# Soil Survey of the Whitecourt and Barrhead Area

REPORT No. 27 — ALBERTA SOIL SURVEY

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# Soil Survey

## of the

# Whitecourt and Barrhead Area

By

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**ALBERTA SOIL SURVEY REPORT No. 27**

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COVER: *The Pembina river is joined by the Paddle river near Manola.*

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## ACKNOWLEDGMENTS

The soil survey of the Whitecourt and Barrhead area was con- :ted by the Soils Division, Research Council of Alberta, as part ı joint project involving the Canada Department of Agriculture l The University of Alberta.

The Research Council of Alberta supplied the funds for the d work and data compilation for the survey of this area. The lyses of soil samples were conducted in a common laboratory h funds being supplied by both the Research Council of Alberta . the Canada Department of Agriculture. The University of ıerta provided the office and laboratory accommodation and lertook to publish the report with the assistance of the Alberta ɔartment of Agriculture.

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# PREFACE

The soil survey of the Whitecourt and Barrhead area was begun .963 with the objective of obtaining information about the soils the area. In the accessible portions, soils were inspected at ılar intervals. In the less accessible portions, fewer inspections e made and the information obtained must be considered as liminary.

The soil map, printed on a scale of two miles to one inch, shows location and extent of the different soil areas and indicates main topographical features. The soil rating map shows a gested productivity grouping based on a rating of the soils ıped in the area. The rating indicated on the map and in the ırt should be regarded as an average for the area rather than ific for individual land parcels.


**Figure 1**—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, (21) Edmonton sheet, (22) St. Mary and Milk Rivers Development. (A) Preliminary 58-1, (B) Preliminary 59-1, (C) Preliminary 60-1, (D) Preliminary 61-1, (E) Preliminary 62-1, (F) Preliminary 63-1, (G) Preliminary 64-1, (H) Preliminary 64-2, (23) Cherry Point and Hines Creek area, (24) Buck Lake and Wabamun Lake area, (25) Grimshaw and Notikewin area, (26) Hotchkiss and Keg River area, (27) **(In Black)** Whitecourt and Barrhead area.

**Note:** Reports for areas 1 to 10 inclusive and areas 12 to 14 inclusive are out of print but may be obtained on loan from the University Extension Library, The University of Alberta, Edmonton.

# Soil Survey of the Whitecourt and Barrhead Area

## GENERAL DESCRIPTION OF THE AREA

### LOCATION AND EXTENT

The Whitecourt and Barrhead area comprises the southern half Alberta map sheet 83-J. It extends approximately 80 miles from t to west and 34 miles from north to south. More specifically, area is located between 54° 00′ and 54° 30′ north latitude and ween 114° 00′ and 116° 00′ west longitude. It includes all or ts of townships 58 to 63 between ranges 1 and 14 west of the h meridian. A total of about 1,800,000 acres are included in the pped area which is shown in Figure 1.

**Figure 2—A planing mill at Whitecourt.**

**Figure 3—An oil pumping station near Carson lake.**

## HISTORICAL DEVELOPMENT

The first settlement in this area was at Fort Assiniboine where the North West Company established a trading post in 1825. During the fur trade era, Fort Assiniboine was at the junction of several overland trails and was the terminus of a long portage from Edmonton. By 1859 this trading post was abandoned, but the trails continued in use until the early part of this century. The Fort Assiniboine trail extended from Edmonton to Kinuso, near Lesser Slave lake, and was frequently referred to as the Chalmer's, Dawson or Klondike trail.

The Whitecourt community was established in 1905 by settlers who were initially destined for the Peace River area but stayed at the junction of the McLeod and Athabasca rivers. Rumors of the pending construction of the Grand Trunk Pacific Railway brought in additional settlers. This proposal failed to materialize and it was not until 1921 that the Canadian National Railways completed the rail line to Whitecourt. Whitecourt grew and prospered initially as a centre for the lumber industry and latterly as a base for the oil and gas industry developed in the adjacent area.

Settlement in this area progressed after the turn of the century. The 1901 Census of Canada reports 27 persons in township 58 range 3 west of the fifth meridian. Presumably, some of the early settlers came by way of the Fort Assiniboine trail and occupied land near the Pembina river. In about 1906 another settlement was started in the vicinity of Eastburg in township 59 range 1 west of the fifth meridian. The following 5 year period was marked by an influx of settlers and the development of several new communities. The 1911 Census of Canada shows that more than 1,800 persons resided within the mapped area.

Barrhead, named after a town in Scotland, was founded in 1912 and was initially located 2 miles north and 1 mile east of its present site. The town was relocated to its present site when the railroad arrived in 1927.

Table 1 shows the total population and farm population for each of the census years as compiled from the Census of Canada.

**TABLE 1—Total Population and Farm Population in the Whitecourt and Barrhead Area (1901 to 1966)**

| | 1901 | 1911 | 1921 | 1931 | 1941 | 1951 | 1961 | 1966 |
|---|---|---|---|---|---|---|---|---|
| Total Population | 18 | 1,834 | 4,148 | 7,325 | 10,470 | 10,972 | 13,022 | 13,310 |
| Farm Population | | | 4,094 | 6,995 | 10,216 | 8,366 | 8,199 | 8,252 |

## TRANSPORTATION AND MARKETS

The railways, highways and main secondary roads that form the transportation network for this area are shown on the accompanying soil map. Generally, the settled portions of this area are well supplied with all-weather transportation facilities but frequently the fringe areas have only fair-weather and winter roads. The eastern portion of the map sheet is serviced by both the main line of the

:thern Alberta Railways and by a branch line between Busby Barrhead. The southwestern portion is serviced by the Cana- n National Railways which extends through Blue Ridge and itecourt to the Windfall gas field area.

Barrhead is the largest farm market and trading centre within area. It is a county centre with school, hospital, and grain livestock marketing facilities. Other centres with some similar lities are Whitecourt, Blue Ridge, Greencourt, Manola, and hridge.

## GEOLOGY AND SURFICIAL DEPOSITS

The distribution of the bedrock formations of this area is shown Figure 4. Three formations are recognized within the mapped a — the Paskapoo, the Edmonton, and the Belly River For- ions. Paskapoo, the uppermost formation, is of Tertiary age is found mostly in the western portion of the area. It is rela- ly free of salts and contains a small amount of lime. In the nity of Swan Hills this formation is often capped by a mantle gravel and cobbles consisting of yellowish white, waterworn rtzites up to 8 inches in diameter. This deposit is generally eral feet in thickness. The Edmonton Formation, of Late Creta- us age, is the most extensive in areal distribution. It is found he central and southeastern portions of the area. The Edmonton mation is a brackish water deposit composed of bentonitic sand- e and sandy shales. The Belly River Formation underlies the ionton Formation and is also of Late Cretaceous age. It occurs he northeastern portion of the mapped area and is composed of shales and sandstones of fresh or brackish water origin.

The surficial deposits indicated in Figure 5 consist of till, lacus- e, alluvial, and aeolian materials.

The till in the western portion of this area is brown to olive vn in color and clay loam in texture. It has a relatively low carbonate content and is nonsaline. In some locations it is y stony with numerous yellowish white waterworn quartzites.

The till in the central and eastern portions of this area has acteristics that appear to be fairly closely related to the Ed- ton Formation. It is brown to grayish brown in color, clay in texture, and relatively firm and compact. This till carries able amounts of lime carbonate and salts. Consequently several series that differ in degree of salinity and morphology have mapped in this area.

The lacustrine deposits occur in basins adjacent to the main s and streams. These lacustrine sediments vary from fine ured dark gray clay to moderately fine textured brown and wish brown silt loam and silty clay loam. The thickness of e materials is quite variable ranging from about 2 feet to about eet.

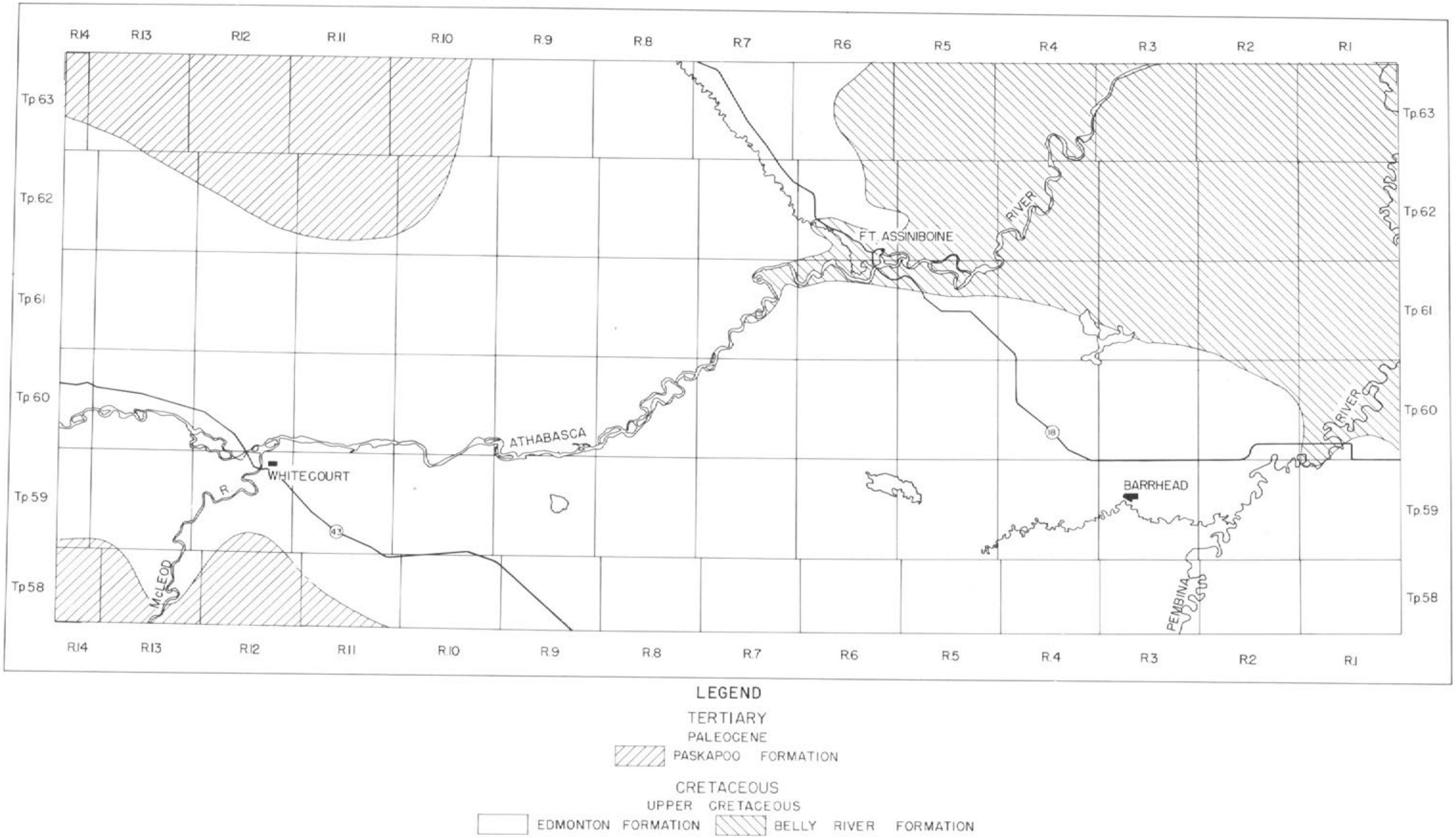
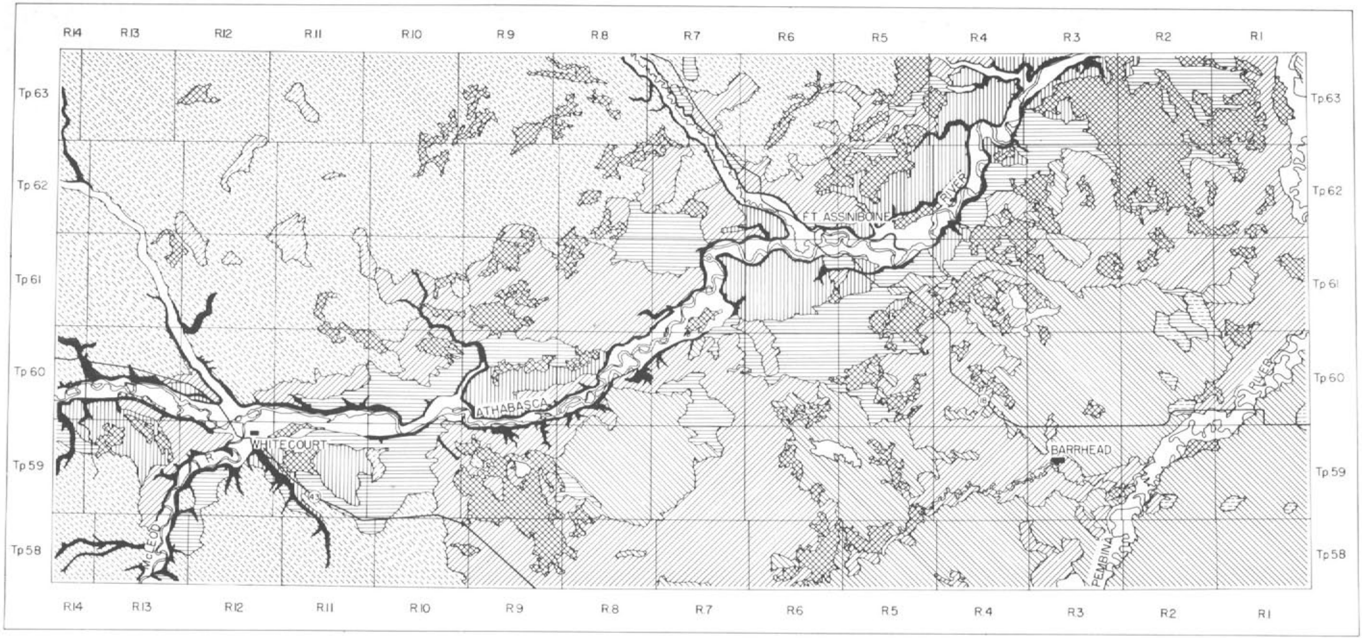



**Figure 4—Map showing the geology of the Whitecourt and Barrhead area. (Canada Geological Survey 951. Geological Map of Alberta, Map 1002A.)**




QUATERNARY

RECENT: Alluvium, Organic soil deposit, Rough broken land, Aeolian

PLEISTOCENE: Lacustrine, Outwash, Till, Edmonton Formation, Till, Paskapoo Formation

TERTIARY

PALEOCENE: Paskapoo Formation

MESOZOIC

UPPER CRETACEOUS: Edmonton Formation

**Figure 5—Map showing the surficial deposits of the Whitecourt and Barrhead area.**

The alluvial deposits of this area are composed of coarse to medium textured materials. They occur as outwash, beaches, thin beds overlying other deposits or as recent deposits on river flats. Generally these deposits occur in a patchy pattern in association with the other surface deposits throughout the mapped area.

The sandy aeolian deposits occur adjacent to the Athabasca river. The sands appear to have been originally deposited by water in the river valley and subsequently reworked by wind.

## PHYSIOGRAPHY AND TOPOGRAPHY

Physiographically the Whitecourt and Barrhead area can be divided into two principal regions—a highland and a lowland. The highland region includes portions of the Swan hills and Whitecourt mountain in the northwestern and southwestern sections of the area. Within the mapped area these prominences rise respectively to about 4,000 and 3,600 feet above the sea level. The lowland region slopes in an easterly direction from the highland. At the eastern edge of the area, the Athabasca and Pembina river valleys occur at an elevation of about 2,000 feet above sea level. In places, the lowland surface is broken by local highlands, some of which rise to 2,800 feet. There is a broad correlation between the physiographic regions and the bedrock geology. The highland region is underlain mainly by the Paskapoo Formation whereas the lowland is underlain by the Edmonton and Belly River Formations.

There is a wide range in topography in the area. The Neerlandia, Vega, and Linaria districts in the northeastern section have level to gently undulating topography interspersed with numerous depressions. The Swan hills area and the Whitecourt district are typified generally by a complex topography in which slopes exceeding 15 percent are not uncommon. Between these two extremes the topography is variable consisting for the most part of complex slopes on a knob and kettle type of terrain. Dunes are associated with the sand areas found adjacent to the Athabasca river.

*Figure 6—Rolling topography in the Romeo lake area.*

**Figure 7—Undulating topography in the foreground and rolling topography in the background near Romeo lake.**

Five topographic classes are shown on the soil map by means ıatching. The topographic classes for the Whitecourt and Barr-d area together with the acreage of each of the classes are wn in Table 2.

**TABLE 2—Topographic Classes with Acreage and Percent Distribution**

| 'lass | Range of Slope % | Symbol | Acreage | Percent of Area |
|---|---|---|---|---|
| to Gently Undulating | 0—2 | b | 671,600 | 38 |
| lating | 2—5 | c | 271,100 | 15 |
| y Rolling | 6—9 | d | 398,700 | 22 |
| ıg | 10—15 | e | 301,700 | 17 |
| | 16+ | f | 38,800 | 2 |
| :ferentiated—rough, broken adjacent to drainage courses | | RB | 47,500 | 3 |

## DRAINAGE

:he mapped area is traversed from southwest to northeast by Athabasca river. The principal tributaries of the Athabasca r are the McLeod, Sakwatamau, Freeman, Paddle, and Pembina rs.

'he valley of the Athabasca river has steeply sloping banks and :ge floodplain which ranges from one-half mile to 2 miles in h. Throughout its course in the mapped area the Athabasca : drops about 200 feet in 70 miles.

'he Paddle and Pembina rivers meander through the south-:rn and eastern sections of the area. These rivers occasionally l over their low banks in years of higher than normal run-off.

here are numerous lakes in the area, the most important of h are Thunder, Romeo, Carson, Baseline, Shoal, and Good-: lakes. Thunder lake is the site of a provincial park and is loped for recreational purposes.

Organic soil areas, which are usually water storage sites, are scattered throughout the area. The greatest occurrence of these soils, however, is found in the Neerlandia and Goodridge lake areas.

**Figure 8—Road flooded in April 1965 by the Paddle river near Manola.**

**Figure 9—Thunder Lake Provincial Park.**

## CLIMATE

The climate of the Whitecourt and Barrhead area is characterized by relatively warm summers and cold winters. Mean monthly records of temperature and precipitation at five recording stations within or near the mapped area are shown in Table 3. Considerable variation occurs within the area but the meteorological records are insufficient to adequately indicate all of these

TABLE 3—Mean Monthly and Annual Temperature and Precipitation at Five Selected Stations Within or Adjacent to the Mapped Area

| | Campsie (51 years) 2,200 ft. | | Meanook (26 years) 2,265 ft. | | Peavine (14 years) 2,279 ft. | | Sion (49 years) 2,315 ft. | | Whitecourt (19 years) 2,430 ft. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Temp. °F | Pptn. inches | Temp. °F | Pptn. inches | Temp. °F | Pptn. inches | Temp. °F | Pptn. inches | Temp. °F | Pptn. inches |
| January | 5.9 | .88 | —8.9 | .81 | 6.3 | 1.04 | 5.6 | .88 | 6.0 | 1.32 |
| February | 9:6 | .84 | 11.3 | .58 | 11.9 | 1.02 | 10.2 | .96 | 10.9 | 1.00 |
| March | 22.2 | .80 | 21.1 | .92 | 22.6 | .66 | 22.3 | .76 | 22.8 | .84 |
| April | 38.3 | .97 | 38.7 | .96 | 37.9 | 1.14 | 38.2 | .82 | 36.4 | .97 |
| May | 49.3 | 1.95 | 52.2 | 2.04 | 50.3 | 1.72 | 50.7 | 1.57 | 48.4 | 2.09 |
| June | 56.0 | 2.85 | 58.6 | 2.71 | 56.2 | 2.76 | 56.1 | 2.88 | 54.6 | 2.77 |
| July | 60.7 | 3.50 | 63.8 | 3.30 | 60.5 | 4.12 | 61.2 | 3.20 | 59.0 | 3.94 |
| August | 57.4 | 2.47 | 60.6 | 2.01 | 58.3 | 2.56 | 57.7 | 1.93 | 56.6 | 3.29 |
| September | 49.0 | 1.23 | 50.8 | 1.32 | 50.3 | 1.30 | 49.9 | 1.06 | 47.9 | 1.42 |
| October | 39.1 | .76 | 38.3 | .91 | 40.5 | .79 | 38.7 | .81 | 38.6 | .74 |
| November | 22.0 | .90 | 22.0 | .72 | 23.3 | .81 | 22.9 | .95 | 20.9 | .80 |
| December | 8.8 | .85 | 9.6 | .62 | 12.4 | .91 | 9.9 | 1.00 | 9.5 | 1.00 |
| Annual | 34.9 | 18.00 | 34.8 | 16.90 | 35.9 | 18.83 | 35.3 | 16.82 | 34.3 | 20.18 |

variations. Consequently a large amount of estimation and interpretation is necessary.*

The mean annual temperature within the area varies from 32 degrees Fahrenheit in the northwestern section to 35 degrees Fahrenheit along the southeastern border. Along the eastern side of the map sheet the mean annual temperature is about 34 degrees Fahrenheit.

The mean summer temperature, May to September inclusive, is about 54 degrees Fahrenheit throughout most of the area but in the northwestern section the mean summer temperature for this period is probably somewhat lower due to the higher elevations.

The mean annual precipitation in this area increases from east to west and ranges from 17 to 21 inches. The mean winter precipitation, October to April inclusive, ranges in a similar manner from 5 to 9 inches. In the months of highest rainfall, June and July, the mean precipitation is 5.5 to 7.5 inches depending on the location. The highest precipitation occurs in the western and northwestern portion of the area.

The average frost-free period for stations in or near the mapped area is shown in Table 4.

**TABLE 4—Frost-free Periods of Selected Stations**

| | Elevation feet | Frost-free period in days Average | Shortest | Longest | No. Years of Records |
|---|---|---|---|---|---|
| Campsie | 2,200 | 69 | 19 | 115 | 51 |
| Peavine | 2,279 | 97 | 61 | 124 | 14 |
| Sion | 2,315 | 78 | 1 | 133 | 49 |
| Whitecourt | 2,430 | 65 | 24 | 89 | 51 |

Since the period for which records are available varies with the individual stations direct comparison between stations is not always possible. There is a decrease in the number of frost-free days from east to west. The land rises in this direction and increases in elevation cause lower temperatures. Generally the average frost-free period within the area ranges from 50 days in the northwestern section to about 80 days in the southeastern section. The first fall frost may occur about August 22, while the date of the last spring frost ranges from about June 10 in the southeastern section to about June 25 in the northwestern region.

*Handbook for Classification of Irrigated Land in the Prairie Provinces. P.F.R.A., Regina, 1964.

## VEGETATION

The mapped area lies within the Boreal Forest region of Canada as described by Rowe.* This area is divided by Moss** into two phytogeographic subregions: the Boreal Forest and the Boreal-Cordilleran transition. The basis for delineating the two subregions

*Rowe, J. S., 1959. Forest Regions of Canada, Canada Department of Northern Affairs and National Resources, Bull. 123.
**Moss, E. H., 1955. Botanical Review 21: 493-567.

is the occurrence of lodgepole pine (*Pinus contorta latifolia*) and balsam or alpine fir (*Abies balsamea or Abies lasiocarpa*). Their occurrence is generally confined to higher altitudes in the western and northwestern sections that are an extension of the Boreal-Cordilleran subregion.

Much of the native vegetation has been destroyed by land clearing and repeated fires. The eastern portion of the area has parkland characteristics and the trees are mostly deciduous. They consist mainly of aspen poplar (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*) with an undergrowth of shrubs and grasses. However, the northwestern portion of the area is fairly heavily forested mainly with lodgepole pine, balsam fir, white spruce (*Picea glauca*) and black spruce (*Picea mariana*). The undergrowth consists primarily of mosses and labrador tea (*Ledum groenlandicum*).

There are many depressional areas that vary from a few acres to a township in size and are occupied by moss and sedge vegetation. The moss bogs usually have an accumulation of sphagnum peat, ranging from about 2 feet to over 10 feet in thickness. This peat is generally acidic, pH 4.0 to 5.0, with a low ash content and a high water-holding capacity, and generally supports a cover of black spruce, larch (*Larix laricina*), willow (*Salix spp.*) and dwarf birch (*Betula glandulosa*). Labrador tea is a common ground cover plant in this type of peat. The sedge peat areas are characterized by a surface cover of sedges (*Carex spp.*) and slough grass (*Beckmannia syzigachme*).

**Figure 10—Coniferous vegetation typical of the upper slopes.**


**Figure 11—Deciduous vegetation typical of the lower slopes.**

# SOILS

## SOIL MAPPING

The soil survey of this area was of a reconnaissance nature and throughout most of the area traverses were made at intervals of 1 mile with soil inspections every half-mile along the lines of traverse. Aerial photographs on scales of 1 inch to 3,333 feet and 1 inch to 2,640 feet were used as an aid in identifying the soil areas and in establishing soil boundaries.

Soil mapping involves the delineation of areas of similar soils. For purposes of identification, these soil entities called *soil series* are given a name which is usually a place name where the soil was first identified or mapped. The interval between traverses and the scale of the final map largely determine the detail of mapping. In reconnaissance survey it is seldom possible to delineate areas consisting of only a single soil series and it is necessary to show areas consisting of two or more soil series. The first named series in these mapped units is the dominant soil in the outlined area.

## SOIL CLASSIFICATION

The classification system used in the Whitecourt and Barrhead area is in keeping with that published by the National Soil Survey Committee of Canada in 1968. The bases of this classification are the morphological, chemical, and physical characteristics of soil profiles.

A soil profile is a cross-sectional sample of a soil body and it usually includes several soil horizons that are approximately parallel to the land surface. Figure 12 shows a schematic diagram of a soil profile with its main horizons.

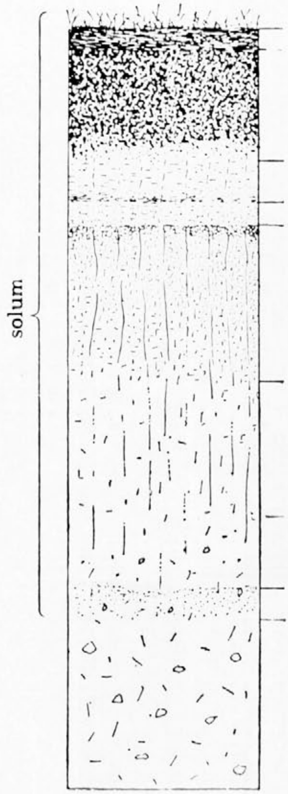



**Figure 12—Diagram of a soil profile showing various horizons.**

The basic unit in the classification system is the *soil series*. A soil series consists of soils which have horizons similar in their differentiating characteristics and arrangements in the soil profile. Any significant variation in one or more of the horizon characteristics permits a separation into a different soil series. If it is not possible because of the scale of mapping to separate series developed on similar material such undifferentiated groups are referred to as *complexes*.

When soils have similar profiles but differ in texture of the surface horizons they may be separated in *soil types*.

When soils have features that are significant to their use and management, such as topography, stoniness, etc., they are separated into *soil phases*.

In addition to the basic units used in field classification—series, types, and phases—other categories are used to group soils into broader classes according to the system outlined by the National Soil Survey Committee. While the soils were initially classified according to the proposals made by the Committee in 1963, then modified in keeping with the 1965 proposals, an attempt was made in the preparation of this report to incorporate, where possible, the changes proposed in the 1968 meetings. Accordingly, the following provides a brief description of the dominant categories encountered in this region and a more detailed description of the soils recognized in the Whitecourt and Barrhead area.

### Chernozemic Soils

The soils of this order are developed under grassland or grassland-forest transition vegetation and are characterized by a dark colored surface horizon. Recognition of the color of the Ah horizon provides a basis of separating soils in this order into the Brown, Dark Brown, Black, or Dark Gray great groups. Further separation provides for a grouping at the subgroup level of categorization. In this region, Orthic Dark Gray, Gleyed Dark Gray, and Solodic Dark Gray subgroups are of common occurrence.

### Solonetzic Soils

Soils of the Solonetzic order are developed under grassland and forest-grassland vegetation on a saline parent material and are characterized by a solonetzic B horizon. A solonetzic B horizon has a columnar or prismatic macrostructure that can be broken into a blocky mesostructure. In addition, the solonetzic B horizon should have a ratio of exchangeable calcium to exchangeable sodium of 10 or less.

Separations at the great group level of classification are based on the morphological differences evident in the profile. Soils of the Solonetz great group have a very hard columnar B horizon that remains intact when removed from the profile. In comparison, soils of the Solod great group have a distinct transitional AB horizon and a B horizon that readily breaks into blocky aggregates.

Separations at the subgroup level are based on the color of the surface horizon and are accordingly designated as Brown, Black, and Gray Solods or Solonetz. The three subgroups that have been mapped in this area are Black Solonetz, Gray Solonetz, and Black Solod.

### Luvisolic Soils

Soils of the Luvisolic order are moderately well to imperfectly drained. They have been developed under deciduous, mixed deciduous-coniferous or boreal forests, or under mixed forest in the forest-grassland transition zone, under moderate and cool climatic conditions, from materials that are generally basic in reaction. They are characterized by light colored eluviated horizons and by darker colored illuviated horizons in which clay is the main accumulation product. The Luvisolic soils of the Whitecourt and Barrhead area belong to the Gray Wooded great group.

The subgroups of the Gray Wooded great group that occur in this area are Orthic Gray Wooded, Dark Gray Wooded, Brunisolic Gray Wooded, and Solodic Gray Wooded. The distinguishing feature between the Orthic Gray Wooded and the Dark Gray Wooded is the presence of a distinct Ah horizon in the latter. The Brunisolic Gray Wooded is distinguished by the presence of a thin but distinctive brown horizon (Bfj) under a light colored Ae horizon and above a finer textured and blocky structured Bt horizon. The Solodic Gray Wooded is distinguished by a hard, somewhat columnar, Btnj horizon rather than the blocky Bt horizon typical of the Orthic Gray Wooded. Salts can usually be observed in the C horizon of the Solodic Gray Wooded.

### Brunisolic Soils

Soils of the Brunisolic order are well to imperfectly drained soils developed under forest, mixed forest and grassland, grass and fern, or heath, and are usually characterized by a brownish colored sola. The B horizon may contain illuvial clay or sesquioxides but not sufficient to meet the requirements of a Bt or Bf horizon. Soils of the Eutric Brunisol great group are characterized by a high base saturation. Of this group, soils of the Degraded Eutric Brunisol subgroup are recognized in this region.

### Regosolic Soils

Regosolic soils lack distinct horizon development except for a discernible Ah horizon that is usually thin and does not meet the requirements of a chernozemic Ah horizon.

### Gleysolic Soils

Gleysolic soils are associated with wetness due to restricted surface run-off or a high water table. Organic horizons up to 18 inches in thickness may occur at the surface whereas the subsoils usually show gleying which is characterized by a generally dull bluish gray color and occasionally may have many reddish yellow mottles. In the mapped area Humic Gleysols are of common occurrence.

### Organic Soils

Soils with 30 percent or more of organic matter and with more than 18 inches of unconsolidated organic material are included in the Organic order. They occur in areas of poor drainage and water accumulation. In this area two types of Organic soils, a moss peat (Kenzie Complex) and a sedge peat (Eaglesham Complex), have been mapped.

## DESCRIPTION OF SOILS

### Alluvium (58,000 acres)

Alluvium consists of a wide variety of soil materials found on the river flats and benches occurring adjacent to the rivers in this area. Since these flats are variable in size, in many cases too small to outline on this scale of mapping, and usually dissected by stream channels, no attempt was made to differentiate the soils formed on this material. Usually the soils vary in texture from sandy loam to silt loam and sometimes may have gravelly subsoils. The following is a description of a Gleyed Rego Black profile developed on the floodplain of the McLeod river near Whitecourt:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. |
| Ah | 3 | 7.5 | Black (10YR 3/1, moist) loam, weak granular, friable. pH 7.8 |
| Ckgj1 | 3 | 7.5 | Grayish brown (10YR 5/2, moist) very fine sandy loam with dark grayish brown (10YR 4/2, moist) mottles. pH 7.8 |
| Ckgj2 | 9 | 22.5 | Olive brown (2.5Y 4/4, moist) very fine sandy loam with dark grayish brown (10YR 4/2, moist) mottles. pH 7.8 |
| Ck3 | 6 | 15 | Dark brown (10YR 3/3, moist) silty clay loam. pH 7.8 |
| Ck4 | 8 | 20 | Very dark grayish brown (10YR 3/2, moist) silty clay loam. pH 7.8 |
| Ck5 | 8 | 20 | Light olive brown (2.5Y 5/4, moist) very fine sandy loam. pH 7.8 |

**Belloy Series (2,100 acres)**

Belloy soils are moderately well drained Dark Gray Wooded soils developed on a relatively thin outwash which frequently is stony or gravelly and is usually underlain by a clay loam till at 18 to 30 inches. They are found primarily in the vicinity of Shoal Creek. These soils have been mapped in association with the Uncas, Onoway, Codner, and Nakamun soils. They occur on gently undulating and undulating topography.

The following is a description of a typical Belloy soil profile:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Leaf litter. |
| Ah | 3 | 7.5 | Very dark grayish brown (10YR 3/2, moist) sandy loam, weak fine granular, friable. pH 6.3 |
| Ae | 2 | 5 | Light yellowish brown (10YR 6/4, moist) loamy sand, weak fine platy, friable. pH 5.5 |
| AB | 4 | 10 | Grayish brown (10YR 5/2, moist) loamy sand, weak subangular blocky, friable. pH 5.5 |
| Bt | 10 | 25 | Brown (10YR 5/3, moist) coarse sandy loam, weak coarse subangular blocky, friable. pH 5.8 |
| IIBC | 12 | 30 | Dark grayish brown (10YR 4/2, moist) clay loam, blocky, firm. pH 6.2 |
| IICk | at 32 | at 80 | Dark grayish brown (10YR 4/2, moist) clay loam, till. pH 7.2 |

**Clouston Complex (900 acres)**

Clouston soils are rapidly to well drained Degraded Eutric Brunisol and Orthic Gray Wooded soils that have developed on gravelly coarse sandy outwash material. These soils are not widespread but occasionally occur in association with Heart, Codesa, Hubalta, and stony Hubalta soils. The topography is gently rolling and rolling.

Clouston soils, typical of the Degraded Eutric Brunisol subgroup, have a thin L-H horizon, a thick well developed Ae horizon, and a weakly expressed Btj horizon. The following is a description of a Clouston soil profile:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Dark grayish brown (10YR 4/2, moist) leaf litter. |
| Ah | 1 | 2.5 | Dark grayish brown (10YR 4/2, moist) sandy loam, single grain, loose. pH 5.5 |
| Ae | 6 | 15 | Light brownish gray (10YR 6/2, moist) gravelly loamy sand, weak coarse platy, very friable. pH 5.5 |
| AB | 4 | 10 | Grayish brown (10YR 5/2, moist) gravelly loamy sand, weak subangular blocky, very friable. pH 5.2 |
| Btj | 10 | 25 | Brown (10YR 5/3, moist) gravelly loamy sand, weak subangular blocky, very friable. pH 5.8 |
| BC | 10 | 25 | Brown (10YR 5/3, moist) gravelly loamy sand, single grain, loose. pH 6.5 |
| Ck | at 32 | at 80 | Grayish brown (10YR 5/2, moist) gravelly loamy sand, spotty lime accumulation on surface of stones. pH 7.0 |

**Codesa Complex (21,900 acres)**

Codesa soils are moderately well drained Degraded Eutric Brunisol and Orthic Gray Wooded soils developed on relatively shallow outwash or alluvial material that overlies till or lacustrine deposits. The depth to the underlying material is usually less than 30 inches. These soils are commonly associated with those of the Cooking Lake, Hubalta, and Culp series and the Clouston complex. The topography ranges from undulating to rolling.

Codesa soils, typical of the Degraded Eutric Brunisol subgroup, have a thin L-H horizon, a relatively thick Ae, and a weakly expressed Btj horizon.

The following is a description of a Codesa soil profile:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. |
| Ah | 1 | 2.5 | Light brownish gray (10YR 6/2, moist) sandy loam, weak fine granular, friable. pH 5.7 |
| Ae | 5 | 12.5 | Very pale brown (10YR 7/3, moist) loamy sand, weak coarse platy. pH 5.5 |
| Btj | 3 | 7.5 | Brown (10YR 5/3, moist) sandy loam, weak subangular blocky, friable. pH 5.2 |
| IIBC | 6 | 15 | Dark brown (10YR 4/3, moist) clay loam, blocky, firm. pH 5.8 |
| IICk | at 16 | at 40 | Dark grayish brown (10YR 4/2, moist) clay loam, till. pH 7.2 |

**Codner Series (29,900 acres)**

Soil of the Codner series are poorly drained Orthic Humic Gleysols developed on coarse to medium textured alluvial material. These soils are found on level to depressional topography in association with soils of the Culp, Leith, and Tolman series and occasionally with Heart and Codesa soils.

Codner soils are distinguished by an L-H horizon, a distinct Ah and/or Ahe horizon, and mottled Bg and Cg horizons.

The following is a description of a Codner soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 4 | 10 | Dark brown (10YR 3/3, moist) fairly well decomposed sedge peat. |
| Ah | 5 | 12.5 | Black (10YR 2/1, moist) sandy loam, weak fine granular, very friable. pH 6.8 |
| Ahe | 3 | 7.5 | Very dark grayish brown (10YR 3/2, moist) sandy loam, weak fine granular, loose. pH 6.7 |
| Bg | 16 | 40 | Grayish brown (2.5Y 5/2, moist) sandy loam with prominent strong brown (7.5YR 5/6, moist) mottles, single grain, slightly sticky when wet. pH 6.3 |
| BCg | 14 | 35 | Grayish brown (2.5Y 5/2, moist) sandy loam, slightly mottled, single grain, slightly sticky when wet. pH 7.8 |
| Cg | at 42 | at 105 | Olive gray (5Y 5/2, moist) sandy loam. pH 7.8 |

**Cooking Lake Series (150,300 acres)**

Soils of the Cooking Lake series consist of moderately well drained soils developed on till derived mainly from the Edmonton

**Figure 13—Topography typical of a Cooking Lake soil area.**

rmation. These Orthic Gray Wooded soils occur extensively in southeastern half of the map sheet and have topography ranging m gently undulating to hilly. On rolling and hilly topography se soils are usually associated with Kenzie, Eaglesham, Tolman, l Codesa soils whereas on undulating and gently rolling topoghy these soils frequently occur with Onoway, Uncas, La Nonne, ywood, and Macola soils.

Soils of the Cooking Lake series are characterized by a thin Ah izon, a distinct Ae horizon, and a prismatic to blocky Bt horizon. ually the C horizon is calcareous. Some stoniness is associated h the Cooking Lake soils.

The following is a description of a Cooking Lake soil profile:

| | *Thickness* | | |
|---|---|---|---|
| *izon* | *in.* | *cm.* | *Description* |
| -H | 1 | 2.5 | Deciduous leaf litter. pH 6.2 |
| h | 1 | 2.5 | Black (10YR 3/1, moist) loam, weak fine granular, friable. pH 6.2 |
| e | 6 | 15 | Grayish brown (10YR 5/2, moist) silt loam, weak platy, friable. pH 6.6 |
| B | 3 | 7.5 | Dark grayish brown (10YR 4/2, moist) clay loam, strong subangular blocky, firm. pH 6.5 |
| t1 | 10 | 25 | Dark yellowish brown (10YR 3/4, moist) clay loam, strong blocky, firm. pH 6.4 |
| :2 | 10 | 25 | Dark brown (10YR 3/3, moist) clay loam, strong blocky, firm. pH 6.2 |
| C | 10 | 25 | Dark grayish brown (10YR 4/2, moist) clay loam, blocky, firm. pH 6.2 |
| | at 41 | at 102.5 | Brown to dark brown (10YR 4/3, moist) clay loam, till. pH 6.5 |

**) Series (91,900 acres)**

Culp soils are well to moderately well drained Orthic Gray oded soils developed on stratified coarse to medium textured vial material. These soils are common and occur in the mapped in association with Leith, Kathleen, Codesa, Davis, Codner, king Lake, Hubalta, Kenzie, and Eaglesham soils.

Topography ranges from gently undulating to hilly. Much of the graphy is of the complex knob and kettle type with organic occupying the depressions between knolls.

A Culp soil profile has an L-H horizon, a distinct Ae horizon, a characteristic Bt horizon. Bands of darker colored and somet finer textured material may occur in the Bt horizon of this es. The C horizon is usually moderately calcareous.

The following is a description of a typical Culp soil profile:

| Horizon | Thickness in. | cm. | Description |
|---|---|---|---|
| L-H | 2 | 5 | Deciduous leaf litter slightly decomposed in the lower portion. |
| Ae | 7 | 17.5 | Pale brown (10YR 6/3, moist) sandy loam, weak fine platy, very friable. pH 6.5 |
| Bt1 | 6 | 15 | Brown (10YR 5/3, moist) sandy loam, weak subangular blocky, friable. pH 6.2 |
| Bt2 | 6 | 15 | Yellowish brown (10YR 5/4, moist) sandy loam, weak coarse blocky, firm. pH 6.7 |
| Ck1 | 10 | 25 | Light olive brown (2.5Y 5/6, moist) sandy loam to loamy sand, moderately calcareous. pH 8.1 |
| Cca | 5 | 12.5 | Light yellowish brown (2.5Y 6/4, moist) sandy loam, strongly calcareous. pH 8.1 |
| Ck2 | at 36 | at 90 | Olive (5Y 5/4, moist) loamy sand, moderately calcareous. pH 8.2 |

**Davis Series (23,800 acres)**

Davis soils are moderately well drained Orthic Gray Wooded soils developed on alluvial-lacustrine deposits consisting of loam to silt loam materials. They occur on gently undulating to hilly topography. Generally, these soils are confined to the central portion of the mapped area and are found in the vicinity of Blue Ridge, Moose Wallow, Topland, and Fort Assiniboine. In these areas they occur in association with Culp, Kathleen, Eaglesham, Kenzie, Cooking Lake, and Hubalta soils.

The Davis soil profile has an L-H horizon, occasionally a thin Ah horizon, a distinct grayish brown Ae horizon, and a brown granular Bt horizon. The C horizon is calcareous.

The following is a description of a typical Davis soil profile:

| Horizon | Thickness in. | cm. | Description |
|---|---|---|---|
| L-H | 2 | 5 | Deciduous leaf litter. |
| Ae | 4 | 10 | Grayish brown (10YR 5/2, moist) sandy loam, weak, fine platy, friable. pH 7.2 |
| Bt1 | 10 | 25 | Yellowish brown (10YR 5/4, moist) loam, strong fine subangular blocky, firm. pH 6.3 |
| Bt2 | 8 | 20 | Dark yellowish brown (10YR 4/4, moist) silt loam, strong coarse granular, firm. pH 6.5 |
| Cca | at 24 | at 60 | Olive gray (5Y 5/2, moist) sandy loam, strongly calcareous. pH 8.2 |

**Dnister Series (4,900 acres)**

Dnister soils are imperfectly drained Gray Solonetz soils developed on till that is derived mainly from the Edmonton Formation. The topography ranges from gently undulating to rolling. Dnister soils occur in small patches throughout the southeastern portion of the map sheet. They are associated mainly with Kawood, Kavanagh, Thorsby, La Nonne, Nakamun, and Cooking Lake soils.

[he distinguishing characteristics of this soil series are a thin horizon, a fairly thick Ae horizon, and a firm columnar Bnt zon. The C horizon is saline and calcareous.

:he following is a description of a typical Dnister soil profile:

| zon | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| H | 1 | 2.5 | Deciduous leaf litter. |
| | 1 | 2.5 | Dark brown (10YR 3/3, moist) loam, weak platy, very friable. pH 6.4 |
| | 6 | 15 | Light gray (10YR 7/2, moist) silt loam, platy, friable. pH 6.3 |
| t1 | 8 | 20 | Dark brown (10YR 4/3, moist) clay loam, strong columnar with white coated round-tops and organic staining, very firm. pH 6.2 |
| t2 | 9 | 22.5 | Very dark grayish brown (10YR 3/2, moist) clay loam, compound strong columnar and strong coarse blocky, very firm, some organic staining. pH 7.5 |
| : | at 26 | at 62.5 | Very dark grayish brown (10YR 3/2, moist) loam, calcareous and saline. pH 7.7 |

**sham Complex (79,500 acres)**

aglesham soils are characterized by an accumulation of sedge They occur in level and depressional positions where surface rs tend to accumulate. The native vegetation usually consists dges and coarse grasses with occasional willow bluffs. Eagle- ι soils are less widespread than the Kenzie soils with which are frequently associated and intermixed.

he sola of Eaglesham soils usually consist of sedge peat and are rlain by a mineral horizon frequently at a depth of about ıches. The organic horizons range in thickness and usually ne darker and more decomposed with depth. A fairly wide e of profiles occur in this complex.

he following is a description of a Terric Mesic Fibrisol profile non to the Eaglesham complex:

| on | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| | 16 | 40 | Brown to dark brown (10YR 4/3, moist) partially decomposed sedge and grass remains. pH 5.8 |
| | 8 | 20 | Very dark brown (10YR 2/2, moist) fairly well decomposed sedge and grass remains. pH 6.8 |
| | 4 | 10 | Black (10YR 2/1, moist) well decomposed peat. pH 7.3 |
| | 4 | 10 | Black (10YR 2/1, moist) loam to clay loam, weak fine granular, friable. pH 7.3 |
| | at 33 | at 82.5 | Gray (10YR 5/1, moist) clay, mottled and weakly calcareous. pH 7.8 |

**Falun Series (12,100 acres)**

Falun soils are well to moderately well drained Orthic Dark Gray soils developed on till. They occur on level to undulating topography. Falun soils are of very limited distribution and occur only in the vicinity of Rossington and Barrhead. These soils usually occur in association with the Uncas, Onoway, or Mico soils. A gleyed phase of this series has been mapped in the vicinity of Linaria. It consists of imperfectly drained soils dominating in about 3,600 acres.

Soils of this series have a thin L-H horizon, a fairly thick Ah horizon, an AB horizon, and a dark grayish brown Bt horizon. The C horizon is usually calcareous. Frequently an Ahe horizon may be present. The gleyed phase of the Falun series differs in that it usually has a thicker Ah horizon and a mottled Btgj horizon.

Following is a description of an Orthic Dark Gray profile representative of the Falun series:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Loose leaf litter. |
| Ah | 4 | 10 | Black (10YR 2/1, moist) loam, fine granular, firm. pH 6.0 |
| Ahe | 3 | 7.5 | Dark grayish brown (10YR 4/2, moist) loam, compound weak coarse platy and fine granular, firm. pH 6.2 |
| AB | 5 | 12.5 | Dark yellowish brown (10YR 4/4, moist) loam, subangular blocky, firm. pH 6.2 |
| Bt | 12 | 30 | Dark brown (10YR 3/3, moist) sandy clay loam, blocky, firm. pH 6.5 |
| BC | 15 | 37.5 | Dark grayish brown (10YR 4/2, moist) sandy clay loam, blocky, firm. pH 6.7 |
| Ck | at 40 | at 100 | Brown to dark brown (10YR 4/3, moist) sandy clay loam, till, weakly calcareous. pH 7.5 |

**Heart Complex (79,700 acres)**

Heart soils are rapidly to well drained Podzolic and Brunisolic soils that have developed on brown and yellowish brown sand and loamy sand which is calcareous. These soils occur mainly in three areas along the Athabasca river and are usually associated with Kenzie and Eaglesham but also occur with Leith, Culp, and Codesa soils. The topography is predominantly rolling though it may range from gently undulating to hilly.

Numerous types of soil profiles are frequently found on similar parent material and in close proximity. Slight variations in position frequently show striking differences in soil profile type. Brunisolic and Podzol soil types occur in very close association.

The following is a description of a Degraded Eutric Brunisol common to the Heart complex:

| zon | Thickness in. | cm. | Description |
|---|---|---|---|
| H | 1 | 2.5 | Deciduous leaves and pine needles. |
|  | 3 | 7.5 | Light yellowish brown (10YR 6/4, moist) sand, single grain, loose. pH 6.5 |
| j | 10 | 25 | Yellowish brown (10YR 5/6, moist) sand, single grain, loose. pH 6.6 |
| a | at 14 | at 35 | Olive (5Y 5/3, moist) sand, moderately calcareous. pH 8.1 |

**Prairie Complex (31,500 acres)**

ligh Prairie soils are imperfectly drained Gleyed Dark Gray Gleyed Black soils developed on relatively recent alluvial erial. They are found on level to undulating topography pri-ily in the valleys of the Pembina and Athabasca rivers. Most of other flats adjacent to streams and rivers have been mapped ndifferentiated Alluvium and some of these areas may contain e soils. High Prairie soils are frequently found in association . Codner, Raven, and Eaglesham soils.

ligh Prairie soils have a relatively thick Ah horizon, a thin sitional ABgj horizon, and a weakly developed Bmgj horizon. Cg horizon may consist of several strata of various alluvial rials.

he following is a description of a Gleyed Dark Gray profile non to the High Prairie complex:

| on | Thickness in. | cm. | Description |
|---|---|---|---|
| I | 2 | 5 | Dark brown (10YR 3/3, moist) leaf and grass litter. |
|  | 5 | 12.5 | Very dark grayish brown (10YR 4/2, moist) loam, fine granular, friable. pH 6.4 |
| gj | 2 | 5 | Dark grayish brown (10YR 4/2, moist) loam with splotches of gray (10YR 5/1, moist), fine granular, friable. pH 6.3 |
| gj | 2 | 5 | Dark grayish brown (10YR 4/2, moist) loam, few mottles, weak blocky, friable. pH 6.1 |
| gj | 8 | 20 | Brown (10YR 5/3, moist) loam, few mottles, weak blocky, friable. pH 6.1 |
|  | 6 | 15 | Olive brown (2.5Y 4/4, moist) sandy loam. pH 6.3 |
|  | 3 | 7.5 | Olive brown (2.5Y 4/4, moist) silt loam. pH 6.3 |

**lta Series (472,300 acres)**

ubalta soils are moderately well drained Orthic Gray Wooded developed on till. They occur extensively in the northwestern on of the mapped area where for the most part they are under-by the Paskapoo Formation. The parent materials of these soils usually olive, olive gray, or olive brown in color. Frequently are quite cobbly and in some places a stony phase was recog-. The topography in these soil areas is usually rolling or gently rolling but may range from gently undulating to hilly. These soils are frequently associated with Kenzie, Pegasus, Codesa, and occasionally with Maywood, Kathleen, and Tolman soils.

The following is a description of a representative Hubalta soil profile:

| Horizon | Thickness in. | Thickness cm. | Description |
|---|---|---|---|
| L-H | 3 | 7.5 | Dark brown (10YR 3/3, moist) partially decomposed deciduous leaf litter. |
| Ae | 4 | 10 | Light grayish brown (10YR 6/2, moist) sandy loam, weak platy, friable. pH 5.4 |
| AB | 2 | 5 | Grayish brown (10YR 5/2, moist) loam, weak coarse platy, friable. pH 5.0 |
| Bt1 | 6 | 15 | Grayish brown (10YR 5/2, moist) clay loam, subangular blocky, firm. pH 4.8 |
| Bt2 | 9 | 22.5 | Olive gray (5Y 5/2, moist) clay loam, blocky, firm. pH 4.7 |
| BC | 16 | 40 | Olive (5Y 4/3, moist) clay loam, blocky, firm. pH 4.8 |
| C | at 40 | at 100 | Olive brown (2.5Y 4/4, moist) clay loam, till. pH 4.8 |

**Judah Series (36,600 acres)**

Soils of the Judah soil series are well to moderately well drained Dark Gray Wooded soils developed on brown to yellowish brown silty clay. These soils occur on a range of complex topographic classes varying from gently undulating to hilly. Judah soils are found in the vicinity of Greencourt, Romeo lake, Mystery Lake, Corbett Creek, Barrhead, and Shoal lake. Kathleen, Raven, and Macola soils are frequently associated with Judah soils.

Judah soils are distinguished by a dark brown Ah horizon, a grayish brown Ae horizon, and a brown subangular blocky Bt horizon. The C horizon is calcareous and stratified.

The following is a description of a typical Judah soil profile:

| Horizon | Thickness in. | Thickness cm. | Description |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. |
| Ah | 3 | 7.5 | Brown to dark brown (10YR 4/3, moist) loam, fine granular, firm. pH 6.7 |
| Ae | 2 | 5 | Grayish brown (10YR 5/2, moist) loam, weak platy, very friable. pH 6.3 |
| AB | 5 | 12.5 | Grayish brown (10YR 5/2, moist) clay loam, weak, coarse granular, friable. pH 6.0 |
| Bt1 | 8 | 20 | Brown (10YR 4/3, moist) sandy clay, subangular blocky, firm. pH 6.2 |
| Bt2 | 7 | 17.5 | Dark yellowish brown (10YR 4/4, moist) clay loam, granular, firm, pH 6.2 |
| Cca | at 26 | at 65 | Dark yellowish brown (10YR 4/4, moist) clay loam with yellowish brown (10YR 5/6, moist) strata of silty clay loam, moderately calcareous. pH 7.5 |

**ly Series (5,900 acres)**

Soils of the Judy series are found at the higher elevations in northwestern portion of the mapped area. These soils are well to derately well drained Brunisolic Gray Wooded soils developed on remely gravelly till. The topography is undulating to gently ling. The most commonly associated soils are the Hubalta (stony ase), Pinto, and Codesa soils.

**Figure 14—Judy soils exposed in a road cut.**

The soil horizon sequence in the Judy soil consists of an L-H, Ae, Ae, Bt, and C horizons. The upper horizons, Ae and Bfj, are eved to represent the initial stages of the development of a zol soil profile within the Ae horizon of an older Gray Wooded

The following is a description of a Judy soil profile:

| zon | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| H | 3 | 7.5 | Moss and pine needle litter. |
| | 2 | 5 | Light brownish gray (10YR 6/2, moist) fine sandy loam, weak platy, friable, stony. pH 5.0 |
| | 5 | 12.5 | Strong brown (7.5YR 5/6, moist) loam, weak granular, friable, stony. pH 5.0 |
| | 2 | 5 | Light yellowish brown (10YR 6/4, moist) loam, weak fine granular, friable, stony. pH 5.5 |
| | 18 | 45 | Yellowish brown (10YR 5/6, moist) silty clay loam, fine granular, firm, stony. pH 4.8 |
| | at 30 | at 75 | Light olive brown (2.5Y 5/4, moist) silty clay loam, stony. pH 5.0 |

**leen Series (123,600 acres)**

oils of the Kathleen series are Orthic Gray Wooded soils de-ped on brown silty clay material. They are moderately well ied and occur extensively in the mapped area. Usually Kath- soils are associated with Judah, Raven, Maywood, Cooking

Lake, Hubalta, Kenzie, and Eaglesham soils. The topography ranges from gently undulating to hilly. Much of the topography consists of knolls with short steep slopes. Organic soils are commonly found between the knolls.

The main distinguishing horizons are a distinct light gray Ae horizon, a transitional AB horizon, and a brown granular to subangular blocky Bt horizon. The C horizon or parent material of the Kathleen series is calcareous and usually occurs within 30 inches of the surface.

**Figure 15—Kathleen soils under cultivation in the Mystery Lake district.**

The following is a description of a Kathleen soil profile:

| *Horizon* | *Thickness in.* | *Thickness cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter, partially decomposed in the lower portion. pH 6.4 |
| Ae | 6 | 15 | Light gray (10YR 7/2, moist) silt loam, weak fine platy, very friable. pH 6.3 |
| AB | 2 | 5 | Grayish brown (10YR 5/2, moist) silty clay loam, weak coarse granular, friable. pH 5.9 |
| Bt | 10 | 25 | Brown (10YR 4/3, moist) silty clay, fine subangular blocky, firm. pH 5.6 |
| BC | 8 | 20 | Brown (10YR 5/3, moist) silty clay, granular, firm. pH 6.1 |
| Ck | at 27 | at 67.5 | Dark yellowish brown (10YR 4/4, moist) silty clay, weakly calcareous. pH 7.5 |

**Kavanagh Series (5,000 acres)**

Kavanagh soils are imperfectly drained Black Solonetz soils developed on material derived mainly from the Edmonton Formation. They occur on level to undulating topography. These soils are not widespread and are found mostly in the southeastern portion of the area, usually associated with other Solonetzic soils such as Kawood, Thorsby, and Dnister.

The distinguishing features of this soil are a dark gray to black Ah horizon, a very hard organic stained Bnt horizon, and a saline C horizon. These soils are somewhat variable in that they usually have a thin Ae horizon but occassionally appear to have an Ah-IIBnt sequence of soil horizons. The cultivated fields in this soil area are dark gray in color. Bedrock exposures often occur in areas of Kavanagh soils.

The following is a description of a Kavanagh soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| Ah | 3 | 7.5 | Very dark brown (10YR 2/2, moist) clay loam, fine granular, firm. pH 5.4 |
| Ae | 5 | 12.5 | Grayish brown (10YR 5/2, moist) sandy loam, fine platy, very friable. pH 6.0 |
| Bn | 11 | 27.5 | Dark grayish brown (10YR 4/2, moist) sandy loam, compound strong columnar and strong coarse blocky, very firm, organic stained. pH 7.0 |
| Bnt | 10 | 25 | Dark yellowish brown (10YR 3/4, moist) sandy clay loam, compound strong columnar and strong blocky, very firm, organic stained. pH 7.8 |
| Csk | 8 | 20 | Very dark grayish brown (10YR 3/2, moist) loam, weakly calcareous and saline. pH 7.9 |
| Csca | at 37 | at 92.5 | Very dark grayish brown (10YR 3/2, moist) loam, moderately calcareous and saline. pH 8.1 |

**Kawood Series (1,400 acres)**

Kawood soils are imperfectly drained Gray Solonetz soils that have developed on material derived mainly from the Edmonton Formation. The topography on which these soils occur is level to undulating. Kawood soils are of minor occurrence and are confined primarily to the southeastern portion where they are associated with Kavanagh, Thorsby, Dnister, Nakamun, or Cooking Lake soils.

Kawood soils are distinguished by a distinct Ae horizon and an impervious Bnt horizon. The C horizon is saline and contains lime carbonate.

The following is a description of typical Kawood soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| Ah | 1 | 2.5 | Very dark gray (10YR 3/1, moist) loam, fine granular, friable. pH 5.8 |
| Ae | 4 | 10 | Grayish brown (10YR 5/2, moist) loam, weak platy, very friable. pH 5.6 |
| Bnt | 10 | 25 | Dark grayish brown (10YR 4/2, moist) sandy clay loam, compound strong columnar and strong coarse blocky, organic stained, very firm. pH 6.8 |
| Csk | at 15 | at 37.5 | Dark brown (10YR 3/3, moist) sandy clay loam, weakly calcareous and saline. pH 7.9 |

**Kenzie Complex (172,900 acres)**

Kenzie soils have an accumulation of moss peat. They occur extensively throughout the mapped area in large or small depressions where surface waters accumulate. Quite frequently these soils are associated and intermixed with Eaglesham soils.

Usually the organic accumulation consists of varying colored layers of peat with the darkest and most decomposed layer occurring immediately above the mineral layer. The reaction of these soils is acidic. The thickness of the peat is quite variable, averaging about 36 inches and seldom exceeding 60 inches.

The following is a description of a Terric Mesisol profile common to the Kenzie complex:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L | 6 | 15 | Yellowish brown (10YR 5/6, moist) undecomposed moss and tree roots. pH 5.0 |
| F1 | 12 | 30 | Reddish brown (5YR 4/4, moist) slightly decomposed peat with remains of moss and roots. pH 5.1 |
| F2 | 10 | 25 | Dark reddish brown (5YR 3/4, moist) coarse fibrous peat partly decomposed. pH 5.4 |
| F-H | 6 | 15 | Dark brown (10YR 3/3, moist) fairly well decomposed peat. pH 5.6 |
| IICg | at 34 | at 85 | Light olive gray (5Y 6/2, moist) clay loam. pH 6.8 |

**La Nonne Series (22,200 acres)**

La Nonne soils are moderately well to imperfectly drained Solodic Dark Gray soils developed on till. These soils occur on level to undulating topography. Generally, they are confined to the east-central portion of the map sheet and are found in the vicinity of Rossington, Lawton, Naples, east of Highridge, and northwest of Connor Creek. In this area these soils occur in association with Onoway, Thorsby, Dnister, Nakamun, and Macola soils.

La Nonne soils have a thin L-H horizon, a fairly thick Ah and/or Ahe horizon, usually a thin Ae horizon, and a transitional AB horizon overlying a prismatic or blocky structured Btnj horizon. The C horizon is calcareous and may contain salts.

The following is a description of a typical La Nonne soil profile:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf and grass litter. |
| Ah | 4 | 10 | Very dark grayish brown (10YR 3/2, moist) loam, fine granular, firm. pH 6.7 |
| Ae | 6 | 15 | Brown (10YR 5/3, moist) loam, platy, friable. pH 5.7 |
| AB | 3 | 7.5 | Brown to dark brown (10YR 4/3, moist) clay loam, subangular blocky, firm. pH 4.9 |
| Btnj | 11 | 27.5 | Very dark grayish brown (10YR 3/2, moist) clay loam, compound coarse prismatic and blocky, firm. pH 5.0 |
| BC | 13 | 32.5 | Brown to dark brown (10YR 4/3, moist) clay loam, blocky, firm. pH 5.8 |
| Csk | at 38 | at 95 | Dark yellowish brown (10YR 4/4, moist) loam, till, weakly calcareous and weakly saline. pH 7.5 |

**Leith Series (13,700 acres)**

Leith soils are well to moderately well drained Dark Gray Wooded soils developed on coarse to medium textured alluvial materials. These soils occur mainly in the northeastern portion of the mapped area. The topography is gently undulating to gently rolling. Leith soils in this area are usually associated with Culp and Codner soils.

The distinguishing profile characteristics of the Leith soils are fairly thick Ah and Ae horizons, and a recognizable Bt horizon. The C horizon is calcareous and often stratified.

The following is a description of a typical Leith soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Very dark grayish brown (10YR 3/2, moist) leaf and grass litter. pH 6.0 |
| Ah | 4 | 10 | Very dark grayish brown (10YR 3/2, moist) sandy loam, weak fine granular, friable. pH 6.2 |
| Ae | 5 | 12.5 | Pale brown (10YR 6/3, moist) loamy sand, single grain, loose. pH 6.2 |
| Bt | 10 | 25 | Yellowish brown (10YR 5/4, moist) sandy loam, weak subangular blocky, friable. pH 6.7 |
| BC | 4 | 10 | Brown (10YR 5/3, moist) sandy loam, weak blocky, friable. pH 6.7 |
| Cca | at 24 | at 60 | Grayish brown (10YR 5/2, moist) loamy sand with sandy loam strata, strongly calcareous. pH 8.0 |

**Macola Series (34,400 acres)**

Macola soils are moderately well drained Dark Gray Wooded soils that have been developed on stone-free dark grayish brown clay. These soils are found on gently undulating to rolling topography. They do not occur extensively but are found mainly in the vicinity of Greencourt, Romeo lake, and along the Paddle river. Usually they are associated with Maywood, Mico, and Raven soils and less frequently with Kathleen, Judah, and Cooking Lake soils.

These soils have an L-H horizon, a dark gray Ah horizon, Ae and AB horizons, and a dark grayish brown blocky Bt horizon. The C horizon is usually calcareous. The color of the cultivated fields of these soils is dark gray.

The following is a description of a typical Macola soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. |
| Ah | 3 | 7.5 | Dark gray (10YR 4/1, moist) silty clay loam, granular, firm. pH 6.0 |
| Ae | 3 | 7.5 | Grayish brown (10YR 5/2, moist) silty clay loam, weak platy, friable. pH 5.8 |
| AB | 3 | 7.5 | Dark grayish brown (10YR 4/2, moist) silty clay loam, subangular blocky, firm. pH 5.5 |
| Bt | 10 | 25 | Very dark grayish brown (10YR 3/2, moist) clay, blocky, very firm. pH 5.6 |
| BC | 8 | 20 | Dark grayish brown (10YR 4/2, moist) clay, massive, firm. pH 6.1 |
| Ck | at 28 | at 70 | Dark grayish brown (10YR 4/2, moist) clay, weakly calcareous. pH 7.5 |

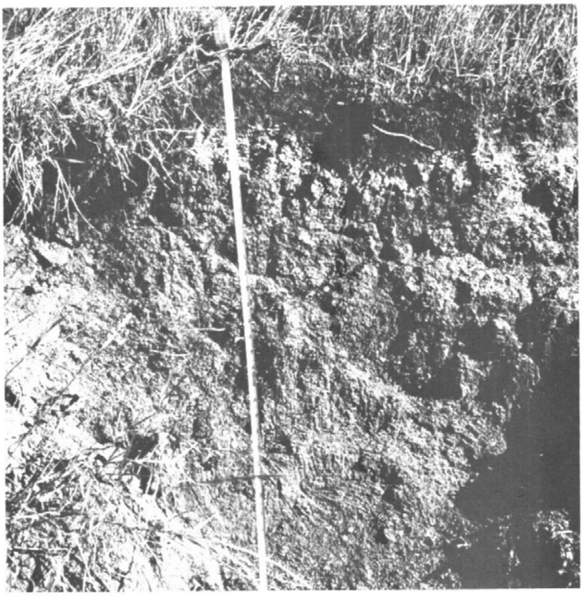


Figure 16—A Majeau soil profile.

**Majeau Series (4,300 acres)**

Majeau soils are moderately well to imperfectly drained Solodic Dark Gray soils that have been developed on dark gray clay. These soils are found on level to undulating topography. Majeau soils are of very limited occurrence and are found only in the vicinity of Lunnford, Lawton, southeast of Linaria, and west of Romeo lake. They are associated with Wabamun, Raven, Eaglesham, Thorsby, and Cooking Lake soils.

Soils of this series have a distinct Ah horizon, thin Ae and AB horizons, and a very firm, columnar, impervious Btnj horizon. The C horizon is usually calcareous and saline.

The following is a description of a typical Majeau soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 2 | 5 | Grass and deciduous leaf litter. |
| Ah | 3 | 7.5 | Very dark grayish brown (10YR 3/2, moist) silty clay loam, weak granular, friable. pH 6.9 |
| Ae | 2 | 5 | Light brownish gray (10YR 6/2, moist) silt loam, weak coarse platy, friable. pH 6.3 |
| AB | 2 | 5 | Dark grayish brown (10YR 4/2, moist) silty clay loam, coarse subangular blocky, firm. pH 5.8 |
| Btnj | 6 | 15 | Very dark gray (10YR 3/1, moist) clay, compound strong coarse prismatic and strong coarse blocky, very firm, organic stained. pH 5.7 |
| Ck | 23 | 57.5 | Dark grayish brown (10YR 4/2, moist) silty clay, weakly calcareous. pH 7.2 |
| Csk | at 38 | at 95 | Dark grayish brown (10YR 4/2, moist) silty clay, weakly calcareous and weakly saline. pH 7.3 |

**Maywood Series (22,000 acres)**

Maywood soils are moderately well drained Orthic Gray Wooded soils developed on dark gray clay. These soils are of limited occurrence, but have been mapped near Doris creek, west of Corbett Creek, and around Romeo lake. The topography ranges from gently undulating to rolling. Soils most commonly associated with the Maywood soils in this area are the Macola, Raven, and Cooking Lake.

Maywood soils are similar to other Orthic Gray Wooded soils in that the major horizons consist of an L-H, a thin Ah, a distinct Ae, and a blocky Bt. The C horizon is usually calcareous.

The following is a description of a typical Maywood soil profile:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 2 | 5 | Deciduous leaf litter. |
| Ae | 5 | 12.5 | Light brownish gray (10YR 6/2, moist) silt loam, coarse platy, friable. pH 5.5 |
| AB | 7 | 17.5 | Grayish brown (10YR 5/2, moist) silty clay, coarse subangular blocky, firm. pH 5.1 |
| Bt | 8 | 20 | Dark grayish brown (2.5Y 4/2, moist) heavy clay, weak prismatic, subangular blocky, firm. pH 5.4 |
| BC | 8 | 20 | Olive gray (5Y 4/2, moist) heavy clay, massive, firm. pH 6.6 |
| Ck | 6 | 15 | Olive gray (5Y 4/2, moist) and dark olive gray (5Y 3/2, moist) heavy clay, weakly calcareous. pH 7.2 |
| Cca | at 36 | at 90 | Olive gray (5Y 4/2, moist) heavy clay, moderately calcareous. pH 7.7 |

**Mico Series (400 acres)**

Mico soils are moderately well drained Orthic Dark Gray soils developed on stone-free dark gray clay. These soils are found on level to gently rolling topography. They are of infrequent occurrence in the mapped area and seldom occur as the dominant soil in a mapped unit. Generally, Mico soils occur in association with Macola and Raven soils in the vicinity of Greencourt and along the Paddle and Pembina rivers.

Mico soils have an L-H horizon, a fairly thick Ah horizon, an AB horizon that is grayish brown, and a dark grayish brown Bt horizon. The C horizon is usually calcareous. In some locations an Ahe and a thin Ae horizon may occur.

The following is a description of a typical Mico soil profile:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. |
| Ah | 4 | 10 | Very dark gray (10YR 3/1, moist) silty clay loam, granular, firm. pH 6.5 |
| Ahe | 4 | 10 | Dark gray (10YR 4/1, moist) silty clay loam, compound weak coarse platy and fine granular, firm. pH 6.2 |
| AB | 3 | 7.5 | Grayish brown (10YR 5/2, moist) silty clay loam, subangular blocky, firm. pH 5.8 |

| Horizon | Thickness in. | cm. | Description |
|---|---|---|---|
| Bt | 8 | 20 | Very dark brown (10YR 2/2, moist) clay, coarse blocky, firm. pH 6.2 |
| BC | 6 | 15 | Dark gray (10YR 4/1, moist) clay, coarse blocky, firm. pH 7.5 |
| Ck | at 26 | at 65 | Dark brown (10YR 3/3, moist) silty clay, weakly calcareous. pH 7.8 |

**Ministik Series**

Ministik soils are imperfectly drained Gray Solonetz soils developed on fine textured saline lacustrine material. These soils occur northwest of Rossington on undulating topography in association with Wabamun soils.

Ministik soils can be recognized by a leaf mat or L-H horizon, a gray leached Ae horizon which is underlain by a hard columnar, organic stained Bnt horizon. The C horizon is calcareous and saline. Thin Ah horizons may occur in some of the Ministik soils.

The following is a description of a Ministik soil profile:

| Horizon | Thickness in. | cm. | Description |
|---|---|---|---|
| L-H | 2 | 5 | Deciduous leaf litter. pH 6.7 |
| Ae | 4 | 10 | Light gray (10YR 7/4, dry) silt loam, platy, slightly hard. pH 4.6 |
| Bnt1 | 2 | 5 | Dark grayish brown (10YR 4/2, moist) silty clay loam, subangular blocky, very firm. pH 4.0 |
| Bnt2 | 10 | 25 | Very dark grayish brown (10YR 3/2, moist) silty clay, compound coarse columnar and coarse blocky, organic stained, firm. pH 4.1 |
| Csk | at 18 | at 45 | Very dark brown (10YR 3/2, moist) silty clay with pale brown (10YR 6/3, moist) silty clay loam strata. pH 7.4 |

**Modeste Series (2,200 acres)**

Modeste soils are well to moderately well drained Orthic Gray Wooded soils developed on Paskapoo sandstone material. They occur primarily in the Swan hills and Whitecourt mountain areas. The topography is rolling to hilly.

Fragments of weathered bedrock are found within the solum and bedrock exposures can be seen in roadcuts. Lime can sometimes be seen in the lower C horizon along root channels.

The following is a description of a Modeste soil profile:

| Horizon | Thickness in. | cm. | Description |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. pH 5.5 |
| Ae | 5 | 12.5 | Pale brown (10YR 6/3, dry) sandy loam, platy, slightly hard. pH 5.3 |
| AB | 5 | 12.5 | Dark yellowish brown (10YR 4/4, moist) sandy loam, weak subangular blocky, friable. pH 5.5 |
| Bt | 18 | 45 | Olive brown (2.5Y 4/4, moist) sandy clay loam, weak subangular blocky, firm. pH 5.5 |
| C | at 29 | at 72.5 | Light olive brown (2.5Y 5/4, moist) loamy sand, with friable medium grained sandstone fragments. pH 6.3 |

**Nakamun Series (14,200 acres)**

Nakamun soils are moderately well to imperfectly drained Solodic Gray Wooded soils developed on till derived from the Edmonton Formation. These soils occur in the southeastern portion of the mapped area and are frequently found in association with Cooking Lake, Dnister, La Nonne, Thorsby, Onoway, and Kenzie soils. The topography of these soil areas ranges from gently undulating to gently rolling.

Nakamun soils have an L-H horizon, a thin Ah, a well developed Ae horizon, a fairly thick AB horizon, an organic stained blocky Btnj horizon, and a calcareous and weakly saline C horizon.

The following is a description of a Nakamun soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Partly decomposed deciduous leaf litter. |
| Ae | 7 | 17.5 | Grayish brown (10YR 5/2, moist) silt loam, weak platy, friable. pH 5.7 |
| AB | 6 | 15 | Dark brown (10YR 3/3, moist) clay loam, strong blocky, very firm. pH 5.6 |
| Btnj | 8 | 20 | Very dark grayish brown (10YR 3/2, moist) clay, strong coarse blocky, very firm. pH 6.1 |
| BC | 5 | 12.5 | Dark grayish brown (10YR 4/2, moist) sandy clay loam, strong blocky, firm. pH 6.5 |
| Csk | at 27 | at 67.5 | Dark grayish brown (10YR 4/2, moist) sandy clay loam, till, weakly calcareous and weakly saline. pH 7.4 |

**Onoway Series (3,000 acres)**

Onoway soils are poorly drained Orthic Humic Gleysols developed on till. In till areas, these soils occur primarily in depressional areas between the knolls. They are often associated with Cooking Lake, Nakamun, La Nonne, and Uncas soils.

Onoway soils are distinguished in cultivated fields by their dark appearance amid the lighter colored Gray Wooded soils with which they are frequently associated.

The following is a description of an Onoway soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 2 | 5 | Partly decomposed deciduous leaf litter. |
| Ah | 4 | 10 | Very dark gray (10YR 3/1, moist) loam, fine granular, friable. pH 7.2 |
| Ahe | 2 | 5 | Dark gray (10YR 4/1, moist) loam, weak coarse platy, friable. pH 7.2 |
| Bg | 10 | 25 | Grayish brown (10YR 5/2, moist) clay loam with yellowish brown (10YR 5/6, moist) mottles, subangular blocky, firm. pH 7.6 |
| BCg | 10 | 25 | Dark grayish brown (10YR 4/2, moist) clay loam with yellowish brown (10YR 5/6, moist) mottles, subangular blocky, firm. pH 7.6 |
| Ckg | at 28 | at 70 | Dark grayish brown (10YR 4/2, moist) clay loam with yellowish brown (10YR 5/6, moist) mottles, till, weakly calcareous. pH 7.9 |

**Pegasus Series (7,500 acres)**

Pegasus soils are not of extensive occurrence but frequently are found in association with Hubalta soils in the northwestern portion of the mapped area. These soils are moderately well drained Orthic Gray Wooded soils developed on fine textured materials derived from the Paskapoo Formation. This material varies in color from brown to olive. The topography on which the Pegasus soils most commonly occur is usually steeply sloping and ranges from rolling to hilly.

The Pegasus soil profile has an L-H horizon, a fairly thin Ae horizon, and a brown granular Bt horizon. The C horizon is usually acidic in reaction. In some locations weathered bedrock is encountered at 24 to 30 inches from the surface.

The following is a description of a typical Pegasus soil profile:

| | *Thickness* | | |
|---|---|---|---|
| *Horizon* | *in.* | *cm.* | *Description* |
| L-H | 2 | 5 | Leaf and root litter. |
| Ae | 3 | 7.5 | Gray (10YR 6/1, moist) silt loam, weak fine platy, very friable. pH 4.8 |
| Bt | 10 | 25 | Light brownish gray (10YR 6/2, moist) silty clay, granular, friable. pH 4.4 |
| BC1 | 5 | 12.5 | Light olive brown (2.5Y 5/4, moist) loam, granular, friable. pH 4.9 |
| BC2 | 10 | 25 | Light olive brown (2.5Y 5/4, moist) silt loam, weak granular, friable. pH 4.5 |
| C | at 30 | at 75 | Olive (5Y 5/3, moist) silty clay loam. pH 4.5 |

**Pinto Series**

Pinto soils are moderately well drained Bisequa Gray Wooded soils that occur for the most part on rolling topography. They are confined to the northwestern portion of the mapped area and are found in association with Hubalta and Kenzie soils. These soils are of minor occurrence and never represent the dominant series in any of the mapped units.

Pinto soils have L-H, Ae, Bf, and Ae horizons. This horizon sequence is underlain by a IIBt horizon. At depths of 10 to 24 inches there may be a gravel contact with the underlying finer textured material.

The following is a description of a Pinto soil profile:

| | *Thickness* | | |
|---|---|---|---|
| *Horizon* | *in.* | *cm.* | *Description* |
| L | 2 | 5 | Moss and coniferous litter. |
| Ae | 2 | 5 | Grayish brown (10YR 5/2, moist) fine sandy loam, single grain, loose. pH 4.5 |
| Bf | 2 | 5 | Yellowish brown (10YR 5/6, moist) fine sandy loam, single grain, loose. pH 5.5 |
| Ae | 6 | 15 | Pale olive (5Y 6/3, moist) fine sandy loam, single grain, loose. pH 4.5 |
| IIBt | 20 | 50 | Olive (5Y 5/3, moist) sandy clay loam, fine subangular blocky, firm, stony. pH 5.5 |
| IIC | at 32 | at 80 | Olive (5Y 5/3, moist) sandy clay loam, stony till. pH 5.7 |

**Prestville Series (600 acres)**

Prestville soils are Orthic Humic Gleysol soils developed on lacustrine materials. They occur near Manola and along the Pembina and Paddle rivers on level to depressional topography in association with Raven, Codner, High Prairie, and Eaglesham soils.

Prestville soils may be recognized by a thick peaty L-H horizon, an Ah horizon, and gleyed B and C horizons.

The following is a description of a Prestville soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L | 7 | 17.5 | Brown (10YR 4/3, moist) sedge peat. pH 5.8 |
| F | 3 | 7.5 | Dark brown (10YR 3/3, moist) partly decomposed peat. pH 6.8 |
| Ah | 4 | 10 | Very dark brown (10YR 2/2, moist) silty clay loam, weak granular, friable. pH 7.2 |
| ABg | 2 | 5 | Dark grayish brown (10YR 4/2, moist) silty clay, massive. pH 7.4 |
| Bg | 6 | 15 | Dark gray (7.5YR 4/0, moist) clay, massive, plastic when wet. pH 7.8 |
| BCg | 6 | 15 | Gray (7.5YR 5/0, moist) clay, granular to shot-like, firm. pH 7.6 |
| Cskg | at 28 | at 70 | Gray (7.5YR 5/0, moist) clay. Weakly calcareous and weakly saline. pH 8.0 |

**Raven Series (34,300 acres)**

The Raven soils occur primarily in the southeastern portion of the area along the Paddle and Pembina rivers. These Orthic Humic Gleysols are found on level to depressional topography in association with Maywood, Macola, Mico, and Judah soils. They are developed on fine textured lacustrine material.

The distinguishing features of the Raven soil series are an Ah horizon and mottled or gleyed Bg and Cg horizons.

The following is a description of a Raven soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf and grass litter. |
| Ah | 8 | 20 | Dark gray (10YR 4/1, moist) heavy clay, weak fine subangular blocky, firm. pH 6.6 |
| ABg | 5 | 12.5 | Dark gray (10YR 4/1, moist) heavy clay with dark yellowish brown (10YR 4/4, moist) mottles, weak subangular blocky, firm. pH 7.2 |
| Bg | 8 | 20 | Dark grayish brown (10YR 4/2, moist) heavy clay with numerous dark yellowish brown (10YR 4/4, moist) mottles, massive, firm, sticky when wet. pH 7.6 |
| BCg | 4 | 10 | Dark grayish brown (10YR 4/2, moist) heavy clay, massive, firm. pH 7.2 |
| Ckg | at 26 | at 65 | Grayish brown (10YR 5/2, moist) heavy clay, weakly calcareous. pH 7.5 |

Figure 17—Topography typical of the Rimbey soil areas.

**Rimbey Series (55,000 acres)**

Rimbey soils are well to moderately well drained Orthic Dark Gray soils developed on alluvial-lacustrine material. They occur on level to gently rolling topography. Their distribution is limited generally to the east-central portion of the map sheet. They are found in the vicinity of Vega, Neerlandia, Linaria and, to a lesser extent, around Topland and northeast of Fort Assinboine. These soils are usually associated with Uncas, Tolman, Codner, and Raven soils. An imperfectly drained gleyed phase of this soil is of common occurrence in this area and dominates in approximately 31,000 acres.

Rimbey soils have a thin L-H horizon, a dark gray Ah and Ahe horizon, occasionally a very thin or discontinuous Ae horizon, and a Bt horizon that has a subangular blocky structure. Glacial till which forms the IIC horizon of the soil profile is usually found at about 30 inches below the surface. The gleyed phase is characterized by a prominent Ah horizon and a gleyed B horizon.

The following is a description of an Orthic Dark Gray soil profile representative of the Rimbey series:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Loose leaf litter. |
| Ah | 7 | 18 | Very dark grayish brown (10YR 3/2, moist) loam, weak prismatic, firm. pH 6.2 |
| Ahe | 2 | 5 | Grayish brown (10YR 5/2, moist) loam, weak granular, friable. pH 6.0 |
| Bt | 10 | 25 | Brown to dark brown (10YR 4/3, moist) silt loam, subangular blocky, firm. pH 5.8 |
| BC | 8 | 20 | Dark yellowish brown (10YR 4/4, moist) silt loam, blocky, firm. pH 6.2 |
| IICk | at 28 | at 70 | Very dark grayish brown (10YR 3/2, moist) silty clay loam, till, moderately calcareous. pH 7.6 |

**Sundance Series**

Sundance soils are well to moderately well drained Bisequa Gray Wooded soils developed on alluvial materials found primarily in the southwestern section of the mapped area. They are uncommon and are found in association with Culp soils on undulating and gently rolling topography.

The following is a description of a typical Sundance soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 2 | 5 | Deciduous leaf litter partially decomposed in lower portion. |
| Ae | 2 | 5 | Light brownish gray (10YR 6/2, moist) fine sandy loam, weak platy, very friable. pH 6.0 |
| Bf | 3 | 7.5 | Strong brown (7.5YR 5/6, moist) fine sandy loam, weak blocky, very friable. pH 5.8 |
| Ae | 7 | 17.5 | Yellowish brown (10YR 5/4, moist) fine sandy loam, weak platy, very friable. pH 6.0 |
| Bt | 12 | 30 | Yellowish brown (10YR 5/6, moist) loam, weak granular, friable. pH 5.5 |
| Ck | at 26 | at 65 | Dark grayish brown (10YR 4/2, moist) fine sandy loam, moderately calcareous. pH 7.5 |

**Tangent Series (1,000 acres)**

Tangent soils are moderately well drained Dark Gray Wooded soils developed on brown to yellowish brown, calcareous, silty alluvial-lacustrine material. These soils are dominant in only a relatively small area but are frequently associated with Davis, Culp, Leith, and Judah soils. Where these soils occur, the topography is complex and variable ranging from gently undulating to gently rolling.

Soils of Tangent series have an L-H horizon, a distinct dark grayish brown Ah horizon, grayish Ae and AB horizons, and a brown granular Bt horizon. The C horizon is calcareous.

The following is a description of a Tangent soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 2 | 5 | Deciduous leaf litter. |
| Ah | 3 | 7.5 | Dark grayish brown (10YR 4/2, moist) silt loam, weak fine granular, friable. pH 6.4 |
| Ae | 3 | 7.5 | Pale brown (10YR 6/3, moist) fine sandy loam, weak platy, friable. pH 6.5 |
| AB | 2 | 5 | Grayish brown (10YR 5/2, moist) silt loam, weak granular, friable. pH 6.5 |
| Bt | 8 | 20 | Dark yellowish brown (10YR 4/4, moist) silt loam, coarse granular, firm. pH 6.7 |
| BC | 4 | 10 | Brown (10YR 5/3, moist) silt loam, weak fine subangular blocky, firm. pH 7.0 |
| Cca | at 22 | at 55 | Pale brown (10YR 6/3, moist) very fine sandy loam, strongly calcareous. pH 8.0 |

**Thorsby Series (8,400 acres)**

Thorsby soils are moderately well to imperfectly drained Black Solod soils that have developed on till derived mainly from the Edmonton Formation. These soils are found on gently undulating to rolling topography. They occur in the southeastern portion of the mapped area and are associated with Kavanagh, Kawood, Dnister, Majeau, La Nonne, Onoway, Nakamun, and Cooking Lake soils.

Thorsby soils have an Ah horizon, thin Ae and AB horizons, and a very firm columnar Bnt horizon. The C horizon contains salts and lime carbonate.

The following is a description of a typical Thorsby soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. |
| Ah | 4 | 10 | Very dark grayish brown (10YR 3/2, moist) loam, granular, friable. pH 5.9 |
| Ae | 2 | 5 | Light brownish gray (10YR 6/2, moist) silt loam, platy, friable. pH 5.9 |
| AB | 2 | 5 | Grayish brown (10YR 5/2, moist) clay loam, blocky, firm. pH 6.1 |
| Bnt | 10 | 25 | Dark grayish brown (10YR 4/2, moist) clay, compound columnar and blocky, very firm, organic stained. pH 6.5 |
| BC | 4 | 10 | Dark grayish brown (10YR 4/2, moist) clay loam, coarse blocky, firm. pH 7.0 |
| Csk | at 26 | at 65 | Very dark grayish brown (10YR 3/2, moist) clay loam, till, moderately calcareous and saline. pH 8.0 |

**Tolman Series (2,100 acres)**

Tolman soils are moderately well drained Orthic Gray Wooded soils developed on medium textured alluvial-lacustrine material. Some of these soils are mapped in the vicinity of Topland and Fort Assiniboine. They usually occur in association with Rimbey and Hubalta soils on gently undulating to gently rolling topography.

The following is a description of a typical Tolman soil profile:

| *Horizon* | *Thickness* *in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter, partially decomposed in the lower portion. |
| Ah | 1 | 2.5 | Dark gray (10YR 4/1, moist) loam, weak fine granular, very friable. pH 5.7 |
| Ae | 6 | 15 | Light brownish gray (10YR 6/2, moist) very fine sandy loam, weak platy, very friable. pH 5.7 |
| AB | 4 | 10 | Grayish brown (10YR 5/2, moist) loam, weak subangular blocky, friable. pH 5.6 |
| Bt | 10 | 25 | Brown (10YR 5/3, moist) silt loam, weak coarse subangular blocky, firm. pH 5.4 |
| BC | 12 | 30 | Brown (10YR 5/3, moist) silt loam, weak subangular blocky, friable. pH 5.5 |
| IIC | at 34 | at 85 | Brown (10YR 5/3, moist) clay loam, till. pH 5.8 |

**Uncas Series (49,700 acres)**

Uncas soils are moderately well drained Dark Gray Wooded soils developed on till derived mainly from the Edmonton Formation. They are of common occurrence in the southeastern portion of the mapped area and are found on complex slopes which range from gently undulating to gently rolling. These soils are frequently associated with La Nonne, Falun, Rimbey, Onoway, Cooking Lake, and Nakamun soils.

Uncas soil profiles have an Ah horizon ranging in thickness from 3 to 5 inches, a distinct Ae horizon, and a blocky Bt horizon. The cultivated fields of Uncas soils are usually dark gray in color.

The following is a description of a typical Uncas soil profile:

| *Horizon* | *Thickness in.* | *cm.* | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Partly decomposed leaf litter. pH 6.4 |
| Ah | 3 | 7.5 | Very dark gray (10YR 3/1, moist) loam, weak subangular blocky, very friable. pH 6.8 |
| Ae | 4 | 10 | Grayish brown (10YR 5/2, moist) silt loam, weak platy, friable. pH 6.6 |
| Bt | 16 | 40 | Brown (10YR 5/3, moist) clay loam, subangular blocky, firm. pH 6.2 |
| BC | 12 | 30 | Dark grayish brown (10YR 4/2, moist) loam, subangular blocky, firm. pH 6.2 |
| Ck | at 36 | at 90 | Dark grayish brown (10YR 4/2, moist) loam, till, weakly calcareous. pH 7.7 |

**Wabamun Series (2,100 acres)**

Wabamun soils are moderately well to imperfectly drained Black Solod soils developed on dark gray clay. These soils are of minor occurrence but are found north of Rossington and southeast of Lawton on undulating topography.

These soils have a fairly thick Ah horizon, a leached Ae horizon, a distinct AB horizon that breaks into blocky aggregates, and a hard to very hard Bnt horizon which is organic stained.

The following is a description of a Wabamun soil profile:

| *Horizon* | *Thickness in.* | | *Description* |
|---|---|---|---|
| L-H | 1 | 2.5 | Deciduous leaf litter. pH 6.1 |
| Ah | 4 | 10 | Dark grayish brown (10YR 4/2, dry) silty clay, fine granular, slightly hard. pH 5.5 |
| Ae | 2 | 5 | Light gray (10YR 7/1, dry) silty clay loam, platy, slightly hard. pH 5.2 |
| AB | 2 | 5 | Pale brown (10YR 6/3, dry) silty clay loam, blocky (tops of old columns), slightly hard. pH 4.7 |
| Bnt | 11 | 27.5 | Light yellowish brown (10YR 6/4, dry) clay, prismatic breaking to coarse- blocky, hard, organic staining (10YR 4/1, dry) on ped faces. pH 4.4 |
| Csk | at 20 | at 50 | Dark grayish brown (10YR 4/2, moist) heavy clay. pH 7.1 |

# ANALYSES OF SOME REPRESENTATIVE SOIL PROFILES

Chemical and physical analyses data for some representative soil profiles are given in Table 5.

The analytical methods used in the various determinations are as follows:

1. **Reaction (pH)**—Soil paste method of Doughty, 1941. Soil Sci. 22:135-138. A Coleman glass electrode was used.
2. **Nitrogen**—Kjeldahl method of Prince, 1945. Soil Sci. 59:47-52. The catalyst used was a mixture of selenium, copper sulphate and potassium sulphate.
3. **Organic Carbon**—By difference between total carbon and inorganic carbon. Total carbon by dry combustion as per instruction manual for operation of Leco Carbon Analyzer nos. 577-100.
4. **Exchange Capacity**—Ammonium acetate method by displacement of ammonium with sodium chloride. Methods of soil analysis Agronomy No. 9, Part 2, 1965.
5. **Exchangeable Cations**—A.O.A.C. extraction method, 8th Edition, 1955, Washington D.C. Calcium and magnesium were determined by EDTA titration and sodium and potassium by Beckman DU flame spectrophotometer.
6. **Calcium Carbonate Equivalent**—Schollenberger, C. J., 1945. Soil Sci. 59:57-63.
7. **Particle Size Analyses**—Pipette method of Kilmer and Alexander as modified by Toogood and Peters, 1953, Can. J. Agr. Sci. 33:159-171.

## Soil Reaction

Generally, the Chernozemic soils are neutral but the Luvisolic soils are acidic to very acidic. Usually the greatest acidity occurs in the uppermost portion of the Bt horizon of Gray Wooded soils. The C horizon of most of the soils listed in Table 5 are neutral to moderately alkaline. Solod and Solonetz soils are usually acidic in the A and B horizons. The Hubalta and Pegasus soil series are very acidic throughout their soil profiles.

## Nitrogen

Nitrogen is an important plant nutrient, the amount of which varies considerably in soils. The well decomposed organic matter in the Ah horizon is the main source of nitrogen in a soil. Consequently soils that have a darker and thicker Ah horizon are generally the most fertile. There is an appreciable difference between soils of different great groups mainly because of the variation in thickness of the Ah horizon. Gray Wooded soils are low in nitrogen. Dark Gray Wooded soils are intermediate and Dark Gray soils are relatively high in nitrogen content.

### Organic Carbon

The determination of organic carbon in soil is considered to provide the best estimate of organic matter in the soil. It is generally accepted that the amount of organic matter is equal to 1.742 times the amount of organic carbon.

The carbon-nitrogen ratio is an indication of the extent of decomposition of the organic matter in the soil. A ratio of 17 or less is characteristic of the well decomposed organic matter commonly found in an Ah horizon of Chernozemic soils. In most of the soils listed in Table 5 the C/N ratio is considerably lower than 17 which indicates relatively complete decomposition of most of the organic matter.

### Exchangable Cations

The cation exchange capacity increases with increased clay and organic matter content. Consequently, the sandy soils and the leached Ae horizons have relatively low exchange capacities.

The base saturation of the samples listed in Table 5 range from 61 to 100 percent. Exchangeable hydrogen is relatively high in the A horizon of Solonetz soils and in the various horizons of Gray Wooded soils.

In most of the soils sampled, calcium is the dominant cation and constitutes from 33 to 95 percent of the exchangeable cations. In Chernozemic soils exchangeable calcium makes up between 66 and 91 percent of the exchangeable cations. In the Solonetz soils reported the ratio of exchangeable calcium to exchangeable sodium is usually less than 10. Exchangeable sodium is low in most of the soils except the Solonetz soils where it reaches 22 percent in the B horizons.

### Particle Size

The determination of sand, silt, and clay size particles in a soil sample makes it possible to group soils into textural classes as shown by the textural triangle in Figure 21. In a soil profile the textural class frequently varies with the soil horizons as indicated in the profile description. Textural class when used in conjunction with a soil series name usually refers to the texture of the cultivated surface of that soil.

**TABLE 5—Chemical and Particle Size Analyses of Some Representative Soil Profiles**

| Horizon | Thickness in. | Thickness cm. | pH | N % | Org. C % | C/N Ratio | Exchangeable Cations H % | Na % | K % | Ca % | Mg % | C.E.C. m.e./100 g. | Ca/Na Ratio | $CaCO_3$ Equiv. % | Particle Size Distribution Sand % | Silt % | Clay % <2u | Clay % <0.2u | Texture |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. CHERNOZEMIC SOILS | | | | | | | | | | | | | | | | | | | |
| Gleyed Falun Loam - SE 18-61-1 W5 - Gleyed Dark Gray (Till) | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ah | 10 | 25 | 7.0 | 0.10 | 1.18 | 11 | 0 | 1 | 1 | 84 | 14 | 18.4 | 84 | - | 38 | 42 | 20 | 13 | Loam |
| AB | 4 | 10 | 6.9 | 0.05 | 0.59 | 11 | 3 | 1 | 1 | 66 | 29 | 19.4 | 66 | - | 26 | 46 | 28 | 19 | Loam |
| Bmg1 | 9 | 22.5 | 6.9 | 0.03 | 0.29 | 12 | 1 | 1 | 1 | 76 | 21 | 15.6 | 76 | - | 48 | 23 | 29 | 16 | Sandy clay loam |
| Bmg2 | 11 | 27.5 | 6.6 | 0.04 | 0.47 | 13 | 3 | Tr. | 1 | 77 | 19 | 17.4 | 77 | - | 47 | 25 | 28 | 20 | Sandy clay loam |
| Ck | at 35 | at 87.5 | 7.6 | - | - | - | - | - | - | - | - | - | - | 2.30 | 49 | 27 | 24 | 15 | Sandy clay loam |
| Mico Silty Clay Loam - NE 15-59-3 W5 - Orthic Dark Gray (Lacustrine) | | | | | | | | | | | | | | | | | | | |
| Ah | 4 | 10 | 6.5 | - | 4.09 | - | 8 | 1 | 5 | 68 | 18 | 32.3 | 68 | - | 17 | 53 | 30 | 11 | Silty clay loam |
| Ahe | 4 | 10 | 6.2 | - | 1.80 | - | 10 | 1 | 1 | 69 | 19 | 24.2 | 69 | - | 18 | 52 | 30 | 15 | Silty clay loam |
| AB | 3 | 7.5 | 5.8 | - | 0.66 | - | 14 | 1 | 1 | 57 | 27 | 22.4 | 57 | - | 15 | 52 | 33 | 18 | Silty clay loam |
| Bt | 8 | 20 | 6.2 | - | 0.83 | - | 5 | 2 | 1 | 68 | 24 | 30.3 | 34 | - | 10 | 37 | 53 | 30 | Clay |
| BC | 6 | 15 | 7.5 | - | 0.58 | - | - | 1 | 1 | 70 | 28 | 24.5 | 70 | 0.11 | 9 | 34 | 57 | 27 | Clay |
| Ck | at 26 | at 65 | 7.8 | - | 0.50 | - | - | 1 | 1 | 80 | 18 | 14.6 | 80 | 1.43 | 1 | 43 | 56 | 25 | Silty clay |
| Gleyed Rimbey Loam - NE 22-61-2 W5 - Gleyed Dark Gray (Alluvial-lacustrine) | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ah | 7 | 17.5 | 6.8 | 0.18 | 2.17 | 12 | Tr. | Tr. | 2 | 82 | 16 | 22.8 | 82 | - | 35 | 37 | 28 | 17 | Loam |
| Bmg | 13 | 32.5 | 6.6 | 0.04 | 0.43 | 10 | Tr. | Tr. | 2 | 77 | 21 | 16.2 | 77 | - | 29 | 45 | 26 | 23 | Loam |
| Cg | 5 | 12.5 | 6.5 | - | - | - | Tr. | 1 | 1 | 74 | 24 | 17.8 | 74 | - | 28 | 30 | 42 | 23 | Clay |
| IICk | at 26 | at 65 | 7.8 | - | - | - | - | - | - | - | - | 12.7 | - | 11.10 | 19 | 45 | 36 | 18 | Silty clay loam |
| La Nonne Loam - NE 27-59-5 W5 - Solodic Dark Gray (Till) | | | | | | | | | | | | | | | | | | | |
| Ah | 4 | 10 | 6.7 | 0.25 | 3.24 | 13 | 10 | Tr. | Tr. | 82 | 8 | 22.3 | 82 | - | 35 | 46 | 19 | 7 | Loam |
| Ae | 6 | 15 | 5.7 | 0.07 | 0.64 | 9 | 24 | 2 | 1 | 66 | 7 | 9.2 | 33 | - | 37 | 44 | 19 | 8 | Loam |
| AB | 3 | 7.5 | 4.9 | 0.06 | 0.55 | 9 | 12 | Tr. | 2 | 70 | 16 | 18.8 | 70 | - | 31 | 33 | 36 | 21 | Clay loam |
| Btnj | 11 | 27.5 | 5.0 | 0.04 | 0.52 | 13 | 11 | 1 | 1 | 70 | 17 | 21.7 | 70 | - | 32 | 31 | 37 | 22 | Clay loam |
| BC | 13 | 32.5 | 5.8 | - | - | - | 5 | Tr. | 2 | 77 | 16 | 17.7 | 77 | - | 40 | 28 | 32 | 18 | Clay loam |
| Csk | at 38 | at 95 | 7.5 | - | - | - | Tr. | Tr. | 1 | 91 | 8 | 11.7 | 91 | 5.15 | 40 | 34 | 26 | 13 | Loam |
| 2. SOLONETZIC SOILS | | | | | | | | | | | | | | | | | | | |
| Kavanagh Loam - NE 34-60-2 W5 - Black Solonetz (Residual) | | | | | | | | | | | | | | | | | | | |
| Ah | 3 | 7.5 | 5.4 | - | 3.19 | - | 39 | 3 | 2 | 40 | 16 | 29.8 | 13 | - | 23 | 45 | 32 | 15 | Clay loam |
| Ae | 5 | 12.5 | 6.0 | - | 0.48 | - | 29 | 7 | 2 | 46 | 14 | 5.8 | 6 | - | 55 | 28 | 17 | 11 | Sandy loam |
| Bn | 11 | 27.5 | 7.0 | - | 0.39 | - | 3 | 22 | 1 | 48 | 26 | 12.9 | 2 | 0.07 | 55 | 26 | 19 | 10 | Sandy loam |
| Bnt | 10 | 25 | 7.8 | - | 0.32 | - | - | 22 | 2 | 45 | 31 | 16.4 | 2 | 0.11 | 50 | 25 | 25 | 17 | Sandy clay loam |
| Csk | 8 | 20 | 7.9 | - | 0.30 | - | - | 11 | 1 | 73 | 15 | 14.1 | 7 | 4.15 | 43 | 43 | 24 | 14 | Loam |
| Csca | at 37 | at 92.5 | 8.1 | - | 0.15 | - | - | 11 | 1 | 75 | 13 | 17.5 | 7 | 6.80 | 36 | 39 | 25 | 12 | Loam |

| Horizon | Thickness in. | Thickness cm. | pH | N % | Org. C % | C/N Ratio | Exchangeable Cations H % | Exchangeable Cations Na % | Exchangeable Cations K % | Exchangeable Cations Ca % | Exchangeable Cations Mg % | C.E.C. m.e./100 g. | Ca/Na Ratio | $CaCO_3$ Equiv. % | Particle Size Distribution Sand % | Particle Size Distribution Silt % | Clay % <2u | Clay % <0.2u | Texture |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dnister Silt Loam - SE 34-60-2 W5 - Gray Solonetz (Till) | | | | | | | | | | | | | | | | | | | |
| Ah | 1 | 2.5 | 6.4 | - | 2.94 | - | 13 | 1 | 4 | 72 | 10 | 17.3 | 72 | - | 39 | 50 | 11 | 5 | Loam |
| Ae | 6 | 15 | 6.3 | - | 0.33 | - | 17 | 6 | 4 | 63 | 10 | 8.4 | 10 | - | 34 | 53 | 13 | 2 | Silt loam |
| Bnt1 | 8 | 20 | 6.2 | - | 0.47 | - | 4 | 8 | 1 | 60 | 27 | 22.6 | 7 | - | 35 | 33 | 32 | 20 | Clay loam |
| Bnt2 | 9 | 22.5 | 7.5 | - | 0.33 | - | - | 10 | 1 | 52 | 37 | 25.0 | 5 | 0.52 | 32 | 37 | 31 | 16 | Clay loam |
| Csk | at 25 | at 62.5 | 7.7 | - | 0.31 | - | - | 7 | 1 | 75 | 17 | 18.4 | 11 | 5.55 | 39 | 47 | 24 | 12 | Loam |
| 3. LUVISOLIC SOILS | | | | | | | | | | | | | | | | | | | |
| Judah Loam - NE 12-58-9 W5 - Dark Gray Wooded (Lacustrine) | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ah | 3 | 7.5 | 6.7 | 0.61 | 8.10 | 13 | Tr. | Tr. | 2 | 92 | 6 | 41.0 | 92 | - | 41 | 36 | 23 | 7 | Loam |
| Ae | 2 | 5 | 6.3 | 0.06 | 0.72 | 12 | 3 | 1 | 1 | 77 | 18 | 10.9 | 77 | - | 35 | 44 | 21 | 7 | Loam |
| AB | 5 | 12.5 | 6.0 | 0.07 | 0.73 | 10 | 1 | Tr. | 2 | 82 | 15 | 18.9 | 82 | - | 44 | 20 | 36 | 20 | Clay loam |
| Bt1 | 8 | 20 | 6.2 | 0.04 | 0.46 | 12 | 3 | Tr. | 2 | 80 | 15 | 18.9 | 80 | - | 48 | 16 | 36 | 23 | Sandy clay |
| Bt2 | 7 | 17.5 | 6.2 | - | - | - | 4 | Tr. | 2 | 73 | 21 | 22.1 | 73 | - | 38 | 25 | 37 | 23 | Clay loam |
| Cca | at 26 | at 65 | 7.5 | 0.05 | 0.47 | 9 | - | Tr. | 1 | 95 | 4 | 17.0 | 95 | 13.21 | 31 | 40 | 29 | 15 | Clay loam |
| Uncas Loam - SW 10-61-3 W5 - Dark Gray Wooded (Till) | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ah | 3 | 7.5 | 6.8 | 0.27 | 5.07 | 19 | 6 | Tr. | 5 | 78 | 11 | 27.8 | 78 | - | 33 | 50 | 17 | 6 | Loam |
| Ae | 4 | 10 | 6.6 | 0.06 | 0.53 | 9 | 8 | Tr. | 7 | 81 | 4 | 12.7 | 81 | - | 37 | 54 | 9 | 3 | Silt loam |
| Bt | 16 | 40 | 6.2 | 0.04 | 0.49 | 12 | 4 | Tr. | 3 | 74 | 19 | 23.5 | 74 | - | 28 | 38 | 34 | 23 | Clay loam |
| BC | 12 | 30 | 6.2 | 0.04 | 0.46 | 12 | 5 | Tr. | 2 | 76 | 16 | 21.1 | 76 | - | 39 | 37 | 24 | 18 | Loam |
| Ck | at 36 | at 90 | 7.7 | - | - | - | - | - | - | - | - | - | - | 3.30 | 42 | 38 | 20 | 11 | Loam |
| Cooking Lake Silt Loam - SW 25-58-2 W5 - Orthic Gray Wooded (Till) | | | | | | | | | | | | | | | | | | | |
| L-H | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 6 | 15 | 6.6 | - | 0.57 | - | 6 | 1 | 13 | 71 | 9 | 9.1 | 71 | - | 36 | 55 | 9 | 3 | Silt loam |
| AB | 3 | 7.5 | 6.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Bt1 | 10 | 25 | 6.4 | - | 0.59 | - | 4 | Tr. | 3 | 74 | 19 | 28.2 | 74 | - | 32 | 38 | 30 | 22 | Clay loam |
| Bt2 | 10 | 25 | 6.2 | - | 0.69 | - | 5 | Tr. | 2 | 71 | 22 | 24.2 | 71 | - | 32 | 39 | 29 | 20 | Clay loam |
| BC | 10 | 25 | 6.2 | - | 0.45 | - | 7 | Tr. | 1 | 69 | 23 | 19.8 | 69 | - | 37 | 34 | 29 | 17 | Clay loam |
| C | at 41 | at 102.5 | 6.5 | - | 0.43 | - | 3 | Tr. | 2 | 72 | 23 | 20.2 | 72 | 0.05 | 37 | 35 | 28 | 16 | Clay loam |
| Culp Sandy Loam - NW 31-60-5 W5 - Orthic Gray Wooded (Alluvial) | | | | | | | | | | | | | | | | | | | |
| L-H | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 7 | 17.5 | 6.5 | 0.03 | 0.28 | 9 | 13 | Tr. | 4 | 70 | 13 | 4.7 | 70 | - | 69 | 24 | 7 | 2 | Sandy loam |
| Bt1 | 6 | 15 | 6.2 | 0.04 | 0.39 | 10 | 8 | Tr. | 3 | 70 | 19 | 10.0 | 70 | - | 59 | 25 | 16 | 6 | Sandy loam |
| Bt2 | 6 | 15 | 6.7 | 0.02 | 0.41 | 20 | - | Tr. | 4 | 82 | 14 | 8.4 | 82 | - | 74 | 9 | 17 | 4 | Sandy loam |
| Ck1 | 10 | 25 | 8.1 | - | - | - | - | - | - | - | - | 4.9 | - | 14.10 | 76 | 19 | 5 | 2 | Sandy loam |
| Cca | 5 | 12.5 | 8.1 | - | - | - | - | - | - | - | - | - | - | 26.10 | 61 | 33 | 6 | 1 | Sandy loam |
| Ck2 | at 36 | at 90 | 8.2 | - | - | - | - | - | - | - | - | - | - | 14.90 | 79 | 16 | 5 | 1 | Loamy sand |

| Horizon | Thickness in. | Thickness cm. | pH | N % | Org. C % | C/N Ratio | Exchangeable Cations H % | Exchangeable Cations Na % | Exchangeable Cations K % | Exchangeable Cations Ca % | Exchangeable Cations Mg % | C.E.C. m.e./100 g. | Ca/Na Ratio | $CaCO_3$ Equiv. % | Particle Size Distribution Sand % | Particle Size Distribution Silt % | Particle Size Distribution Clay % <2u | Particle Size Distribution Clay % <0.2u | Texture |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hubalta Loam - NE 36-53-10 W5 - Orthic Gray Wooded (Till)** | | | | | | | | | | | | | | | | | | | |
| L-H | 3 | 7.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 4 | 10 | 5.4 | 0.04 | 0.57 | 14 | 33 | 1 | 4 | 62 | 1 | 5.1 | 62 | - | 50 | 41 | 9 | 3 | Sandy loam |
| AB | 2 | 5 | 5.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Bt1 | 6 | 15 | 4.8 | 0.04 | 0.30 | 8 | 17 | 1 | 3 | 52 | 27 | 17.3 | 52 | - | 41 | 27 | 32 | 23 | Clay loam |
| Bt2 | 9 | 22.5 | 4.7 | 0.03 | 0.36 | 12 | 18 | Tr. | 3 | 59 | 20 | 19.4 | 59 | - | 41 | 31 | 28 | 19 | Clay loam |
| BC | 16 | 40 | 4.8 | - | - | - | 16 | Tr. | 2 | 52 | 30 | 19.9 | 52 | - | 40 | 27 | 33 | 18 | Clay loam |
| C | at 40 | at 100 | 4.8 | - | - | - | 16 | 3 | 2 | 60 | 19 | 20.1 | 20 | - | 36 | 31 | 33 | 18 | Clay loam |
| **Kathleen Silt Loam - SW 10-60-4 W5 - Orthic Gray Wooded (Lacustrine)** | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | 6.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 6 | 15 | 6.3 | - | 0.68 | - | 17 | 2 | 4 | 65 | 12 | 8.9 | 34 | - | 12 | 68 | 20 | 9 | Silt loam |
| AB | 2 | 5 | 5.9 | - | 0.85 | - | 11 | 1 | 2 | 38 | 48 | 19.6 | 38 | - | 12 | 51 | 37 | 15 | Silty clay loam |
| Bt | 10 | 25 | 5.6 | - | 0.53 | - | 9 | 1 | 2 | 68 | 20 | 30.2 | 68 | - | 3 | 44 | 53 | 27 | Silty clay |
| BC | 8 | 20 | 6.1 | - | 0.62 | - | 6 | 1 | 2 | 75 | 16 | 28.2 | 75 | - | 2 | 51 | 47 | 23 | Silty clay |
| Ck | at 27 | at 67.5 | 7.5 | - | 0.39 | - | - | Tr. | 1 | 90 | 9 | 16.5 | 90 | 2.72 | 1 | 57 | 42 | 12 | Silty clay |
| **Maywood Silty Clay Loam - SW 14-61-9 W5 - Orthic Gray Wooded (Lacustrine)** | | | | | | | | | | | | | | | | | | | |
| L-H | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 5 | 12.5 | 5.5 | 0.10 | 1.02 | 10 | 34 | 5 | Tr. | 47 | 10 | 11.3 | 9 | - | 24 | 55 | 21 | 10 | Silt loam |
| AB | 7 | 17.5 | 5.1 | 0.06 | 0.64 | 11 | 13 | 3 | 3 | 53 | 28 | 19.6 | 18 | - | 15 | 44 | 41 | 27 | Silty clay |
| Bt | 8 | 20 | 5.4 | 0.06 | 0.66 | 11 | 5 | 2 | 2 | 56 | 35 | 34.7 | 28 | - | 1 | 32 | 67 | 43 | Heavy clay |
| BC | 8 | 20 | 6.6 | 0.05 | 0.95 | 19 | 1 | 2 | 2 | 49 | 46 | 39.5 | 25 | - | 1 | 28 | 71 | 35 | Heavy clay |
| Ck | 6 | 15 | 7.2 | - | - | - | - | - | - | - | - | - | - | 5.49 | 0 | 14 | 86 | 38 | Heavy clay |
| Cca | at 36 | at 90 | 7.7 | - | - | - | - | - | - | - | - | - | - | 12.90 | 0 | 39 | 61 | 26 | Heavy clay |
| **Pegasus Silty Clay Loam - SE 6-62-11 W5 - Orthic Gray Wooded (Residual)** | | | | | | | | | | | | | | | | | | | |
| L-H | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 3 | 7.5 | 4.8 | 0.12 | 1.93 | 16 | 11 | Tr. | 2 | 83 | 4 | 22.3 | 83 | - | 21 | 51 | 28 | 4 | Silt loam |
| Bt | 10 | 25 | 4.4 | 0.06 | 0.82 | 14 | 13 | Tr. | 4 | 67 | 16 | 39.0 | 67 | - | 5 | 45 | 50 | 30 | Silty clay |
| BC1 | 5 | 12.5 | 4.9 | 0.03 | 0.37 | 10 | 11 | Tr. | 4 | 74 | 11 | 31.2 | 74 | - | 33 | 43 | 24 | 13 | Loam |
| BC2 | 10 | 25 | 4.5 | - | - | - | 19 | Tr. | 6 | 72 | 3 | 29.3 | 72 | - | 27 | 51 | 22 | 13 | Silt loam |
| C | at 30 | at 75 | 4.5 | - | - | - | 15 | 1 | 2 | 46 | 36 | 32.7 | 46 | - | 4 | 59 | 37 | 8 | Silty clay loam |
| **Nakamun Silt Loam - NW 36-59-1 W5 - Solodic Gray Wooded (Till)** | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 7 | 17.5 | 5.7 | - | 0.41 | - | 12 | 4 | 4 | 69 | 11 | 6.2 | 17 | - | 41 | 52 | 7 | 1 | Silt loam |
| AB | 6 | 15 | 5.6 | - | 0.70 | - | 11 | 4 | 1 | 63 | 21 | 25.7 | 15 | - | 34 | 30 | 36 | 21 | Clay loam |
| Bt | 8 | 20 | 6.1 | - | 0.65 | - | 5 | 4 | 1 | 61 | 29 | 27.5 | 15 | - | 28 | 31 | 41 | 22 | Clay |
| BC | 5 | 12.5 | 6.5 | - | 0.41 | - | 2 | 3 | 1 | 67 | 27 | 23.1 | 22 | - | 47 | 25 | 28 | 16 | Sandy clay loam |
| Cks | at 27 | at 67.5 | 7.4 | - | 0.37 | - | - | 2 | 1 | 80 | 17 | 17.2 | 40 | 3.19 | 46 | 25 | 29 | 14 | Sandy clay loam |

| Horizon | Thickness in. | Thickness cm. | pH | N % | Org. C % | C/N Ratio | Exchangeable Cations H % | Na % | K % | Ca % | Mg % | C.E.C. m.e./100 g. | Ca/Na Ratio | $CaCO_3$ Equiv. % | Particle Size Distribution Sand % | Silt % | Clay % <2u | Clay % <0.2u | Texture |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **4. BRUNISOLIC SOILS** | | | | | | | | | | | | | | | | | | | |
| Heart Sand - SE 27-61-6 W5 - Degraded Eutric Brunisol (Aeolian) | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ae | 3 | 7.5 | 6.5 | 0.03 | 0.50 | 17 | 20 | 2 | 8 | 59 | 11 | 4.9 | 29 | - | 90 | 6 | 4 | 1 | Sand |
| Bfj | 10 | 25 | 6.6 | 0.01 | 0.33 | 33 | 3 | 1 | 2 | 84 | 10 | 4.4 | 84 | - | 90 | 5 | 5 | 1 | Sand |
| Cca | at 14 | at 35 | 8.1 | - | - | - | - | - | - | - | - | 3.2 | - | 12.70 | 89 | 9 | 2 | 0 | Sand |
| **5. GLEYSOLIC SOILS** | | | | | | | | | | | | | | | | | | | |
| Raven Heavy Clay - SE 29-63-2 W5 - Orthic Humic Gleysol (Lacustrine) | | | | | | | | | | | | | | | | | | | |
| L-H | 1 | 2.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ah | 8 | 20 | 6.6 | 0.34 | 4.83 | 14 | 7 | Tr. | 1 | 77 | 15 | 56.0 | 77 | - | 3 | 21 | 66 | 34 | Heavy clay |
| ABg | 5 | 12.5 | 7.2 | 0.04 | 0.65 | 16 | - | 1 | 1 | 75 | 23 | 41.5 | 75 | - | 1 | 28 | 71 | 37 | Heavy clay |
| Bg | 8 | 20 | 7.6 | 0.04 | 0.80 | 20 | - | 1 | 1 | 84 | 14 | 38.4 | 84 | - | 1 | 34 | 65 | 32 | Heavy clay |
| BCg | 4 | 10 | 7.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Ckg | at 26 | at 65 | 7.5 | 0.06 | - | - | - | 2 | 1 | 78 | 19 | 41.2 | 39 | 0.95 | 0 | 28 | 72 | 37 | Heavy clay |

# LAND USE

Land is required for numerous purposes such as agriculture, forestry, engineering, wildlife, recreation, and for urban and industrial development. Since soils are the major component of land an appreciation of their characteristics is vital to the intelligent use of land. Following is information obtained from and for the principal users of land in this region which, supplemented by a study of the soils indicated in the map and report, may assist in the development of land in this area.

## AGRICULTURE

### Development

Land clearing and agricultural development in the Whitecourt and Barrhead area started with the arrival of settlers shortly after the turn of the century and has been continued since then. The map in Figure 18 shows the distribution of farms on which cultivation was observed at the time of soil survey. In portions of this area this distribution may have changed significantly since that time.

Data in Tables 6, 7, and 8, compiled from the Census of Canada, show that changes in agricultural development occurred as evidenced by land improvement, crop and livestock production in the mapped area between 1921 and 1966.

Table 6 shows that there is marked and steady increase in occupancy of land and a very marked increase in improved land in this area. Of the total land area, approximately 15 percent was occupied and about 3 percent improved in 1921. In 1966, approximately 45 percent was occupied and 26 percent improved. Over 70 percent of the improved land has been under crop.

Wheat has rarely been a dominant crop in this region as evidenced in Table 7. Barley and oats have been grown extensively at all times but recently pasture and hay crops have assumed a prominent place in the general farming practice.

**TABLE 6—Total Acreage Occupied and Improved Land in the Whitecourt and Barrhead Area (1921 to 1966)**

| | 1921 | 1931 | 1941 | 1951 | 1961 | 1966 |
|---|---|---|---|---|---|---|
| Land Occupied | 273,701 | 480,620 | 639,393 | 646,385 | 796,612 | 838,619 |
| Land Improved | 50,826 | 149,945 | 252,861 | 309,710 | 456,496 | 511,403 |
| Under Crop | 39,000 | 110,053 | 174,150 | 225,481 | 313,793 | 358,271 |
| Summerfallow | 9,446 | 29,645 | 61,749 | 57,583 | 86,075 | 73,832 |
| Pasture | 1,024 | 3,498 | 9,003 | 16,655 | 41,122 | 61,165 |
| Other | | | 7,945 | 10,493 | 15,512 | 18,140 |

**TABLE 7—Total Acreage of Principal Crops in the Whitecourt and Barrhead Area (1921 to 1966)**

| | 1921 | 1931 | 1941 | 1951 | 1961 | 1966 |
|---|---|---|---|---|---|---|
| Wheat | 5,479 | 55,280 | 66,516 | 46,331 | 40,703 | 51,445 |
| Oats | 23,576 | 34,287 | 55,549 | 54,817 | 61,996 | 48,468 |
| Barley | 3,545 | 54,995 | 38,815 | 91,178 | 92,614 | 105,297 |
| Mixed Grains | 12 | | | 1,269 | 15,882 | 21,467 |
| Rye | 352 | 233 | 608 | 244 | 300 | 299 |
| Flax | 11 | 17 | 549 | 1,378 | 3,389 | 3,114 |
| Tame Hay | 3,318 | 4,547 | 16,070 | 29,269 | 80,192 | 109,933 |
| Rape Seed | | | | | 10,869 | 11,290 |

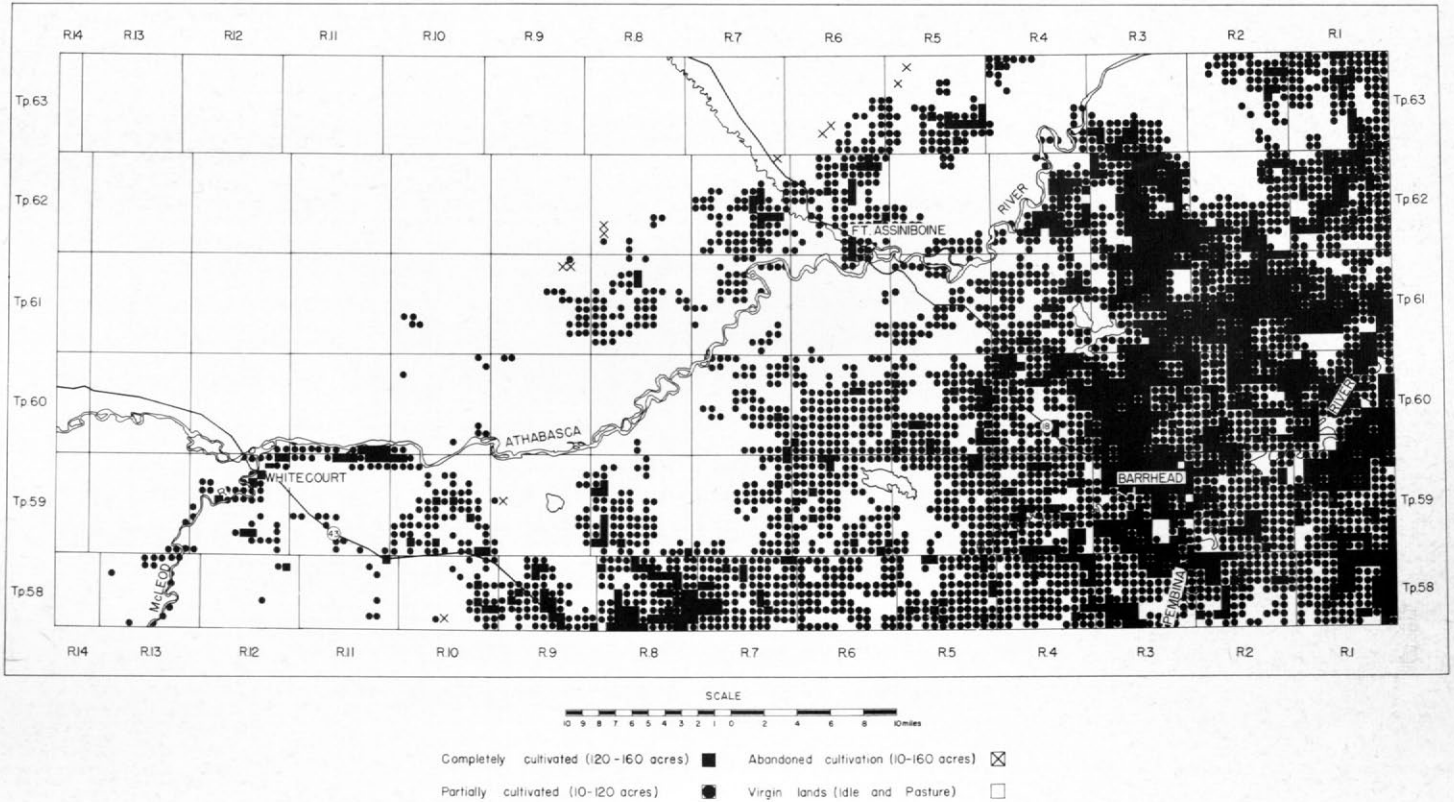



**Figure 18—Map showing cultivated, abandoned, and virgin lands in the mapped area at the time of survey.**

**TABLE 8—Livestock Population in the Whitecourt and Barrhead Area (1921 to 1966)**

| | 1921 | 1931 | 1941 | 1951 | 1961 | 1966 |
|---|---|---|---|---|---|---|
| Horses | 433 | 7,998 | 11,657 | 5,346 | 1,916 | 1,454 |
| Cattle | 4,021 | 10,525 | 17,812 | 20,634 | 49,811 | 73,500 |
| Sheep | 680 | 3,622 | 6,232 | 5,076 | 9,357 | 6,814 |
| Swine | 7,398 | 16,653 | 41,044 | 32,280 | 61,931 | 49,424 |
| Poultry | | 115,457 | 170,385 | 160,281 | 260,482 | 201,258 |

**Figure 19—Improved pasture in a Raven-Codner soil area.**

Livestock population given in Table 8 shows a marked change in composition. Cattle and hogs are the most important livestock produced in this area. Their comparative population has changed considerably during this period. Whereas in 1921 the hog population was nearly twice that of the cattle population the reverse is evident in 1966.

## Soil Management

Good soil management is concerned with the profitable production of crops and the conservation of the soil resources. This objective involves an appraisal of crops and management suitable to the location and the soils of the region.

### *Chernozemic Soils*

Chernozemic soils are the best soils of the area and present very few special problems in soil management. They are adaptable to a wide range of crops and are naturally quite fertile. Management of these soils should aim to maintain their natural characteristics and increase their productivity.

Maintenance of high organic matter content in the mineral soil enhances the moisture storage capacity of the soil and is perhaps the single most beneficial farm practice. The rainfall is readily absorbed by a soil that is high in organic matter and is held there for plant use. Straw and trash should always be worked into the soil rather than burnt. Wind and water erosion can be greatly minimized by maintaining a good trash cover and high organic matter content in the soil. The tilth of the soil and the seed bed are greatly improved if sufficient organic matter has been worked into the soil.

The use of recommended fertilizers in Chernozemic soil areas is an established economic practice providing for increased yields.

### *Gray Wooded Soils*

Research† and experience provide ample proof that a grain-legume crop rotation supplemented by applications of recommended fertilizers can assure a profitable agricultural enterprise on Gray Wooded soils. These soils have a low nutrient supply, a low organic matter content, and lack good physical properties. Frequently these soils have a hard surface crust which hinders the emergence of young seedlings. Careful management involving an increase of the nutrient supply and the addition of organic matter is a prime requisite in the agricultural utilization of these soils.

### *Solonetzic Soils*

Solonetzic soils frequently present serious crop production problems. The relatively impermeable B horizon of these soils tends to limit plant root penetration and curtails water percolation. In many areas it is very difficult to establish and maintain good plant growth on these soils.

Research‡ at the Vegreville Solonetzic Soil Substation has been rewarding and shows promise of the successful agricultural utilization of a large proportion of these soils. These studies show that regard given to surface drainage of depressional areas, to breaking the B horizon with tillage implements, to seedbed preparation, to methods of seeding, and to fertilizer practices is of prime concern in the management of these soils.

### *Organic Soils*

Soils with a thick accumulation of peat generally serve as good reservoirs for surface water. They help control spring flooding and provide for a steady stream discharge throughout the summer. The larger areas of these soils should not be drained. Smaller areas associated with cultivated areas can be used to advantage for the production of hay, pasture, and other crops if satisfactory drainage can be provided.

Crop production on Organic soils presents many problems. Frozen conditions persist longer in Organic soils in the spring

†Toogood, J. A. et. al. 1962. Gray Wooded Soils and their Management. Univ. of Alta. Bull. 21 (6th Edition).

‡Cairns, R. R., and Bowser, W. E., 1968. The Solonetzic Soils of the Prairies. Agric. Inst. Rev. (Jan.-Feb.).

while in the fall such areas are subject to frosts earlier than those common to the better drained mineral soils. Apart from hay and pasture some success has been experienced in the production of early ripening barley.

Organic soils vary considerably, each area requiring individual attention with respect to drainage, clearing, and fertilizer treatment. Burning of excess peat in preparation for cultivation may be desirable in some cases but must be practised with restraint and caution. Organic soils characterized by a shallow peat accumulation and those consisting mainly of sedge peat are preferred for cultivation purposes.

**Figure 20—Drainage and burning of excess peat in preparation for cultivation of Organic soils.**

## Soil Rating

The soils of the Whitecourt and Barrhead area are grouped on the basis of their inherent productivity into seven groups according to their suitability for grain production. Three of these groups are nonarable and are included in the pasture and woodland group, and four of the groups are arable. This rating is based on a consideration of the type of soil profile, soil texture, stoniness, topography, drainage, and general elevation of the area. Frequently, the past performance of somewhat similar soils under cropping conditions was used as a guide in establishing the rating of various soils.

Most of the soil areas that appear on the soil map usually consist of more than one soil series. These soil series may have a different productivity rating, but because of the limited detail in mapping it is necessary to apply a single rating to the entire soil area. Therefore, the soil rating map should be regarded as indicating average ratings of soil areas rather than specific ratings of individual land parcels. On the accompanying soil rating map, pasture and woodland is indicated as P. & W. whereas the arable groups are numbered 4 to 7. The following is the approximate acreage of each of the productivity groups as shown on the accompanying soil rating map:

| | | |
|---|---|---|
| P. & W. | Pasture and Woodland, nonarable land | 718,500 |
| Group 4 | Poor to fair arable land | 275,600 |
| Group 5 | Fair to fairly good arable land | 502,000 |
| Group 6 | Fairly good to good arable land | 189,000 |
| Group 7 | Good to very good arable land | 44,300 |

This rating system provides only a relative comparison since the actual yields depend greatly on the varieties of crops grown as well as the resources and management skills of the producer.

## Soil Capability

Soil capability classification for agricultural purposes is one of the objectives of the Canada Land Inventory under the Agricultural and Rural Development Act (ARDA) of June 1961. It is an interpretive grouping based on soil survey data and it attempts to assess the potentialities and limitations of areas for agricultural use. There are seven classes of mineral soils, three of which are considered capable of sustained production of common cultivated crops. The fourth class is marginal for sustained culture, the fifth is capable of use only for permanent pasture and hay, the sixth is capable of use only for wild pasture, while the seventh class is for soils and land types considered incapable of use for arable culture or permanent pasture.

The soil capability map for the Whitecourt and Barrhead area will be published in the near future and will be available from the Queen's Printer, Ottawa.

## FORESTRY

Lumbering is an important industry in the mapped area. Although the eastern portion of the area is largely developed for agriculture, the western portion remains mainly as forested land where coniferous trees are predominant and merchantable timber has been harvested for many years. The timber production from this area for the period 1957-1967 is shown in Table 9.

**TABLE 9—Timber Production within the Whitecourt and Barrhead Area for Ten Consecutive Years***

| | Volume in FBM | | | | | |
|---|---|---|---|---|---|---|
| Fiscal Year | Poplar Lumber | Coniferous Lumber | Poplar Plywood | Railway Ties | Round Timber | Total Volume |
| 1957-1958 | 150,187 | 12,778,123 | | 2,350,075 | | 15,278,385 |
| 1958-1959 | 19,500 | 16,364,540 | 2,957,590 | 1,407,770 | 7,700 | 20,757,100 |
| 1959-1960 | | 22,333,828 | 3,919,551 | 1,465,590 | 6,360 | 27,725,329 |
| 1960-1961 | 38,267 | 12,911,754 | 965,713 | 297,640 | | 14,213,374 |
| 1961-1962 | 186,794 | 13,904,133 | 257,906 | 245,175 | 35 | 14,594,043 |
| 1962-1963 | 28,739 | 15,027,309 | | 3,396,960 | 3,356 | 18,456,364 |
| 1963-1964 | 11,879 | 15,408,997 | | 974,400 | 29,951 | 16,425,227 |
| 1964-1965 | | 11,816,248 | | 622,335 | 53,855 | 12,492,438 |
| 1965-1966 | | 15,651,886 | | 1,066,065 | 165,149 | 16,883,100 |
| 1966-1967 | | 13,801,985 | | 382,130 | 86,656 | 14,270,871 |

*Data supplied by Alberta Forest Service, 1968

Among the coniferous trees, white spruce, black spruce, balsam fir, and lodgepole pine represent the principal species available to the forest industry. At the present time trees are utilized principally as sawlogs and railroad ties. However, recent studies have indicated that much of this area is suitable for pulpwood production and the possible establishment of a pulp mill in the Whitecourt area has been forecasted.

The data presented in Table 9 indicate that in this area the production of lumber from coniferous species has remained relatively constant in the 10 year period, 1957-1967, but the production of poplar lumber and poplar plywood reached a maximum between 1959 and 1962 and has since dropped off considerably.

The forest inventory of the unsettled portion of the Whitecourt and Barrhead area is shown in Table 10. The data were compiled by the Alberta Forest Service from 1955 aerial photographs and includes cords of pulpwood and thousands of board feet of sawtimber.

**TABLE 10—Pulpwood and Sawtimber Inventory in the Whitecourt and Barrhead Area***

| | | Cords | FBM (thousands) |
|---|---|---|---|
| Pulpwood | coniferous | 3,690,121 | |
| | deciduous (poplar) | 3,691,497 | |
| Sawtimber | coniferous | | 1,557,718 |
| | deciduous (poplar) | | 1,702,402 |

*Data supplied by Alberta Forest Service, 1968

Preparations are underway to provide a land capability classification for forestry of this region as part of the Canada Land Inventory programme. On completion, copies of the report and map will be available from the Queen's Printer, Ottawa.

## ENGINEERING

Characteristics of soil materials are of concern to engineers in the construction of roads and highways. Consequently, a joint project of the Highways Research Division and the Soils Division of the Research Council of Alberta was started several years ago to provide a guide for the engineering classification of soils. Soil Survey collected the samples and determined the particle size distribution while the Highway Research Division determined the liquid limit, the plastic limit, and the plasticity index of the material. The selected samples are representative of some of the principal soils of this area. In some cases several samples of the same soil series were collected to show the variations within a soil series. The samples of the C horizon were taken at depths usually not greater than 5 feet.

The methods used in these determinations are:

1. Particle Size—Pipette method of Kilmer and Alexander as modified by Toogood and Peters, 1953. Can. J. Agric. Sci. 33: 159-171.

2. Liquid Limit—ASTM procedures for testing soils, 1958. 1916 Race St., Philadelphia 3, Pa. Designation D423-54T.
3. Plastic Limit—ASTM procedures for testing soils, 1958. 1916 Race St., Philadelphia 3, Pa. Designation D424-54T.

The results are shown in Table 11 in which the soil horizons and the sample location are also indicated.

**TABLE 11—Physical Analyses of Some Representative Soils**

| Soil Series and Location | Soil Horizon | Percent Particle Size | | | Liquid Limit Wi | Plastic Limit Wp | Plasticity Index Ip |
|---|---|---|---|---|---|---|---|
| | | Sand | Silt | Clay | | | |
| **Till Parent Materials** | | | | | | | |
| Cooking Lake | Bt | 32 | 38 | 30 | 43.3 | 17.9 | 25.4 |
| (SW 25-58-2 W5) | C | 37 | 35 | 28 | 38.9 | 15.3 | 23.6 |
| Dnister | Bnt | 34 | 35 | 31 | 43.1 | 16.7 | 26.4 |
| (SE 34-60-2 W5) | C | 39 | 37 | 24 | 36.7 | 13.6 | 23.1 |
| Falun | Bt | 48 | 24 | 28 | — | — | — |
| (SE 18-61-1 W5) | C | 49 | 27 | 24 | 30.9 | 14.2 | 15.7 |
| Hubalta | B | 36 | 31 | 33 | 48.6 | 18.4 | 30.2 |
| (NE 4-61-12 W5) | C | 32 | 36 | 32 | 46.8 | 17.6 | 29.2 |
| Hubalta | B | 41 | 29 | 30 | 35.8 | 17.7 | 18.1 |
| (NE 36-63-10 W5) | C | 38 | 29 | 33 | 36.6 | 16.3 | 20.3 |
| Hubalta | B | 20 | 32 | 48 | 49.9 | 23.2 | 26.7 |
| (SW 33-60-12 W5) | C | 16 | 32 | 52 | 64.9 | 29.3 | 35.2 |
| Hubalta | B | 39 | 27 | 34 | 39.6 | 18.8 | 20.8 |
| (NE 36-63-14 W5) | C | 33 | 29 | 38 | 39.8 | 19.5 | 20.3 |
| Nakamun | Btn | 31 | 38 | 31 | 44.6 | 16.7 | 27.9 |
| (NW 36-59-1 W5) | C | 46 | 26 | 28 | 37.0 | 15.1 | 21.9 |
| Nakamun | Btn | 32 | 30 | 38 | 40.3 | 17.6 | 22.7 |
| (NE 29-58-1 W5) | C | 42 | 32 | 26 | 31.1 | 15.3 | 14.8 |
| Uncas | Bt | 33 | 38 | 29 | 43.6 | 16.3 | 27.3 |
| (SW 10-61-3 W5) | C | 42 | 38 | 20 | 32.2 | 16.5 | 15.7 |
| **Lacustrine Parent Materials** | | | | | | | |
| Kathleen | Bt | 7 | 45 | 48 | 51.1 | 20.6 | 30.5 |
| (SW 31-58-3 W5) | C | 4 | 51 | 45 | 52.7 | 22.1 | 30.6 |
| Kathleen | B | 28 | 23 | 49 | 51.7 | 21.0 | 30.7 |
| (NW 29-58-9 W5) | C | 35 | 22 | 43 | 51.5 | 20.1 | 31.4 |
| Kathleen | B | 3 | 47 | 50 | 53.4 | 21.8 | 31.6 |
| (SW 10-60-4 W5) | C | 1 | 57 | 42 | 46.9 | 23.1 | 23.8 |
| Macola | Bt | 10 | 35 | 55 | 60.1 | 24.2 | 35.9 |
| (SW 15-59-3 W5) | C | 1 | 43 | 56 | 57.8 | 23.3 | 34.5 |
| Maywood | B | 5 | 35 | 60 | 54.4 | 21.1 | 33.3 |
| (SW 14-61-9 W5) | C | 0 | 26 | 74 | 73.0 | 29.1 | 43.9 |
| Raven | Bg | 1 | 32 | 67 | 74.8 | 27.3 | 47.5 |
| (SE 29-60-1 W5) | Cg | 0 | 28 | 72 | 79.5 | 31.6 | 47.9 |
| **Alluvial Parent Materials** | | | | | | | |
| Codner | Bg | 49 | 37 | 14 | 26.7 | N.P.* | — |
| (SE 2-63-2 W5) | Cg | 64 | 16 | 20 | 27.2 | N.P. | — |
| Culp | Bt | 66 | 17 | 17 | 23.7 | N.P. | — |
| (NE 31-60-5 W5) | C | 74 | 21 | 5 | — | N.P. | — |
| Davis | Bt | 50 | 37 | 13 | 25.6 | N.P. | — |
| (SE 31-60-6 W5) | C | 57 | 32 | 11 | — | N.P. | — |
| Heart | Bf | 90 | 5 | 5 | — | N.P. | — |
| (SE 27-61-6 W5) | C | 90 | 10 | 0 | — | N.P. | — |
| **Residual Parent Materials** | | | | | | | |
| Kavanagh | Bnt | 52 | 26 | 22 | 27.7 | 13.4 | 14.3 |
| (NE 34-60-2 W5) | C | 40 | 35 | 25 | 37.7 | 16.0 | 21.7 |
| Modeste | B | 74 | 19 | 7 | — | N.P. | — |
| (NE 17-63-11 W5) | C | 86 | 10 | 4 | — | N.P. | — |
| Pegasus | B | 19 | 47 | 34 | 44.9 | 23.2 | 21.7 |
| (SE 6-62-11 W5) | C1 | 4 | 59 | 37 | 56.6 | 26.9 | 29.7 |
| | C2 | 23 | 60 | 17 | 68.2 | 28.0 | 40.2 |

* Non plastic

## APPENDIX

### DEFINITIONS OF DESCRIPTIVE TERMS

Throughout the report frequent use was made of descriptive terms in describing features of significance within the mapped area. The following are definitions of some of these descriptive terms:

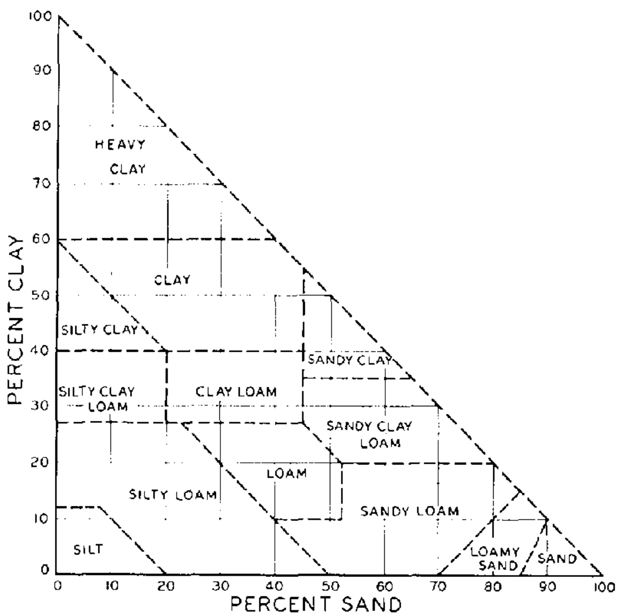
1. **SOIL TEXTURE**

(a) **Soil Separates (Particle Size) on which Textural Classes are Based**

| *Separates* | | *Diameter in Millimeters* |
|---|---|---|
| Very Coarse Sand (V.C.S.) | Sand (S.) | 2.0 -1.0 |
| Coarse Sand (C.S.) | Sand (S.) | 1.0 -0.5 |
| Medium Sand (M.S.) | Sand (S.) | 0.5 -0.25 |
| Fine Sand (F.S.) | Sand (S.) | 0.25-0.10 |
| Very Fine Sand (V.F.S.) | Sand (S.) | 0.10-0.05 |
| Silt (Si.) | | 0.05-0.002 |
| Clay (C.) | | less than 0.002 |
| Fine Clay (F.C.) | | less than 0.0002 |

(b) **Proportions of Soil Separates in Various Soil Textural Classes**

From: Toogood, J.A.—A Simplified Textural Classification Diagram. Can. J. Soil Sci. 38: 54-55. 1958.




A further separation of sands is made according to the prevalence of different sized sand fractions. Medium and coarse sands may contain over 25 percent coarse sand but not over 50 percent fine sands. Fine and very fine sands must contain over 50 percent of the respective fine sand fractions.

**Figure 21—Chart showing proportions of soil separates.**

## 2. SOIL STRUCTURE AND CONSISTENCE

*Soil structure* refers to the aggregation of the primary soil particles into compound particles, or clusters of primary particles, which are separated from adjoining aggregates by surfaces of weakness. The aggregates differ in grade of development (degree of distinctness) as follows: weak, moderate, and strong. They vary in class (size) as follows: very fine, fine, medium, coarse, and very coarse. They also vary in kinds (character of the faces and edges of the aggregates). The kinds mentioned in this report are: *Single-grain*—loose, incoherent mass of individual particles as in sands. *Blocky*—faces rectangular and flattened, vertices sharply angular. *Subangular blocky*—faces subrectangular, vertices mostly oblique, or subrounded. *Columnar*—vertical edges near top of columns are not sharp (columns may be flat-topped, round-topped, or irregular). *Granular*—spheroidal, characterized by rounded vertices. *Platy*—horizontal planes more or less developed.

*Soil consistence* comprises the attributes of soil materials that are expressed by the degree and kind of cohesion and adhesion or by the resistance to deformation and rupture. It deals with the strength and nature of the forces of attraction within a soil mass. The terms used in describing soils in this report follow: *Loose*—noncoherent. *Friable* (specifies friable when moist)—soil material crushes easily under gentle to moderate pressure. between thumb and forefinger, and coheres when pressed together. *Firm* (specifies firm when moist)—soil material crushes under moderate pressure between thumb and forefinger but resistance is distinctly noticeable. *Hard* (specifies hard when dry)—moderately resistant to pressure, can be broken in the hands without difficulty but rarely breakable between thumb and forefinger. *Compact*—term denotes a combination of firm consistence and a close packing or arrangement of particles. *Plastic* (specifies plastic when wet)—wire formable by rolling the soil between the thumb and forefinger and moderate pressure required for deformation of the soil mass.

## 3. SOIL MOISTURE CLASSES

Soil moisture classes are defined in terms of (a) actual moisture content in excess of field moisture capacity, and (b) the extent of the period during which such excess water is present in the plant root zone.

(1) *Rapidly drained*—soil moisture content seldom exceeds field capacity in any horizon except immediately after water additions.

(2) *Well drained*—soil moisture content does not normally exceed field capacity in any horizon except possibly the C, for a significant part of the year.

(3) *Moderately well drained*—soil moisture in excess of field capacity remains for a small but significant period of the year.

(4) *Imperfectly drained*—soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year.

(5) *Poorly drained*—soil moisture in excess of field capacity remains in all horizons for a large part of the year.

(6) *Very poorly drained*—free water remains at or within 12 inches of the surface most of the year.

Specific reference to surface drainage may be designated in terms of run-off and described as high, medium, low, or ponded. Similarly specific reference to the characteristics of horizons within the profile may be designated in terms of permeability or percolation and described as rapid, moderate, slow, very slow, and none.

## 4. CALCAREOUS CLASSES

The National Soil Survey Committee has set the following nomenclature and limits for calcareous grades:

1. *Weakly calcareous* 1 - 5 percent calcium carbonate equivalent
2. *Moderately calcareous* 6 - 15 percent calcium carbonate equivalent
3. *Strongly calcareous* 16 - 25 percent calcium carbonate equivalent
4. *Very strongly calcareous* 26 - 40 percent calcium carbonate equivalent
5. *Extremely calcareous* >40 percent calcium carbonate equivalent.

# GLOSSARY*

*This is not a complete glossary but is primarily to define some terms commonly used in this report.

*Aggregate*—A group of soil particles cohering so as to behave mechanically as a unit.

*Aeolian deposit*—Material deposited by wind.

*Alluvial deposit*—Material deposited by moving water.

*Alluvium*—A general term for all deposits of modern rivers and streams.

*Available plant nutrients*—Plant nutrients in soluble form, readily available to the plant.

*Calcareous material*—Material which contains more than 1 percent calcium carbonate and which will effervesce visibly when treated with dilute hydrochloric acid.

*Cleavage*—The capacity of a soil on shrinkage to separate along certain planes more readily than on others.

*Concretions*—Local concentrations of certain chemical compounds such as calcium carbonate or compounds of iron that form hard grains or nodules of mixed composition and of various sizes, shapes, and coloring.

*Eluviation*—The removal of soil material in suspension or in solution from a layer or layers of soil.

*Erosion*—The wearing away of the land surface by running water, wind, or other erosive agents. It includes both normal and accelerated soil erosion. The latter is brought about by changes in the natural cover or ground conditions and includes those due to human activity.

*FBM*—Foot board measurement.

*Flood Plain*—The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

*Formation*—Any igneous, sedimentary, or metamorphic rock which is represented as a unit in geological mapping.

*Frost-free period*—The period or season of the year between the last frost of spring and the first frost of autumn.

*Gley*—Gleying is a reduction process that takes place in soils that are saturated with water for long periods of time. The horizon of most intense reduction is characterized by a gray, commonly mottled appearance, which on drying shows numerous rusty brown iron stains or streaks. It is generally very sticky when wet and hard when dry. Those horizons in which gleying is intense are designated with the subscript g.

*Humus*—The well decomposed, more or less stable part of the organic matter of the soil.

*Illuviation*—The process of deposition of soil material removed from one horizon to another in the soil; usually from an upper to a lower horizon in the soil profile. Illuviated substances include silicate clay, iron and aluminum hydrous oxides and/or organic matter.

*Lacustrine*—Sediments which were deposited in lake waters.

*Mottles*—Spots or blotches of different color or shades of color interspersed with the dominant color.

*Orthic*—A term used in soil classification to denote the subgroup that typifies the central concept of the great group.

*Outwash*—Sediments "washed out" by flowing water beyond the glacier and laid down in thin foreset beds as stratified drift. Particle size may range from boulders to silt.

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

*pH*—A notation used to designate the relative acidity or alkalinity of soils and other materials. A pH of 7.0 indicates neutrality, high values indicate alkalinity, and lower values acidity.

*Phase (soil)*—A subdivision of a soil series having minor variation from the characteristics of the series. The phase is differentiated on the basis of external characteristics such as degree of slope, degree of erosion, content of stones, etc.

*Profile (soil)*—A vertical section of the soil through all its horizons and extending into the parent material.

*Saline material*—Material that has an electrical conductivity greater than 4 mmhos./cm*.

*Soil series*—A soil body or a collection of soil bodies having either a similar number and arrangement of horizons whose color, texture, structure, consistence, thickness, reaction and composition, or a combination of these are within a defined range or, in soils without horizons will have the differentiating properties, except thickness, within specified depth lines.

*Solum*—The upper horizons of a soil in which the parent material has been modified and within which most plant roots are confined. It consists usually of A and B horizons.

*Till*—Unstratified glacial drift deposited directly by the ice and consisting of clay, silt, sand, gravel, and boulders intermingled in any proportion.

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