0- 3″	Black (10YR 2/1) loam; granular. pH 5.7
Ahe	3- 7″	Dark grey brown (10YR 4/2) silt loam; granular. pH 5.4
Ae	7- 8″	Light brownish grey (10YR 6/2) silt loam; weak platy. pH 5.5
AB	8-10″	Yellowish brown to pale brown (10YR 5/4 - 6/3) loam to clay loam; coarse blocky and vesicular; hard. pH 6.3
Bnt	10-20″	Very dark greyish brown (10YR 3/2) clay loam to clay; columnar to blocky; stained; very hard. pH 6.1
BC	20-34″	Dark greyish brown (2.5Y 4/2) loam; massive to weak blocky. pH 7.6
Ck	at 34″+	Dark greyish brown (2.5Y 4/2); massive to weak blocky; slightly hard till of loam texture. pH 7.6

Stones may be found throughout the profile. The topography is level to undulating.

Daysland Loam (Dl.L):

Daysland loam is a thin Black Solod developed on till. It is a moderately to well drained soil. Stones may occur throughout the profile—the surface is relatively stone free. What appears to be a relic solonetz-like structure is quite noticeable in this soil.

A generalized description of a Daysland loam follows:

Ah	0- 7″	Black to dark brown (10YR 2/1 - 4/3) loam; weak medium prismatic; darker in color towards the top. pH 5.5
Ae	7-10″	Dark greyish brown to brown (10YR 4/2 - 5/3) loam to sandy loam; micro structure platy and macro structure weak columnar. pH 5.6
AB	10-14″	Dark greyish brown (10YR 4/2) loam to clay loam; weak columnar to subangular blocky; vesicular; peds usually coated with light colored siliceous material. pH 5.6
Bt	14-22″	Dark brown (10YR 4/3) clay loam; columnar; organic staining. pH 5.6
Bntj	22-36″	Dark greyish brown (10YR 3/2) clay loam; weak subangular blocky. pH 7.1
Csk	at 36″	Greyish brown (10YR 5/2) clay loam to loam; massive. pH 7.5
C	at 40″	Dark greyish brown (10YR 3/2); massive; till of loam texture. pH 7.6

The topography is gently undulating to gently rolling. The native cover is parkland; there is good tree growth on the northern slopes.

Kapona Loam (Kp.L):

Kapona loam is a moderately well drained thin Black Solod developed on medium textured material of alluvial lactustrine origin. No large areas of this soil series have, as yet, been mapped. However, it occurs in small areas which are included with other soils. This soil resembles Daysland loam excepting that the profile is stone free and a stony or sandy layer may be found at depths of 30 to 40 inches between the overlying alluvial lacustrine material and the underlying till.

The topography is level to undulating.

Botha Silt Loam (Bt.SiL):

Botha silt loam is a thin Black Solod developed on fine textured lacustrine material. Only a few areas of this soil series have been mapped to date and therefore a generalized profile description has not been established. The profile is stone free, of fine texture, and horizonwise resembles the Daysland loam described previously. This soil is found in association with Gadsby silt loams. It occurs in the better drained portions.

The topography is level to gently undulating.

TABLE 6.—Acreages of Various Soil Series Mapped Under the Solonetzic Order

Solonetz Soils			
Whitford series	20,000		
Duagh series	56,000		
		76,000	
Solodized Solonetz Soils			
Camrose series	478,000		
Wetaskiwin series	74,000		
Armena series	1,000		
Kavanagh series	135,000		
Killam series	70,000		
Kopernick series	7,000		
Gadsby series	6,000		
		771,000	
Dark Grey Solodized Solonetz Soils			
Thorsby series	19,000	19,000	
Grey Wooded Solodized Solonetz Soils			
Dnister series	3,000		
Ministik series	3,000		
Kawood series	5,000		
		11,000	
Thin Black Solod Soils			
Daysland series	25,000		
Botha series	2,000		
Kapona series	1,000		
		28,000	
Total Acreage of Solonetzic Soils			905,000

PODZOLIC SOILS

Thirteen soil series in the Podzolic Order have been recognized in the Edmonton sheet area. Twelve series are Grey Wooded and one is a Minimal Podzol. These soils occupy a total of 379,000 acres. In the native state they were tree covered; primarily poplar and poplar-spruce. They lie within the Grey Wooded soil zone.

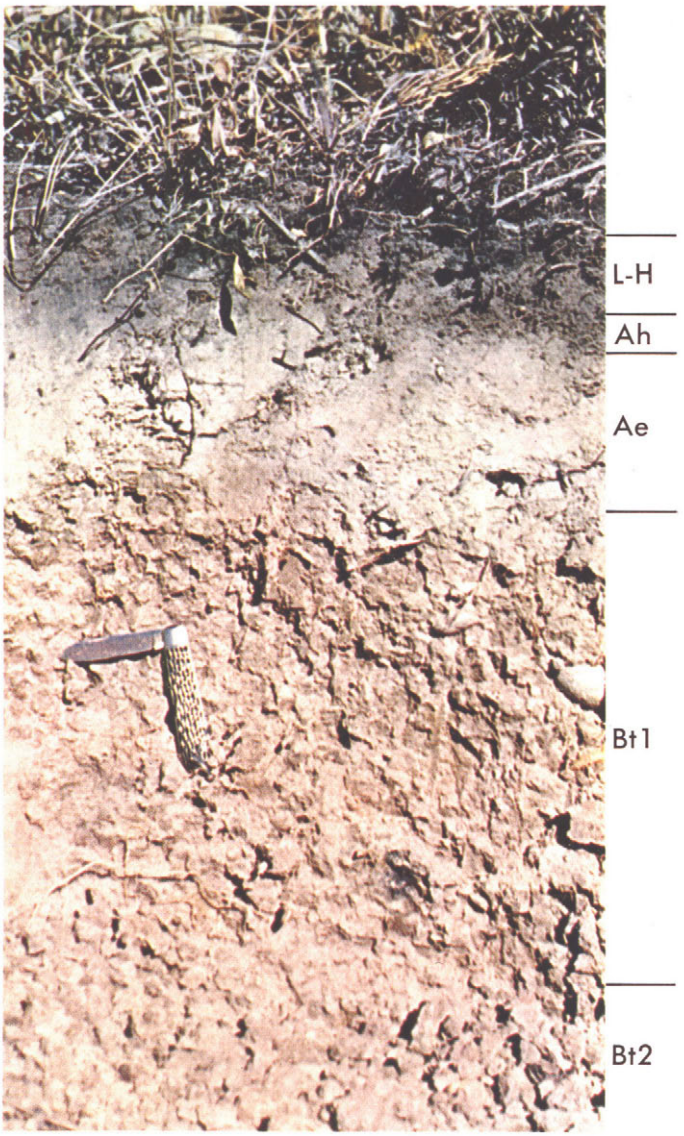
The Podzolic soils of this area vary from non-arable to fairly good arable; some of the non-arable are fairly good to good timber lands. The Dark Grey Wooded of intermediate texture, if on fairly level topography, are agriculturally the most desirable. All of these soils have a low initial organic matter content and therefore respond to the application of nitrogen and manures. They are moderately to strongly eluviated and are usually deficient in some of the mineral plant foods. Crop responses have been obtained from the application of phosphorus and of sulphur in many of these soils—but not all. Also the response may vary within one soil type. In general, no response has been obtained from the application of lime. Under natural conditions these soils usually have a fairly high percentage of the exchange complex base saturated—mainly calcium.

Following are profile descriptions of the soil series belonging to the Podzolic Order:

Cooking Lake Loam (Ck.L):

Cooking Lake loam is a fairly well drained Orthic Grey Wooded soil developed on till that is mainly of Edmonton formation origin. Stones occur throughout the profile. Structurally, this soil has a mild suggestion of being Solonetzic.

Following is a generalized description of a Cooking Lake soil:



Orthic Grey Wooded

ORTHIC GREY WOODED

This Orthic Grey Wooded is a HUBALTA Loam. It is formed on medium textured (clay loam) material that contains stones. It occurs on undulating to hilly topography.

Distinguishing features:

1. A leaf mat two to three inches thick (L-H).
2. A light brown, ashy, surface horizon three to six inches thick (Ae).
3. A brown, fairly hard, compact, blocky structured subsoil (Bt).

Use:

This soil is low in many of the plant food elements: in particular, nitrogen, and possibly sulphur, and phosphorus. It is very low in organic matter. If on fairly level topography it is satisfactory for the growth of hays, coarse grains, and legume seed: If on very rough topography it should be left in the native state.

Climate:

Mean annual precipitation—18 to 20 inches.

Mean annual temperature—33 to 35 degrees F.

Mean May to September temperature—50 to 52 degrees F.

Native Cover:

Forest; mixed poplar, birch, spruce and pine.

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University of Alberta
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L-H	2.5- 0"	Partially decomposed leaf litter. pH 6.4
Ae	0- 6.5"	Very pale brown (10YR 8/3) loam to silt loam; platy. pH 6.5
Bt1	6.5-11"	Brown (10YR 5/3) clay to clay loam; blocky to weak columnar; hard. pH 5.2
Bt2	11-21"	Brown to dark brown (10YR 5/3 - 4/3) clay loam; blocky but not as hard nor is the structure as well defined as in Bt1. pH 5.1
Bm	21-33"	Dark brown (10YR 4/3) clay loam; massive to blocky. pH 6.5
Ck	at 40-50"	Dark grey brown (10YR 4/2) clay loam; massive to blocky; lime flecked; may contain traces of sulphate. pH 7.4
C	at 50-70"	Brown to dark brown (10YR 5/3 - 4/3) clay loam; massive to weak coarse blocky; till. pH 7.5

There may be a thin dark colored surface (Ah) horizon immediately under the leaf mat (L-H). There may also be a thin transition (AB) horizon between the platy Ae and hard Bt.

The topography is undulating to hilly. Numerous sloughs and peaty depressions occur throughout the areas.

Breton Loam (Bn.L):

Breton loam is a fairly well to well drained Orthic Grey Wooded soil developed on till that is primarily of Paskapoo formation origin. Bedrock is occasionally found within the solum. In these cases the solum tends to be yellowish in color.

Following is a generalized description of a Breton loam:

L-H	2- 0"	Partially decomposed leaf litter. pH 6.6
Ae	0- 6"	Light grey to pale brown (10YR 7/2 - 6/3) silt loam to loam; medium to fine platy; some mottling. pH 6.0
AB	6-10"	Brown (10YR 5/3) loam to clay loam; medium to fine subangular blocky. pH 5.2
Bt	10-18"	Brown (10YR 5/3) clay loam; medium blocky. pH 5.4
Bm	18-48"	Dark greyish brown (10YR 4/2) clay loam; blocky to massive. pH 5.8
Ck	at 50"	Dark yellowish brown (10YR 4/4) clay loam; blocky to massive. pH 7.9
C	at 70"	Light olive (2.5Y 5/4) clay loam; massive to fragmental till. pH 8.0

There may be a thin dark colored surface (Ah) horizon present. Often the lower part of the Ae horizon has a slightly higher chroma (more reddish) than the upper part. This is the beginning of a second eluviation process. This becomes more pronounced farther west; that is, under a slightly more humid climate and a higher elevation.

The topography is undulating to hilly. Many peaty depressions occur throughout the areas.

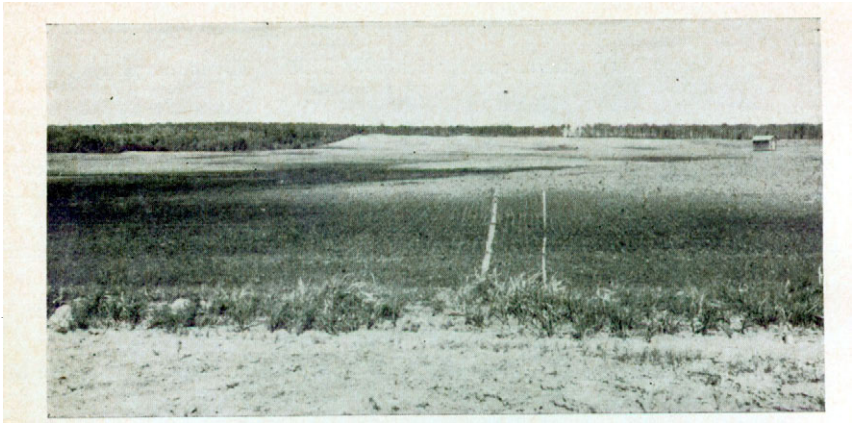


Figure 2—A mixed area of Dark Grey and Grey Wooded soils. The Grey Wooded is on the higher spots and should receive extra applications of organic matter.

Maywood Clay Loam, Silty Clay Loam (Mw.CL, SiCL):

The Maywood soils are Orthic Grey Wooded developed on fine textured lacustrine material. They are imperfectly to fairly well drained. In the spring the light colored Ae horizon often becomes semi-mobile and in a road cut may flow down as much as 10 to 12 inches.

The following is a description of a Maywood silty clay loam:

L-H	4- 0″	Organic leaf mat. pH 6.3
Ae	0- 7″	Light brownish grey (10YR 6/2) silt loam; platy. pH 5.9
AB	7-10″	Dark greyish brown (2.5Y 4/2) clay; coarse to fine blocky; hard. pH 5.6
Bt	10-15″	Very dark greyish brown (2.5Y 3/2) clay; small subangular blocky; hard. pH 5.3
Btj	15-30″	Dark olive grey (5Y 3/2) clay; small subangular blocky; hard. pH 5.6
Ck	30-36″	Olive (2.5Y 4/4) clay; varved. pH 7.6
C	at 48″	Dark olive grey (2.5Y 3/2) clay; varved. pH 7.6

Till is usually found at depths greater than 48″. The topography is level to gently undulating. Usually the slopes are long and smooth. On a macro basis the areas are usually basin-like.

Tolman Loam, Sandy Loam (To.L, SL):

The Tolman soils are Orthic Grey Wooded developed on alluvial lacustrine material. They are fairly well to well drained soils. In general, there is more dark surface (Ah) than in the other Orthic Grey Wooded soils in this area.

A generalized description of a Tolman loam is as follows:

L-H	1- 0″	Leaf litter.
Ah	0- 2″	Dark grey (10YR 4/1) loam to silt loam; loose to granular. pH 5.9

Ahe	2- 5″	Greyish brown (10YR 5/2) silt loam; mottled; coarse platy. pH 5.6
Ae	5- 9″	Pale brown (10YR 6/3) very fine sandy loam to silt loam; platy. pH 5.9
Bt	9-20″	Brown (10YR 5/3) silt loam; subangular blocky. pH 5.3
Btj	20-30″	Brown (10YR 5/3) silt loam; structure less distinct than in Bt above. pH 5.3
IIC	at 30-40″	Loam till. pH 5.5

There may be a stony or gravelly contact above the till. The topography is level to undulating. These soils often lie on the edge of large basin-like areas.

Glory Loam (Gy.L):

Glory loam is a well drained Orthic Grey Wooded soil developed on pitted deltaic material.

This soil occupies only 1,000 acres in this area and no generalized profile description has been established. The profile reported in table 14 (Chemical analysis) is the only one sampled to date. The topography is undulating to hilly with smooth, often steep, slopes. Small kettle holes dot the area. In the native state there is a fairly heavy tree cover.

Modeste Loam (Md.L):

Modeste loam is a well drained Orthic Grey Wooded soil developed on residual material (Paskapoo formation). This soil does not occupy a very large acreage (2,000 acres) in this sheet. It occurs intimately associated with Breton loam. Weathering bedrock can usually be found at 12 to 24 inches from the surface. Texture variability within the solum is, in part, inherited from the bedrock parent material.

The following is a generalized description of a Modeste loam:

L-H	1- 0″	Leaf litter. pH 6.1
Ae	0-11 ″	Pale brown (10YR 6/3) silt loam; fine platy. pH 5.3
Bt	11-14″	Dark yellowish brown (10YR 4/4) clay loam; medium subangular blocky. pH 5.0
Bm	14-26″	Light olive (2.5Y 5/4) loam; fragmental. pH 4.8
C	at 30″	Yellowish brown (10YR 5/4) sandy loam to silt loam; fragmental. pH 5.5

The topography is level to undulating, with smooth uniform slopes.

Culp Sandy Loam, Loamy Sand (Cu.SL, LS):

The Culp soils are well to excessively drained Orthic Grey Wooded soils developed on alluvial aeolian material.

A generalized description of a Culp loamy sand follows:

L-H	1- 0″	Leaf litter with very thin black Ah. pH 6.9
Ae	0-14″	Pale brown (10YR 6/3) loamy sand; weak platy; loose. pH 6.1
Bt	14-20″	Dark yellowish brown (10YR 4/4) very fine sandy clay loam; weak coarse prismatic to weak subangular blocky. pH 6.5
Bm	20-38″	Yellowish brown (10YR 5/4) loamy sand; weak coarse prismatic to massive; may be quite firm. pH 6.5
C	38-48″	Pale brown (10YR 6/3) loamy sand; massive to loose. pH 8.0

Lime appears as small concretions in the C horizon. The Bt horizon is usually quite definite and has a much lower permeability and much higher water holding capacity than the horizons above and below. There are usually very thin irregular dark bands in the lower B (Bm) horizon.

The topography is gently undulating to rolling; often dune-like. Moderately to poorly drained spots occur between the knolls. These support a meadow grass. The tree cover on the upland is usually light.

Uncas Loam (Un.L):

Uncas loam is a fairly well to well drained Orthic Dark Grey Wooded soil developed on till that is mainly of Edmonton formation origin. Stones occur throughout the profile.

A generalized description of an Uncas loam follows:

L-H	1.5- 0″	Loose leaf litter. pH 6.5
Ahe	0- 4″	Very dark greyish brown (10YR 3/2) loam to sandy loam; granular to weak platy; depth of this horizon varies considerably. pH 5.9
Ae	4- 7″	Dark greyish brown (10YR 4/2) sandy loam; platy. pH 5.8
AB	7- 9″	Dark brown (10YR 4/3) clay loam; coarse platy to weak blocky; slightly hard; horizon varies considerably in depth. pH 5.3
Bt	9-27″	Dark yellowish brown (10YR 4/4) clay loam; prismatic to medium subangular blocky; hard. pH 5.4
Ck	at 27″+	Grey brown (10YR 5/2) loam to clay loam; massive to blocky. pH 7.5
C	at 48″	Dark yellowish brown (10YR 4/4) sandy clay loam; massive to blocky; till. pH 7.6

The topography is undulating to rolling—much of it knob and kettle. Peat accumulates in the kettle holes. The upland usually has a fairly heavy tree cover.

Macola Clay Loam (Ml.CL):

The Macola series is a moderately well drained Orthic Dark Grey Wooded soil developed on fine textured lacustrine material.

The following is a generalized description of a Macola clay loam:

L-H	2- 0″	Loose leaf litter. pH 6.8
Ahe	0- 4″	Dark grey (10YR 4/1) clay loam; loose to granular. pH 6.0
Ae	4- 7″	Grey (10YR 5/1) clay loam; platy to granular. pH 5.9
AB	7-15″	Dark brown (10YR 4/3) clay loam to clay; subangular blocky. pH 5.5
Bt	15-24″	Dark grey (10YR 4/1) clay; subangular blocky. pH 4.8
Bm	24-36″	Dark greyish brown (10YR 4/2) clay; massive to weak subangular blocky. pH 5.3
Ck	at 36″+	Dark greyish brown (10YR 4/2) clay; massive. pH 7.5
C	at 40″+	Dark greyish brown (10YR 4/2) clay; massive. pH 7.6

The depth and color of the Ahe and Ae varies considerably.

The topography is gently undulating to gently rolling and usually has long smooth slopes.

Carvel Loam, Sandy Loam (Cv.L, SL):

The Carvel soils are well drained Dark Grey Wooded developed on pitted deltaic material.

A generalized description of Carvel loam is as follows:

L-H	2- 0″	Loose leaf litter. pH 6.5
Ahe1	0- 4″	Dark greyish brown (10YR 4/2) loam; loose to mildly platy. pH 6.0
Ahe2	4-14″	Brown (10YR 5/3) loam; weak platy. pH 6.1
Ae	14-20″	Pale brown (10YR 6/3) loam; platy to granular. pH 6.0
Bt1	20-26″	Dark yellowish brown (10YR 4/4) silt loam; strong subangular blocky. pH 5.5
Bt2	26-48″	Yellowish brown (10YR 5/4) silt loam; weak subangular blocky. pH 5.2
C	48-70″+	Pale brown (10YR 6/3) silt loam; massive. pH 5.8

There is very pronounced banding of coarse and medium textures, particularly in the Bt horizon. The structure of the medium textured layers is much more pronounced than in the coarse textured layers. No lime was found to 70 inches.

The topography is undulating to hilly with smooth slopes.

Leith Sandy Loam, Loamy Sand (Le.SL, LS):

These coarse textured soils are well drained Dark Grey Wooded and have developed on alluvial aeolian parent material.

The following is a generalized discription of a Leith sandy loam:

L-H	2- 0″	Loose leaf litter. pH 6.5
Ahe	0- 6″	Brown to dark brown (10YR 5/3 - 4/3) sandy loam; weak prismatic. pH 6.4
Ae	6-14″	Pale brown to yellowish brown (10YR 6/3 - 5/4) loamy sand; weak platy to loose. pH 6.2
Bt	14-24″	Yellowish brown to brown (10YR 5/4 - 5/3) sandy clay loam; weak prismatic to weak blocky; slightly hard. pH 6.8

Ck	at 24″	Greyish brown (10YR 5/2) loamy sand to sand; massive and firm; low lime content. pH 7.8
C	at 36″+	Brown to yellowish brown (10YR 5/3 - 5/4) loamy sand; single grain; often contains lenses of finer textured materials. pH 8.0

Photo courtesy J. A. Toogood

Figure 3—Water erosion in a Carvel loam area. This was the result of a single rain.

The topography is undulating to hilly and is often dune-like. There are many depressional spots, some of which are peaty.

Holburn Sandy Loam (Hl.SL):

The Holburn series is an Orthic Grey Wooded well drained soil that has developed on highly calcareous material of alluvial deposition. Some gravel and stones may be found throughout the profile. It appears to be associated with the North Saskatchewan drainage system and was only found adjacent to the river.

Following is a generalized description of a Holburn soil:

L-H	4- 0″	Decomposing leaf litter.
Ahe	0- 4″	Greyish brown (10YR 5/2) loam to sandy loam; weak granular.
Ae	4- 8″	Light brownish grey (10YR 6/2) sandy loam; weak platy.
Bt	8-16″	Brown (10YR 5/3) sandy loam; weak subangular blocky; friable.
Ck	at 16″+	Very pale brown (10YR 7/3) silt loam to silty clay loam; massive; may be layered; lime is often concentrated in pockets or in horizontal bands.

The topography is gently undulating to undulating; mostly areas that slope to the river.

Edwand Coarse Sandy Loam (Ed.CSL):

The Edwand soil is a Minimal Podzol developed on an outwash plain. The one area mapped lies adjacent to the North Saskatchewan River. Lenses of gravel and of coarse loamy sand occur in the profile. The cover is mainly pine mixed with deciduous trees.

Following is a generalized description of an Edwand soil:

L-H	1-0″	Black to very dark brown (10YR 2/2), moist 2/1; mainly organic but may contain a very thin Ah. pH 6.2
Ae	0- 1″	Light brownish grey to white (10YR 8/2), moist 6.5/2; single grain; may only be 0.5 inches thick. pH 6.0
Bf1	1-12″	When dry the entire horizon is light yellowish brown (10YR 6/4), when moist it gradually changes with depth from 7.5YR 5/6 to 5YR 4/6; weakly granulated. pH 5.8
Bf2	12-24″	Light yellowish brown (10YR 6/4), when moist it is 7.5YR 5/6; weakly granular to single grain. pH 5.8
C	at 30″	Very pale brown (10YR 7/3), moist 6/3; single grain. pH 6.2

This soil shows much "redder" moist than when dry.

The subsoil (Bf1) horizon has a total exchange capacity of 3.5 millequivalents per 100 grams with 40 per cent exchangeable H^+ and 40 per cent exchangeable Ca^{++}. This is a much higher percentage of exchangeable acidity than in the Grey Wooded soils. The topography is level to gently undulating.

TABLE 7.—Acreages of the Various Soil Series Mapped Under the Podzolic Order

Orthic Grey Wooded Soils			
Cooking Lake series	196,000		
Breton series	29,000		
Maywood series	14,000		
Tolman series	8,000		
Glory series	1,000		
Modeste series	2,000		
Culp series	18,000		
		268,000	
Dark Grey Wooded Soils			
Uncas series	61,000		
Macola series	8,000		
Carvel series	7,000		
Leith series	30,000		
Holburn series	2,000		
		108,000	
Minimal Podzol Soils			
Edwand series	3,000		
		3,000	
Total Acreage of Podzolic Soils			379,000

GLEYSOLIC SOILS

Five soil series in four Sub-Groups of the Gleysolic Order have been recognized in the Edmonton sheet area totalling 54,000 acres. All of these soils have limited agricultural use. Some, if drainage is provided, would be good arable land. Since they usually occur in areas of lower relief frost can be a hazard in some years.

Following are the series mapped in the Gleysolic Order:

Codner Loam (Cn.L):

Codner loam is a Peaty Meadow developed on alluvial lacustrine material. It has from 3 to 12 inches of peat on the surface.

The following is a description of a typical Codner loam:

L-H	6- 0″	Sedge peat. pH 7.2
Ah	0- 9″	Very dark greyish brown (10YR 3/2) loam; granular to shot-like structure. pH 7.6
Bg	9-15″	Olive brown (2.5Y 4/4) loam; fine subangular blocky. pH 7.7
C	at 36″	Light olive brown (2.5Y 5/4) silt loam; usually stratified. pH 7.7

The Bg horizon may vary considerably in the degree of mottling. The native vegetation is mainly tall growing grasses.

The topography is level to depressional.

Prestville Silty Clay Loam (Pr.SiCL):

The Prestville soil is a Peaty Meadow developed on fine textured lacustrine material. It may have from 3 to 12 inches of peat.

A generalized description of a Prestville silty clay loam follows:

L-H	10- 0″	Brown, raw and decomposed peat.
Ah	0- 3″	Very dark brown to black (10YR 2/2 - 2/1) silt loam to clay loam; very little structure.
Bg1	3- 8″	Dark grey (10YR 4/1) clay; massive to blocky; very firm; mottled.
Bg2	8-26″	Grey (10YR 3/1) clay; granular to shot-like.
Ck	at 27″	Grey to dark grey (10YR 5/1 - 4/1) clay; massive to sub-angular blocky; moderate lime accumulation.

The amount of mottling may vary considerably from season to season. Permeability is very slow in this soil. It therefore remains wet for some time in the spring and after heavy rains. The topography is level to depressional.

Navarre Meadow (Nv.M):

Navarre Meadow is a saline Meadow developed on fine textured, slightly saline, lacustrine material.

A generalized description of Navarre Meadow follows:

L-H	2- 0″	Sedge peat. pH 7.8
Ah	0-15″	Black to very dark brown (10YR 2/1 - 2/2) silty clay; weak medium prismatic to granular. pH 7.3
Bskg	at 15″+	Olive brown (2.5Y 4/4) silty clay; weak granular to massive. pH 7.7
C	at 24″	Olive brown (2.5Y 4/4) silty clay; massive; often varved. pH 7.4

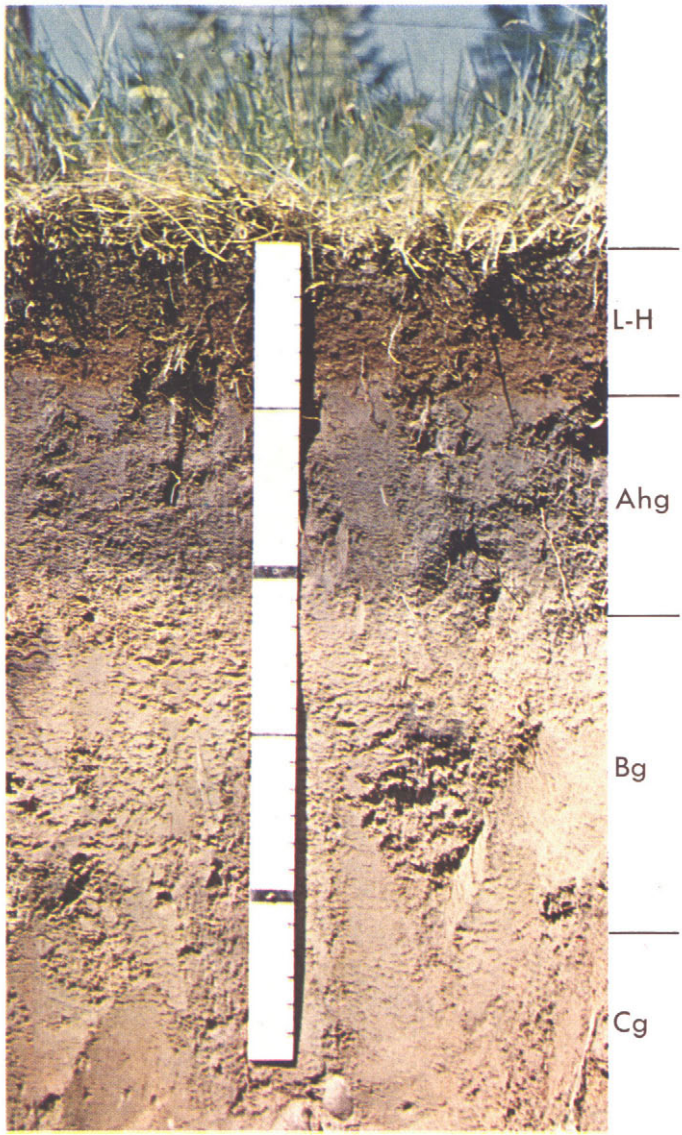
The surface (Ah) horizon may contain carbonate, especially during the seasons or higher rainfall. The topography is level to depressional.

The Gleysol Great Group (P.G.):

No detailed separation of soil series was attempted in this Group. All the soils that had 6 to 12 inches of peat, with 2 inches or less of Ah horizon, were grouped together under Peaty Gleysols, regardless of the type of deposition. In general, they are intermediate to fine textured. The surface is primarily sedge peat, and the mineral horizons are strongly gleyed.

Demay Loam (Dy.L):

Demay loam is an Eluviated Gleysol developed on till. Stones occur throughout the profile.



Peaty Meadow

PEATY MEADOW

This Peaty Meadow is a CODNER loam. It is formed on medium textured (silt loam) stone free material. It occurs on level to depressional topography that often receives run-off water from adjacent higher land.

Distinguishing features:

1. Three to twelve inches of peaty accumulation (L - H).
2. Four to ten inches of dark colored mineral surface soil (Ahg).
3. A somewhat sticky, compact subsoil (Bg).
4. An overall bluish tint, often blotched with red and yellow.

Use:

This soil is usually fairly well supplied with the plant food elements: although there may be a shortage of readily available nutrients when the soil is first cultivated. It tends to be cold in the spring and since Codner loam occurs in areas of level to depressional topography frost is often a hazard. There is a limited range of crops that can be satisfactorily grown.

Native Cover:

Tall grass, sedges, dwarf birch, willow and scattered poplar.

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(Photo by K. J. Spread)

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Department of Extension
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Edmonton, Alberta, Canada

The following is a description of a Demay loam (in some profiles the L-H and ABg horizons are much thinner).

L-H	2- 0″	Partially decomposed leaves and moss. pH 6.1
Ahe	0- 2″	Grey (10YR 5/1) loam; platy to granular, friable. pH 5.7
Aeg	2- 7″	Light grey (10YR 7/2) loam to silt loam; platy; friable; somewhat mottled. pH 5.9
ABg	7-12″	Light brownish grey (10YR 6/2) loam to clay loam; coarse platy to fine subangular blocky; strongly mottled. pH 5.7
Btg	12-23″	Greyish brown (10YR 5/2) clay loam; fine subangular blocky; hard; strongly mottled. pH 5.5
Bmg	23-31″	Greyish brown (10YR 5/2) clay loam; prismatic to medium blocky; hard. pH 5.7
Cg	at 46″+	Light brownish grey (10YR 6/2) clay loam; massive; mottled; till. pH 7.6

The mottling varies throughout the profile and during the season. The topography is depressional.

TABLE 8.—Acreages of the Various Soil Series Mapped Under the Gleysolic Order

Peaty Meadow			
Codner series	1,000		
Prestville series	22,000		
		23,000	
Saline Meadow			
Navarre Meadow	6,000		
		6,000	
Peaty Gleysols	2,000		
		2,000	
Low Humic Eluviated Gleysols			
Demay series	23,000		
		23,000	
Total Acreage of Gleysolic Soils			54,000

REGOSOLIC SOILS

Four Orthic Regosolic soils were recognized in the Edmonton sheet area totalling 69,000 acres. All of these soils lack distinct horizon development and are therefore classified primarily on the basis of parent material. They vary from non-arable to good arable land.

Following are brief descriptions of the soils belonging to the Regosolic Order:

Bittern Clay (Bi.C):

This soil is forming on lacustrine clay that has been recently exposed due to receding lake water. The subsoil is somewhat saline. It has limited, if any, arable value.

Alluvium (Av.):

These soils occur along the lower terraces of the river valleys. Many have received considerable alluvium within the last century. Although there is considerable variation in texture, in general they are loams, silt loams, and very fine sandy loams. Usually they are good to very good arable lands.

Dune Sand (DS):

The dune sand areas are characterized by open and semi-stabiliz-

ed dunes separated by shallow depressions that support grass and shrub growth. The sand is highly quartzitic. They have some value as native pasture.

Beach Sands (BS):

These sands are coarse textured and have been recently exposed due to receding lake water. In general they are non-arable.

TABLE 9.—Acreages of the Various Soil Series Mapped Under the Regosolic Order

Orthic Regosolic			
Bittern Clay	5,500		
Alluvium	15,000		
Dune Sand	32,000		
Beach Sand	16,000		
		69,000	
Total Acreage of Regosolic Soils			69,000

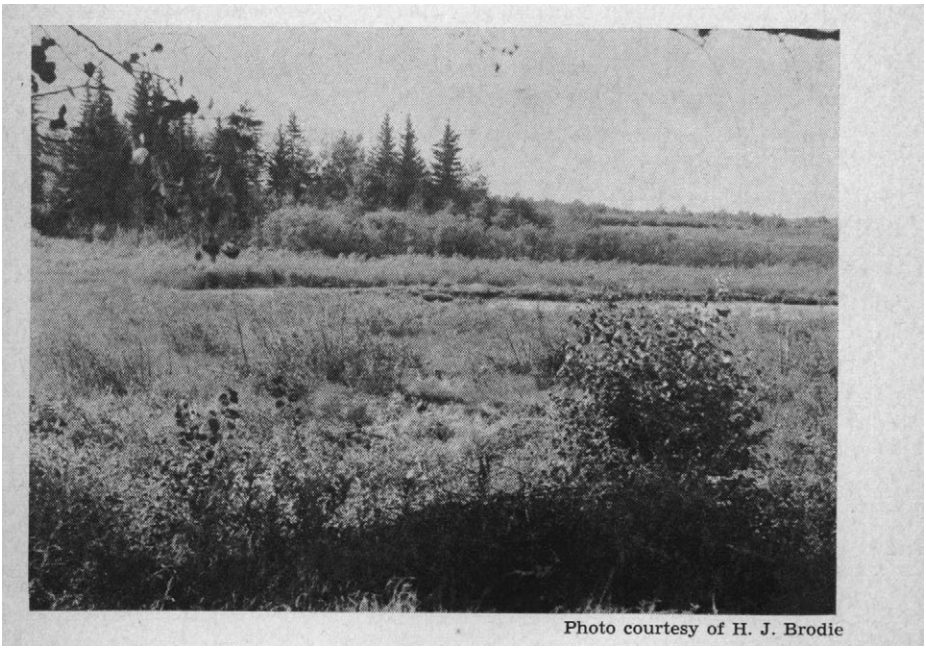
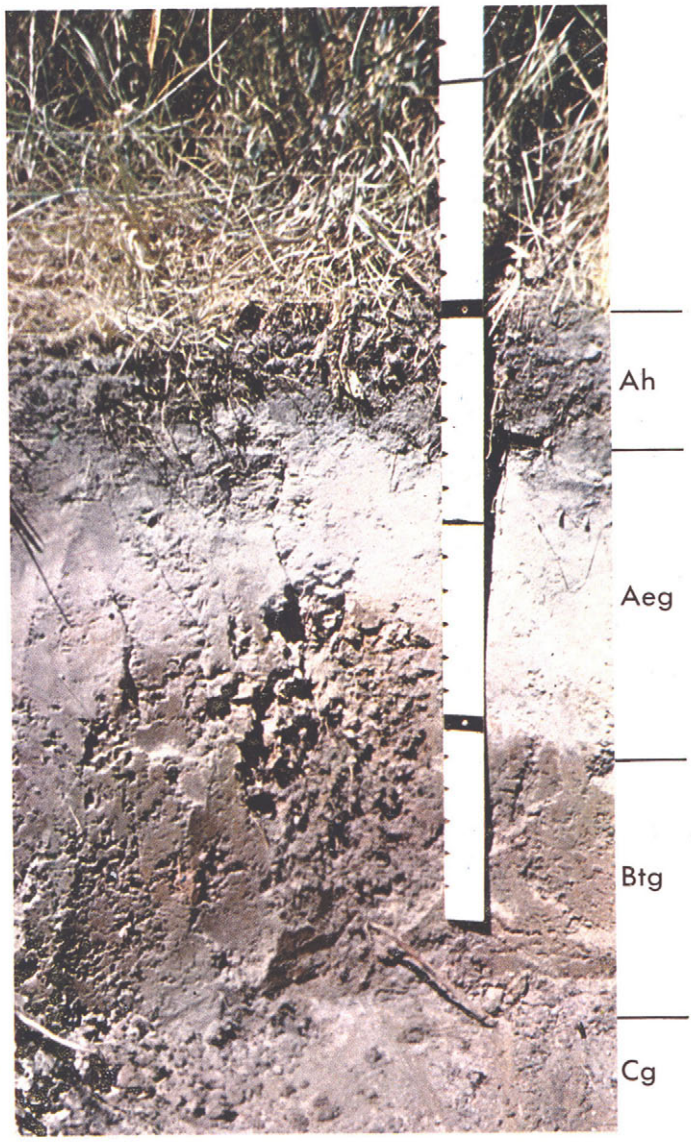


Photo courtesy of H. J. Brodie

Figure 4—A mixed area of Culp loamy sand and Organic soil in Township 51, Range 26. This is now part of a Botanical Garden and Field Laboratory established by the Department of Botany, University of Alberta.

ORGANIC SOILS

All those soils with an accumulation of sedge or moss peat over 12 inches in thickness are classified as Organic. No separation was made between moss and sedge peats as usually areas of these soils contained the two types of peat. In the larger areas sedge peat often occurs around the edge with sphagnum in the centre. Sedge is from pH 6.0 to 7.0, has about 3.0 per cent nitrogen, and has a high calcium saturation. Moss is from pH 4.5 to 5.5, has less than 1.0 per cent nitrogen, and has a high exchangeable acidity.



Humic Eluviated Gleysol

HUMIC ELUVIATED GLEYSOL

This Humic Eluviated Gleysol is a DEMAY loam. It is formed on medium to fine textured (clay loam) material that contains stones. It occurs in areas of depressional topography and receives run-off water from surrounding higher land.

Distinguishing features:

1. A dark colored surface fairly high in organic matter two to five inches thick (Ah).
2. A light grey (often red or yellow mottled) platy horizon three to ten inches thick underlies the Ah (Aeg).
3. A hard, blocky structured subsoil that has a bluish tint and is usually mottled (Btg).

Use:

This soil is relatively low in mineral food elements in the surface foot. It is a cold soil and occurs in areas where early fall frosts can be a hazard. It has limited use when cultivated.

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(Photo by K. J. Spread)

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Edmonton, Alberta, Canada

The areas with deep organic accumulation, and that are mainly sphagnum, are considered to be non-arable and should remain as water reservoirs. There is very little data available on the fertility requirements of the Organic soils of this area. However, manure and nitrogen, particularly in the initial years of cultivation, seem to give a significant increase in growth. There is, also, some indication that the addition of phosphorus and potash might be of value.

Organic Soils (O.):

There are 109,000 acres of Organic soils mapped. Many of the areas are in the depressional spots within the larger sandy areas.

CHEMICAL AND PHYSICAL ANALYSES

Tables 10, 11, 12, 13, and 14 report certain chemical and physical analytical data pertaining to the principal soil Groups that occur in the Edmonton sheet area. In these tables the soil series are grouped on a parent material basis. This makes it possible to compare the pedogenic effect of the different soil forming processes. In the following discussion the characteristics of each of the analyses reported will be summarized in a general way as they apply to the area as a whole. Some data that are not reported in the tables will also be discussed.

pH (1)*

Most of the pH's reported fall between 5.5 - 8.0. Only three soils have a pH of over 8.0, namely, the Csk of the Duagh (Solonetz) and Wetaskiwin (Solodized Solonetz) and the C of the Whitford (Alkali Solonetz).

The following table shows the average pH's of the A, B, and C horizons of some of the Sub-Groups that occur in the Edmonton sheet area. There are exceptions but most of the profiles analysed fall within the average range as reported below.

Soils	Horizon		
	A	B	C
Chernozmic soils			
Orthic Black	Slightly Acid	Neutral	Moderately Alkaline
Eluviated Black	Slightly Acid	Slightly Acid	Mildly Alkaline
Dark Grey	Slightly to Medium Acid	Medium Acid	Neutral
Podzolic Soils			
Dark Grey Wooded	Slightly Acid	Medium Acid	Mildly Alkaline
Grey Wooded	Slightly Acid	Strongly Acid	Mildly Alkaline
Solonetzic Soils			
Solodized Solonetz	Medium Acid	Neutral	Mildly to Moderately Alkaline
Solonetz	Medium Acid	Slightly Acid	Mildly to Moderately Alkaline
Gleysolic Soils			
Low Humic Eluviated Gleysol	Medium Acid	Medium Acid	Neutral
Peaty Meadow	Neutral to Mildly Alkaline	Mildly Alkaline	Mildly Alkaline

*This and similarly bracketed numbers in this section of the report refer to the methods of analyses used. These are given on page 60.

Following are the pH ranges for each of the above classes: strongly acid 5.1 - 5.5 medium acid 5.6 - 6.0, slightly acid 6.1 - 6.5, neutral 6.6 - 7.3, mildly alkaline 7.4 - 7.8, moderately alkaline 7.8 - 8.4. It is noted that the C horizons of the soils listed in the above tables are neutral to moderately alkaline. The soils formed on pitted deltaic material are an exception to this; in these the pH is acid to at least six feet.

TABLE 10 - Soils Formed on Medium Textured Glacial Till of Upper Cretaceous Origin

Hori zon	Depth (ins)	pH	%N	C/N	% Exchange Ions H	Na	K	Ca	Mg	CEC me/100g	Mech. Anal. S	Si	C	FC	Text ure	$CaCO_3$ Equiv.
Whitford Loam - A Black Alkali Solonetz																
Ah	0-2	6.1	0.50	12	29	6	3	48	14	21	51	34	15	7	L	
Bnt	2-6	7.3	0.24	14	1	35	1	32	31	37	36	26	38	25	CL	
Csk	6-24	7.9									30	35	35	16	CL	5.4
C	at 30	8.3									50	29	21	9	L	3.5
			90 Meq./l of soluble cations in Csk													
Camrose Loam - A Black Solodized Solonetz																
Ah1	0-6	5.9	0.77	12	24	2	2	53	19	35	35	42	23	8	L	
Ah2	6-10	6.0	0.29	12	37	7	1	35	20	20	42	38	20	10	L	
Ae	10-12	6.6	0.06	12	18	16	2	30	34	12	36	49	15	6	L	
Bnt	12-18	7.3	0.11	11		20	2	31	47	28	25	38	37	14	CL	
Bm	18-26	7.9	0.05	12		18	2	37	43	25	40	31	29	9	CL	
Ck	26-36	7.9									44	30	26	6	L	4.3
Csk	36-50	7.8									45	31	24	7	L	4.5
C	at 60	7.7									44	33	23	6	L	2.9
			50 Meq./l of soluble cations in Csk													
Thorsby Loam - A Dark Grey Solodized Solonetz - Dark Grey Solod intergrade																
Ah	0-3	6.1	0.56	12	18	2	3	64	13	34	51	28	21		L	
Ahe	3-7	5.5	0.14	12	48	5	2	35	10	13	25	58	17		SiL	
Ae	7-8	5.6	0.05	11	57	8	2	22	11	7	27	60	13		SiL	
Bt	8-20	5.3	0.06	18	14	13	2	48	23	29	26	24	50		C	
BC	20-36	7.7									36	35	29		CL	1.3
Ck	at 44	7.8									43	31	26		L	5.1
Dnister Loam - A Grey Wooded Solodized Solonetz																
H-Ah	0-2	5.8	0.34	17	47	8	2	30	13	40	25	43	32	8	CL	
Ae	2-6	6.2	0.04	8	31	16	Tr	47	4	4	34	55	11	3	SiL	
Bnt1	6-14	6.4	0.04	8	9	19	1	52	18	16	40	29	31	16	CL	
Bnt2	14-25	7.5	0.02	8		23	2	56	19	21	41	22	37	19	CL	
Csk	25-40	8.2									45	24	31	13	CL-SCL	4.6
C	40-60	8.2									42	24	34	16	CL	2.8
Angus Ridge Loam - An Eluviated Black																
Ah	0-13	6.6	0.56	13	7	1	2	79	11	40	33	38	29	12	CL	
Ahe	13-19	5.6	0.19	12	26	1	1	52	20	21	39	39	22	10	L	
Ae	19-22	5.6	0.06	11	18	2	1	54	25	11	44	41	15	7	L	
Bt	22-40	5.2	0.04	10	10	1	1	56	32	19	47	26	37	14	SCL	
Bm	40-50	6.5			2	2	1	61	34	18	44	33	23	9	L	
Ck	at 60	7.8									43	31	26	9	L	6.4
			5 Meq./l of soluble cations in Ck													

TABLE 11 - Soils Formed on Fine Textured Lacustrine Material

Horizon	Depth (ins)	pH	%N	C/N	% Exchange Ions H	Na	K	Ca	Mg	CEC me/100g	Mech. Anal. S	Si	C	Texture	$CaCO_3$ Equiv.	Hyd. Cond.
Duagh Silty Clay Loam - A Black Solonetz																
Ah	0-5	5.3	1.00	12	26	10	3	36	25	42	10	52	38	SiCL		5.00
Btn1	5-12	5.8	0.25	10	8	18	3	18	53	44	5	19	76	C		0.01
Btn2	12-16	7.7	0.07			31	3	22	44	38	4	18	77	C		0.01
Csk	16-24	8.0									3	43	54	SiC	5.0	0.20
C	at 48	7.7									4	18	78	C		0.05
					100 Meq./l of soluble cations in Cs											
Thin Wetaskiwin Silt Loam - A Black Solodized Solonetz																
Ah	0-5	5.6	0.52	11	33	7	3	38	19	28	28	52	20	SiL		1.40
Ae	5-7	5.5	0.17	12	39	19	4	17	21	19	19	59	22	SiL		2.60
Bt1	7-13	6.9	0.14	12	4	38	3	16	39	21	21	44	35	CL		0.01
Bt2	13-24	7.7				39				14	14	48	38	SiCL		0.01
Csk	24-36	8.3				39				11	11	55	34	SiCL	5.3	
C	at 60	8.0				32				28	27	45	28	CL	2.7	0.02
					180 Meq./l of soluble cations in Cs											
Malmo Silt Loam - An Eluviated Black																
Ah	0-5	6.3	0.67	13	10	0	6	64	20	37	23	54	23	SiL		2.20
Ahe	5-9	5.5	0.44	13	25	1	5	49	20	29	38	38	24	L		1.50
Bt1	9-16	5.4	0.10	17	18	1	2	51	28	27	27	34	39	CL		1.10
Bt2	16-24	5.7			10	2	2	50	30	23	22	44	34	CL		0.60
Ck	24-36	7.3				2					35	39	26	L	3.9	0.40
C	at 60	7.6				11					42	33	25	L	2.0	0.05
					30 Meq./l of soluble cations in C											
Maywood Silt Loam - An Orthic Grey Wooded																
L-H	4-0	6.8	1.08	14												
Ae	0-7	6.6	0.06	12	13		7	60	20	11	27	61	12	SiL		0.20
AB	7-10	5.4	0.06	13	9	1	3	55	32	31	18	33	49	C		0.50
Bt1	10-15	5.2	0.05	16	8	1	2	56	33	39	11	20	67	C		0.06
Bt2	15-30	5.6	0.04	18	4	1	1	58	36	38	13	24	63	C		0.01
Ck	30-36	7.6									5	31	64	C	7.5	0.60
C	at 48	7.6									3	16	81	C	14.1	
					7 Meq./l of soluble cations in C											

TABLE 12 - Soils Formed on Coarse to Medium Textured Water and Wind Lain Material

Hori zon	Depth (ins)	pH	%N	C/N	% Exchange Ions H	Na	K	Ca	Mg	CEC me/100g	Mech. Anal. S	Si	C	FC	Text ure	$CaCO_3$ Equiv.
Ponoka Silt Loam - An Orthic Black - Eluviated Black intergrade																
Ah	0-18	7.3	0.42	11	5	1	2	77	15	34	7	66	27	10	SiL	
Bt	18-28	6.3	0.07	11	5	1	1	66	27	23	4	61	35	16	SiCL	
Bm	28-40	6.5	0.06	11	4	1	1	66	28	19	1	76	23	10	SiL	
BC	40-60	6.8	0.06	11	2	2	1	67	28	19	2	75	23	8	SiL	
Ck	at 65	7.6									1	82	17	6	SiL	1.5
			4 Meq./l of soluble salt in Ck													
Peace Hills Sandy Loam - An Orthic Black - Eluviated Black intergrade																
Ah	0-15	7.2	0.18	14	1	Tr	3	83	13	21	64	20	16		SL	
Ahe	15-18	7.0	0.07	13	4	1	3	76	16	12	65	19	16		SL	
Bt	18-30	6.3	0.04	11	6	1	2	74	17	13	59	22	19		SL	
Ck	30-48	7.7									66	17	17		SL	4.3
IICk	48-60	7.7									32	39	29		CL	10.2
Culp Loamy Sand - An Orthic Grey Wooded																
L-H	2-0	(Not Analysed)														
Ae	0-14	6.1	0.03	12	19	Tr	4	58	19	5	81	12	7	1	LS	
Bt1	14-20	6.9	0.04	10	3	2	4	73	18	17	71	6	23	14	SCL	
Bt2	20-40	6.5	0.02	12	12	3	3	63	19	9	85	5	10	6	LS	
Ck	40-60	7.9									88	3	9	5	LS	12.2
C	60-84	7.9									88	4	8	5	LS	8.9

TABLE 13 - Soils Formed on Till of Edmonton Formation Origin

Hori zon	Depth (ins)	pH	%N	C/N	% Exchange Ions H	Na	K	Ca	Mg	CEC me/100g	Mech. Anal. S	Si	C	FC	Text ure	$CaCO_3$ Equiv.	Hyd. Cond.
Beaverhills Loam - An Orthic Black																	
Ah	0-10	5.9	.39	11	14	1	2	72	11	32	42	38	20	12	L	-	1.4
Btj	10-22	6.0	.10	8	7	1	1	72	19	20	48	31	21	12	L	-	1.2
Bm	22-30	7.3								21	45	32	23	13	L	0.8	.8
Ck	30-40	7.9								15	57	26	17	8	SL	4.9	1.3
C	at 40	7.8								16	49	31	20	13	L	4.4	
Falun Loam - A Dark Grey - Dark Grey Wooded intergrade																	
L-H	1-0	6.4	2.10	16	3	Tr	3	84	10	109							
Ah	0-4	6.0	0.37	13	14	Tr	3	70	13	25	49	31	20		L		1.3
Ahe	4-12	6.3	0.10	11	12	1	1	68	18	11	57	29	14		SL		1.7
Ae	12-14	6.2	0.03	9	8	Tr	1	59	32	8	48	36	16		L		0.3
Btl	14-29	6.2	0.04	11	5	Tr	1	51	43	24	43	21	36		CL		0.1
Bt2	29-45	6.7	.03	14	1	1	2	60	36	23	41	23	36		CL		0.1
Ck	45-60	7.6									43	26	31		CL	7.2	0.2
C	at 72	7.6									44	24	32		CL	5.5	0.3
Uncas Loam - A Dark Grey Wooded																	
L-H	2-0	6.4	1.90	19	3	2	2	73	20	102							
Ahe	0-4	6.2	0.22	14	12	1	2	73	12	20	58	28	14		SL		3.9
Ae	4-7	6.1	0.05	9	11	Tr	2	68	18	8	55	31	14		SL		0.2
Btl	7-11	5.3	0.04	10	10	1	1	70	19	21	40	23	37		CL		0.2
Bt2	11-27	5.0		11	9	1	1	69	20	22	41	23	36		CL		0.8
Ck	27-48	7.4									47	26	27		CL	7.4	0.2
C	at 60	7.6									48	25	27		SCL	7.1	0.1
Cooking Lake Loam - An Orthic Grey Wooded																	
L-F	3-1	6.4	1.86	17	8	1	3	84	4	108							
H	1-0	5.2	1.22	19	32	1	4	52	10	66							
Ae	0-5	6.1	0.08	15	15	2	2	66	15	10	32	53	15	3	SiL		
Btl	5-11	4.8	0:08	13	12	1	2	62	22	24	20	38	42	16	C		
Bt2	11-24	4.2	0.04	13	22	2	2	43	31	21	41	24	35	17	CL		
BC	24-30	7.1			0	1	1	76	22	36	40	26	34	13	CL	4.3	
Ck	at 48	7.5									40	29	31	12	CL	6.9	
Demay Loam - A Low Humic Eluviated Gleysol																	
L-H	3-0	6.1	1.83	17													
Ahe	0-2	5.7	0.11	12	21	2	5	63	9	11	46	41	13	4	L		
Aeg	2-8	5.9	0.03	11	15	2	6	60	15	5	45	45	10	3	L		
ABg	8-13	5.7	0.03	9	10	1	4	65	19	13	54	24	22	14	SCL		
Btg1	13-22	5.5	0.05	11	11	1	2	66	22	23	31	32	37	21	CL		
Btg2	22-30	5.7	0.04	14	7	1	1	67	23	22	39	27	34	-	CL		
Ckg	at 30	7.6									42	30	28	15	CL	3.9	

TABLE 14 - Soils Formed on Pitted Deltaic Material

Hori zon	Depth (ins)	pH	%N	C/N	% Exchange Ions H	Na	K	Ca	Mg	CEC me/100g	Mech. Anal. S	Si	C	FC	Text ure	Hyd. Cond.
Winterburn Loam - An Orthic Dark Grey																
Ahej	0-18	6.2	0.17	13	16	1	2	67	14	20	36	50	14		L	1.6
Ahe	18-32	6.1	0.06	14	17	1	2	60	20	12	53	35	12		SL	1.2
Bt	32-40	5.8	0.05	10	7	1	2	65	25	22	6	69	25		SiL	0.5
Bm	40-70	6.1	0.04	10	7	1	1	65	26	18	3	78	19		SiL	0.3
C	at 75	6.2			7	1	1	65	26	16	11	74	15		SiL	0.3
Carvel Silt Loam - A Dark Grey Wooded																
Ahe1	0-4	5.8	0.13	12	18	2	2	63	15	17	36	50	14	5	SiL	
Ahe2	4-14	5.9	0.06	18	14	1	3	67	15	14	36	49	15	5	L	
Ae	14-20	5.7	0.04	11	17	2	3	60	18	11	36	50	14	5	SiL	
Bt1	20-26	5.2	0.05	10	10	2	4	64	20	19	18	58	24	10	SiL	
Bt2	26-48	5.4	0.03	9	9	2	3	63	23	16	24	55	21	8	SiL	
C	48-70	5.7			11	2	2	58	27	12	32	56	12	3	SiL	
Glory Loam - An Orthic Grey Wooded																
L-H	2-0	6.5	1.12	17	7	Tr	2	75	16	69						6.6
Ael	0-8	6.1	0.08	13	19	1	4	50	26	10	50	41	9		L	0.5
Ae2	8-16	5.9	0.04	9	16	1	4	52	27	7	57	34	9		SL	0.7
Bt1	16-22	5.2	0.04	10	14	1	2	54	29	13	53	29	18		SL	0.2
Bt2	22-40	5.1	0.04	11	10	Tr	1	59	30	17	28	52	20		SiL	0.1
C	40-70	5.5			8	Tr	1	55	36	16	32	48	20		L	0.2

Note 1 - Rarely is lime found within six feet.
Note 2 - Less than 3 Meq./l of soluble cations in the C horizon.

Nitrogen (2)

It is noteworthy that the surface (Ah) horizon of the Solonetzic soils have a high nitrogen content. This is characteristic. However, on a total profile basis the Orthic Black soils contain the most nitrogen and organic matter: for example, the Ponoka loam (Orthic Black) has 7.0 per cent organic matter in the surface foot, Wetaskiwin loam has 3.0 per cent, and Cooking Lake loam (Orthic Grey Wooded) has only 1.4 per cent organic matter in the top foot of mineral soil. The C/N ratio in the mineral soils is, in nearly all cases, between 10 and 13; a few of the B horizons in the eluviated soils have a C/N ratio of 17 or 18.

Exchangeable Ions (3, 4, 5)

Total exchange capacity, in general, increases with increased clay content and/or organic matter content. Consequently, the sandy soils and the leached (Ae) horizons of the eluviated soils generally have the lowest exchange capacity.

The Solonetzic soils have a high percentage of exchange acidity in the Ah horizon. This is reported as exchangeable hydrogen. The relatively high percentage of exchangeable acidity carries far down the profile in the Carvel and Glory (Grey Wooded) soils. In these soils there is no free lime to at least six feet; the exchange-

able calcium is, however, over 50 per cent. In the Chernozemic and Podzolic soils exchangeable calcium makes up between 50 and 80 per cent of the exchangeable ions. In the Solonetzic soils reported the exchangeable calcium is less than 50 per cent throughout excepting in the Ah horizons of the Camrose and Thorsby soils. In these latter two soils exchangeable magnesium is between 30 and 40 per cent in the B horizons and between 10 and 20 per cent in the Ah horizons. In most of the soils magnesium makes up between 15 and 30 per cent of the total exchangeable cations.

Exchangeable sodium ranges from 15 to 40 per cent in the B and C horizons in all the reported soils of the Solonetzic Order. The C horizon of the Malmo silty clay loam, an Eluviated Black, has 11 per cent exchangeable sodium. This soil is usually found associated with Solonetzic soils and it can be postulated that it is a regraded Solod. All the other soils reported have a very low percentage of exchangeable sodium—from a trace to three per cent.

The percentage of exchangeable potassium is relatively low. In most of the soils it amounts to 2 to 3 per cent of the total exchangeable cations.

Mechanical Analyses (6, 7)

The mechanical analyses data reported indicate that there is a definite clay accumulation horizon (Bt) in practically all of the soils and particularly so in the Solonetzic soils and Grey Wooded soils. This clay bulge is usually more significant if the fine clay fraction is considered. In the tables 10, 12, 13, and 14 FC means fine clay—less than 0.0002 mm. In the Grey Wooded soils and Solod soils the illuvial clay appears to be distributed over a considerable depth.

Carbonate (8)

With the exception of the soils formed on the pitted deltaic material free lime was found within five feet of the surface. In practically all of these there is from 3 - 6 per cent calcium carbonate equivalent in the Ck horizon. Other data, not reported, indicate there are about two of calcium carbonate to one of magnesium carbonate.

Hydraulic Conductivity (9)

Hydraulic conductivity is the rate at which water passes through the soil under a constant head of water and has the dimensions of velocity. It is expressed in tables 11, 13 and 14 as inches per hour. The greater the hydraulic conductivity the more permeable the soil. Hydraulic conductivity is, in general, inversely related to clay content and to the amount of sodium present, and directly related to the per cent of non-capillary pore space. Most of the non-Solonetzic clayey soils are highly saturated with calcium, have a well developed pedogenic structure, and are relatively permeable to water. Table 11 shows how relatively impermeable the Bt horizon of the Solonetzic soils is when compared, for example, with the B horizons of the Chernozemic soils. Other analyses indicate that the Solonetzic soils have an air to water permeability ratio of over 1,000 in the Bt

horizon. By way of comparison the ratio for the Bt of the Malmo (also fine textured but Eluviated Black) is 20, and for the Bt of Elnora (an Orthic Black soil on clay loam till) it is 10 or less.

Volume Weight

Limited data, not reported, indicate that the average volume weight of the A horizons of the soils of this area is 1.0; of the B horizons 1.5 to 1.7; and of the C horizons 1.6 to 1.7. There is little difference between soil Orders or Groups. There are, however, significant differences between soil types. Fairly frequently the volume weight of the B horizon of Solonetzic soils is slightly higher than the C horizon.

Shrinkage

Shrinkage in the soils of this area is directly related to the percentage and kind of clay in the soil. Limited analyses indicate that up to 50 per cent of the clay faction of some soils is montmorillonite. Illite is subdominant and kaolinite is present in only trace amounts. In the Ae horizons of some eluviated soils these three minerals are in about equal amounts. Soils high in montmorillonite have the highest shrinkage: the B and C horizons of the Duagh, Wetaskiwin, Malmo soils have a shrinkage of up to 40 per cent. Extensive cracking is very evident in these soils during dry periods. Conversely the Ae horizon of the Grey Wooded soils cracks little when dry and cultivated fields often crust over when the soil dries out after a heavy rain that has puddled the surface.

Phosphorus (10, 11)

The total amount of phosphorus in the C horizons does not vary greatly from one soil to another. There is, however, considerable variation between A horizons. Average data for the soils of the mapped area show the following percentage of total phosphorus (elemental):

	A Horizon	C Horizon
Solonetzic soils	0.12%	.05%
Chernozemic soils	0.07%	.05%
Podzolic soils	0.05%	.05%

In general, phosphorus is in limited supply in the Podzolic soils. Most of the phosphorus in the A horizons of the Solonetzic and Chernozemic soils is tied up with organic matter and hence is only slowly available to plants. It is therefore logical that most of these soils will respond to the application of phosphatic fertilizers, particularly after the initially available phosphorus has been used up by the crops.

Potassium (12)

Total potassium varies little among soils. Limited analyses indicate that, on the average, there is 1.2 per cent K (elemental) in the A horizon and 1.4 per cent in the B and C horizons. Most of this is relatively insoluble. This plus the small amount of exchangeable K suggests that potash may become a limiting factor to crop growth, particularly for such crops as legumes and root crops that have a high potassium requirement.

Soluble Salts (9)

The underlying bedrock in the map area varies from fresh-water sandstone to marine shale: the first is relatively salt free; the second is usually quite saline. Since the ground moraine left by the glacier is usually over 50 per cent of local origin its salt content reflects the characteristics of the underlying rock. The east half of the map area is, in general, much more saline than the west half. This is due mainly to the high admixture of Bearpaw and Grizzly Bear shales in that portion of the till mantle. The post glacial sorting that took place formed areas of lacustrine deposition and of alluvial deposition: the former are often saline, the latter usually low in salt.

The percolating rain water tends to leach the soluble salts into the C horizon and therefore in the moderately to well drained soils the A and B horizons are relatively salt free. Salts are often found at or near the surface in the depressional areas, particularly in the eastern portion of the area. Generally, these have remained in native pasture. Table 15 gives the salt analyses of the C and Csk

TABLE 15.—Soluble Salt in the C Horizon of some of the more Common Soil Series and in the Csk Horizon of some Solonetz Soils

	Cations meq./l.			Anions meq./l.			
	Ca	Mg	Na	SO_4	Cl	HCO_3	CO_3
C Horizon							
Whitford	Tr	1	17	12	....	4	....
Duagh	26	8	27	58	Tr	2	....
Camrose	16	17	35	62	....	4	....
Wetaskiwin	19	26	140	182	1	3	....
Angus Ridge	2	2	1	2	....	3	....
Malmo	3	3	8	11	Tr	3	....
Ponoka	2	1	0.5	1	....	3	....
Cooking Lake	2	2	1.5	1.5	....	5	....
Uncas	1	2	0.5	1	....	4	....
Falun	2	1	1	1	1	4	....
Navarre	1	2	2	1	Tr	3	....
Maywood	0.5	Tr	Tr	Tr	Tr	1	....
Csk Horizon							
Whitford	17	14	60	85	....	2	....
Duagh	18	25	65	103	1	4	....
Camrose	11	7	12	31	....	5	....
Wetaskiwin	18	59	216	290	1	5	....

horizons of some soil types found in the Edmonton sheet. The Solonetzic soils have a high concentration of sulphates in the C and Csk horizons, most of which is sodium sulphate with lesser amounts of calcium and magnesium sulphate. The salt concentration in the Duagh and Wetaskiwin soils is much higher than in the Whitford and Camrose soils. The former soils are formed on fine textured material whereas the latter two are developed on medium textured glacial till. The Chernozemic and Podzolic soils have low concentrations of salt in the C horizons.

There are relatively no chlorides found in this area. The bicarbonate content is low: it ranges from 2 to 5 milliequivalents per liter throughout the Groups and throughout the profile.

Sulphates and Total Sulphur (13)

Large amounts of sulphur (as sulphate) are found in the Solonetzic soils of this area as shown in Table 15. In most of the other soils it is found but in lesser amounts. The glacial tills that are

primarily of Edmonton formation origin contain considerable sulphate: those that were formed primarily from Paskapoo formation bedrock are usually quite low in sulphate. The parent materials of Breton loam, Modeste loam, and Falun loam (the first two are Grey Wooded, the last one is Dark Grey) are closely associated with the Paskapoo formation. These soils are very low in sulphates, usually less than 1 milliequivalent per liter, and have responded to the application of sulphur fertilizers. Cooking Lake loam (Grey Wooded), derived mainly from the Edmonton formation, has given variable response to the application of sulphur.

Mineralogical analyses of Breton and Cooking Lake soils showed that Breton loam contained only traces of anhydrite whereas Cooking Lake loam contained some traces of anhydrite, gypsum, and barite.

Total sulphur analyses of a Breton loam (Grey Wooded) show that there is less than .01 per cent sulphur throughout the various horizons of the profile. A Malmo soil (Eluviated Black on fine textured material) has over .05 per cent in the A horizon but only 0.01 per cent in the B horizon.

METHODS OF ANALYSIS

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HOW TO USE THE MAP AND REPORT

The soils of the Edmonton sheet were mapped on a soil series basis; that is, the major soil types were identified and named. The name given to a soil type is usually a place name where this soil is of dominant occurrence. Rarely does one soil type occur in an area to the exclusion of all other types; more often two or more types occur in intimate association. Where more than one profile type occurs in one mapped area, the approximate percentage of each type is shown on the soil map.

The soil map, on the scale of one inch equals two miles, is an integral part of this report. It shows the location and extent of the different soil types, as well as indicating the main topographical features. The soil series name, along with the texture, are shown for each area outlined on the soil map.

The following steps are suggested in using this report and map:

(1) determine the soil types in the particular area concerned;
(2) refer to the legend on the map;
(3) read the description in the report;
(4) refer to the "Characteristics and Use" table in the pocket of the report.

In this way the reader will get a description of the soil type and relatively detailed information on the factors related to its management.

The soil map and report should be kept and used together: one supplements the other.

Accompanying this report is a soil rating map of the Edmonton sheet. This divides the mapped area into six classes, or groups, one non-arable and five arable. **This rating map should be regarded as an average rating for a soil area rather than specific rating for individual land parcels.** This is particularly applicable in mixed areas. Here the area is given an average rating. A somewhat more specific parcel rating could be obtained by determining the soil series of the parcel and then applying the rating given this series in the "Characteristics and Use" table.

The data used in the compilation of the rating map are based mainly on the physical characteristics of the area. Such physical data as soil type, degree of stoniness, topography, rainfall and rainfall variability, were all taken into consideration. Economic factors such as distance from market were not considered, nor were such factors as hail incidence or a local frost hazard.

It is practically impossible to set any definite productivity limits for these groups. It is also recognized that, particularly in the Grey Wooded Zone, some types of crop will produce much better than others. For example, a soil might grow a poor wheat crop but produce a fairly good legume seed crop. Also, it has been shown that with suitable crop rotations and fertilization very good crops of legume hays and cereal grains can be produced on Grey Wooded

soils. In general, however, the ratings given reflect the "natural" ability of the soil to produce. Using wheat production as a measuring stick, Group Four soils are classed as poor to fair arable, since over a long period of years they have produced less than 12 bushels of wheat per seeded acre per year. Group Five soils have produced 12 to 16 bushels of wheat per acre; Group Six, 16 to 20 bushels per acre; Group Seven, 20 to 28 bushels per acre; and Group Eight, over 28 bushels per acre. The Pasture and Woodland Group contains those soil areas which are deemed best left in their native state. Put another way, Group Four soils have produced about three-quarters of a ton of dry matter per acre per year; Group Eight soils about two to three tons.

TABLE 16—Acreage of the Various Soil Rating Classes on the Edmonton Sheet

Class	Acreage	Per Cent of Area
8 (VG - Ex)	112,000	3.1
7 (G - VG)	1,018,000	27.9
6 (FG - G)	1,147,000	31.4
5 (F - FG)	661,000	18.1
4 (P - F)	313,000	8.6
Pasture and Woodland	238,000	6.5
Water	126,000	3.5
City of Edmonton (1959)	35,000	.9

FARM PRACTICE

There are 56 soil series mapped in the Edmonton sheet area. Each series has recognizable and definable characteristics that differentiate it from all the others. The agronomic significance of each of these characteristics is well known in some cases; in others it is not yet fully understood. In general, however, each has some effect on the soil's response to management practices and on its ability to produce plant growth. The greatest and most profitable growth can be obtained from a soil by: (1) methods of cultivation that maintain good tilth, maintain a desirable water regime, and prevent erosion; (2) supply artificially plant food elements that naturally are in limited supply; and (3) growing crops that are best suited to the particular characteristics of the soil.

To assist in the better management of the soils of this area a table has been prepared entitled: "Characteristics of the Soils of the Edmonton Area and their Management and Use". This is in the map pocket. It summarizes what is presently known regarding the utilization of the soil series that appear on the soil map.

The following are some additional sources of information:

1. The local District Agriculturist.
2. The Department of Soil Science, University of Alberta, Edmonton.
3. The Sub-Station, Canada Department of Agriculture, Vegreville.
4. The Experimental Farm, Canada Department of Agriculture, Lacombe.

5. The current publications of The Alberta Advisory Fertilizer Committee, The Alberta Varietal Zonation Committee, and The Alberta Forage Crops Advisory Committee: (Alberta Department of Agriculture, Edmonton).

GLOSSARY

Soil Horizon Nomenclature

Organic Horizons

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

F—An organic layer characterized by an accumulation of partially decomposed organic matter. The original structures are discernible with difficulty. Fungi mycelia often present.

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

Master Mineral Horizons

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 eluviated of clay, iron, aluminum, and/or organic matter (Ae);

(3) horizons dominated by (1) and (2) but transitional to underlying B or C (AB or A and B);

(4) horizons markedly disturbed by cultivation or pasture (Aa).

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, Bf);

(3) the 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 the overlying and/or underlying horizons in the same sequum (Bmf);

(5) a prismatic or columnar structure characterized by presence of exchangeable sodium (Bn).

C—A mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting

(1) the process of gleying, and (2) the accumulation of dolomite and salts more soluble in water (Ck, Cs, Cg, and C).

Lower Case Suffixes

a—A layer disturbed by man's activities; i.e. by cultivation and/or pasturing. Used only with A.

e—A horizon characterized by the removal of clay, iron, aluminum or organic matter. Usually lighter colored than the layer below (eluviated).

f—A horizon enriched with hydrated iron. It has a chroma of 3 or more and is redder than the horizon above or below.

g—A horizon characterized by reduction and grey colors; often mottled.

h—A horizon enriched with organic matter. It must show at least one Munsell unit of value darker than the layer immediately below. When used as the only suffix to B (Bh) this horizon must contain ten per cent or more of organic matter.

j—A horizon whose characteristics are weakly expressed.

k—A horizon enriched with carbonate.

m—A horizon characterized by the loss of water soluble materials only. Usually slightly altered by hydrolysis and/or oxidation (mellowed).

n—A horizon containing over fifteen per cent exchangeable sodium or more exchangeable sodium plus magnesium than calcium.

s—A horizon enriched with salt including gypsum.

t—A horizon enriched with silicate clay.

Notes

1. Lithologic changes are indicated by Roman Numeral prefixes (I to be assumed).
2. Horizon subdivisions are shown with Arabic Numerals used as suffices.
3. If more than one lower case suffix is required and if one only is a weak expression then the j is linked to that suffix with a bar, i.e., Ahe$\bar{j}$.

A complete outline of the soil classification system and of the horizon designations can be found in the February 1960 report of the National Soil Survey Committee of Canada.

Types of Parent Material

1. Aeolian deposits: Medium to coarse textured stone free deposits that usually occur in dune like topography.
2. Alluvial deposits: Medium to coarse textured deposits (often gravelly). Usually these occur on level to gently undulating topography.

3. Alluvial aeolian deposits: These are areas where both alluvial and aeolian deposited materials occur: usually areas where part of the material that was originally deposited by moving water has been resorted by wind action.
4. Alluvial lacustrine: Medium textured fairly uniform deposits that usually occur on level to gently undulating topography.
5. Lacustrine deposits: Fine textured, stone free, uniform deposits that are usually on depressional to very gently sloping topography.
6. Outwash deposits: Coarse textured materials (often very gravelly) usually on fairly level topography.
7. Pitted deltaic: Usually crossbedded sands and silts. The area contains many closed depressions created by the melting of buried, or partly buried, blocks of ice that remained after sedimentation had ceased. The topography is of the hump and kettle variety; the slopes being fairly steep but smooth.
8. Residual material: This, as used by the Soil Survey, refers to areas where the underlying bedrock is at, or is very close to, the surface. Surface stones may occur if the original till mantle has been eroded off. The topography is usually gently undulating.
9. Till: A heterogeneous mixture of stones, gravel, sand, silt, and clay, and usually on undulating to hilly topography.

Miscellaneous Terms

Available plant food: Plant nutrients in soluble form, readily available to the plant roots.

Calcareous material: Material having a significant amount of lime carbonate.

Cleavage: The capacity of the soil on shrinkage to separate along certain planes more easily than on others.

Complex: A mixture of soil series or types which cannot be indicated separately on the map at the scale used.

Friable: Easily crushed with the fingers, non-plastic.

Horizon (Soil): A layer in the soil profile approximately parallel to the land surface with more or less will defined characteristics. They are produced through the operation of soil building processes.

Impervious material: Materials which resist the passage of drainage water and plant roots.

Lime: As used in the profile description it means calcium carbonate, magnesium carbonate, and calcium-magnesium carbonate.

Peat: Unconsolidated soil material consisting largely of undecomposed to partially decomposed organic matter accumulated under conditions of excessive moisture.

pH: A measurement of relative acidity and alkalinity in soil and other materials. A pH of 7.0 indicates neutrality, higher values indicate alkalinity and lower values indicate acidity (sourness).

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

Series (Soil): A group of soils having horizons similar in distinguishing characteristics and arrangement in the profile, except for the texture of the surface soil, and formed from the same parent material.

Solum: That part of the soil profile influenced by climate and vegetation.

Structure (Soil): The arrangement of soil particles into aggregates. Often one type of aggregation occurs within another; for example, columnar structures can often be broken down to a blocky structure. In this case the columnar structure is called the macrostructure and the blocky structure the mesostructure.

The following structures are recognized in this report:

Blocky: Block-like aggregates with angular corners.

Columnar: Fairly large aggregates with the vertical axis usually considerably longer than the horizontal axis and with well defined edges. The tops may be rounded. Usually hard.

Granular: Aggregates more or less rounded and with smooth faces. Usually friable.

Massive: Large cohesive masses of soil with ill defined irregular cleavage faces.

Platy: Thin plates or aggregates in which the horizontal axis is longer than the vertical.

Prismatic: Fairly large friable aggregates with the vertical axis longer than the horizontal axis, and with fairly well defined edges. The tops are usually flat.

Texture: This refers to the relative proportion of the various size groups of individual soil grains. Grains larger than 0.05mm. are called sand; grains from 0.05 to 0.002 mm. are called silt; and grains less than 0.002 mm. in diameter are called clay. Soils dominantly sandy are referred to as coarse textured; soils dominantly clayey are referred to as fine textured; those in between as medium textured. Sand, loamy sand, and the sandy loams are coarse textured; loam, silt loam, and most clay loams are medium textured; silty clay loam, some clay loams, and clays are fine textured.

Varving: A succession of thin layers of material usually coarse grained at the base and fine grained at the top.