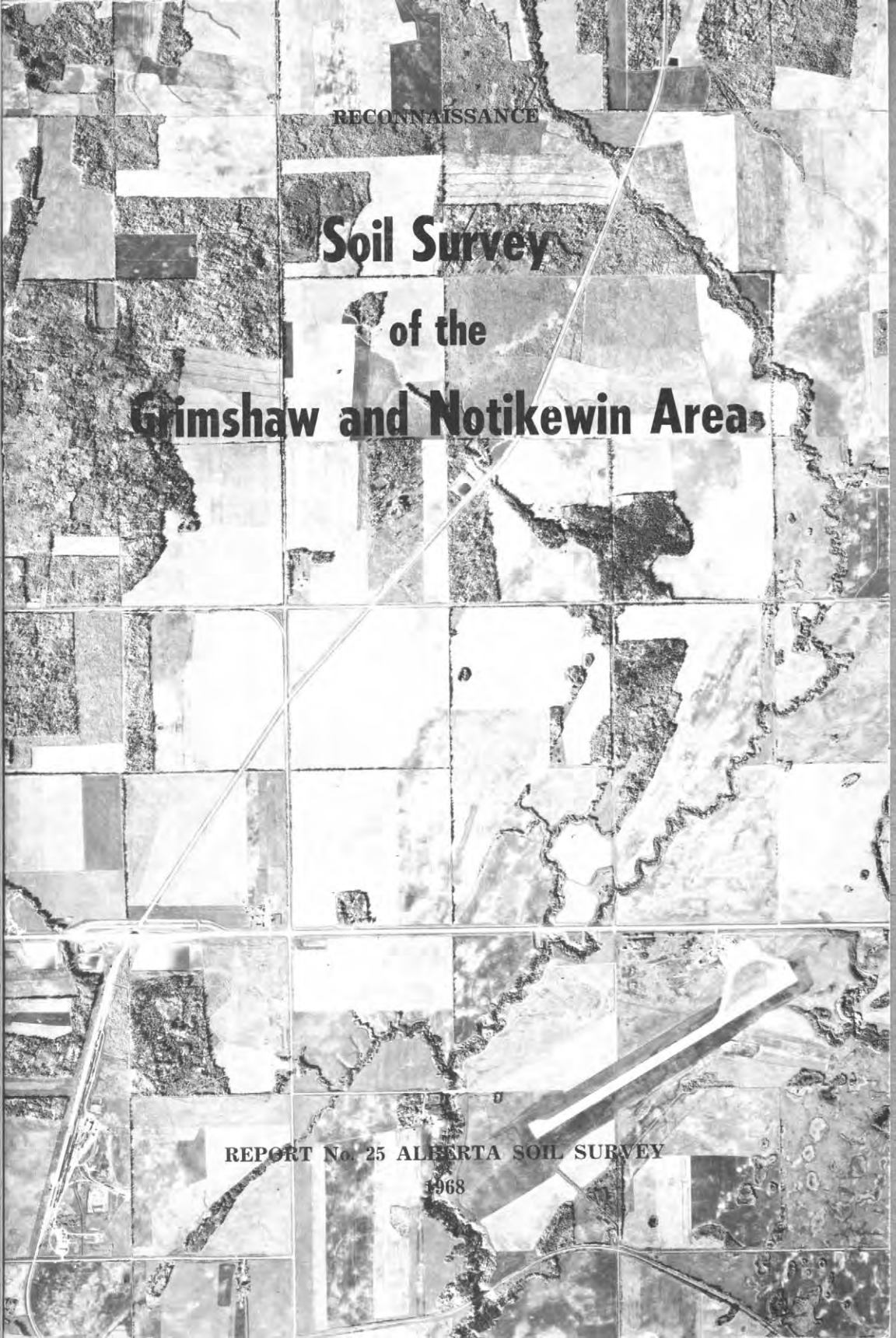

RECONNAISSANCE

Soil Survey of the Grimshaw and Notikewin Area

REPORT No. 25 ALBERTA SOIL SURVEY
1968

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RECONNAISSANCE

Soil Survey

of the

Grimshaw and Notikewin Area

By

M. D. SCHEELAR and WM. ODYNSKY

Research Council of Alberta

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ALBERTA SOIL SURVEY COMMITTEE

This report is published with the approval of the Alberta Soil Survey Committee and with permission of the Committee on Agricultural Extension and Publications of The University of Alberta.

COVER: *Aerial photograph of the Peace River airport and adjacent area*

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ACKNOWLEDGMENTS

The soil survey of the Grimshaw and Notikewin area was conducted by the Soils Division, Research Council of Alberta, as part of a joint project involving the Canada Department of Agriculture and The University of Alberta.

The Cartography Section, Canada Department of Agriculture, in Ottawa finalized and published the maps accompanying this report. The University of Alberta provided the office and laboratory accommodation and published the report.

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PREFACE

This publication describes the soils of the Grimshaw and Notikewin area. It is the sixth reconnaissance soil survey publication describing the soils of portions of the Peace River district. The preceding publications described the soils of the Rycroft and Watino area (1950), the High Prairie and McLennan area (1952), the Grande Prairie and Sturgeon Lake area (1956), the Beaverlodge and Blueberry Mountain area (1961), and the Cherry Point and Hines Creek area (1965).

The soil survey of the Grimshaw and Notikewin area was begun in the summer of 1961 to obtain essential information about the kind, distribution, and morphological characteristics of the soils of this area. The information is presented in this report and on a soil map and a soil rating map.

The soil map, printed on a scale of three miles to one inch, shows the location and extent of the different soil areas and indicates the main topographical features. The soil rating map distinguishes the better land from the poorer land and serves as a guide to future agricultural development.

The report describes the cultural and physical features of the area, the morphological and chemical characteristics of the soil series, and certain land use aspects. The glossary defines some of the most frequently used soil terms.

The soil survey of the Grimshaw and Notikewin area was essentially a reconnaissance survey carried out by making traverses at intervals of one mile wherever possible. Traverses were made by vehicle, on foot, and by saddle horses. In the latter case, both the traverse interval and the route was very irregular and the information obtained was of an exploratory nature.

The boundary lines between different soil areas were determined along the lines of traverse with the aid of aerial photographs. Further inspections should be made if information of a more detailed nature is required.

Test holes were dug at frequent intervals in order to determine the texture, color, depth, and structure of the various soil horizons. Additional notes were made on the nature and density of tree cover, stones, topography, and other features believed pertinent to the development of the area.

This information is supplemented by laboratory analyses of representative soil samples.

The soils are usually shown on the map as an association of two or more soil series in order of dominance. Those soils that constitute less than 15 per cent of an area are not included in the mapped association.

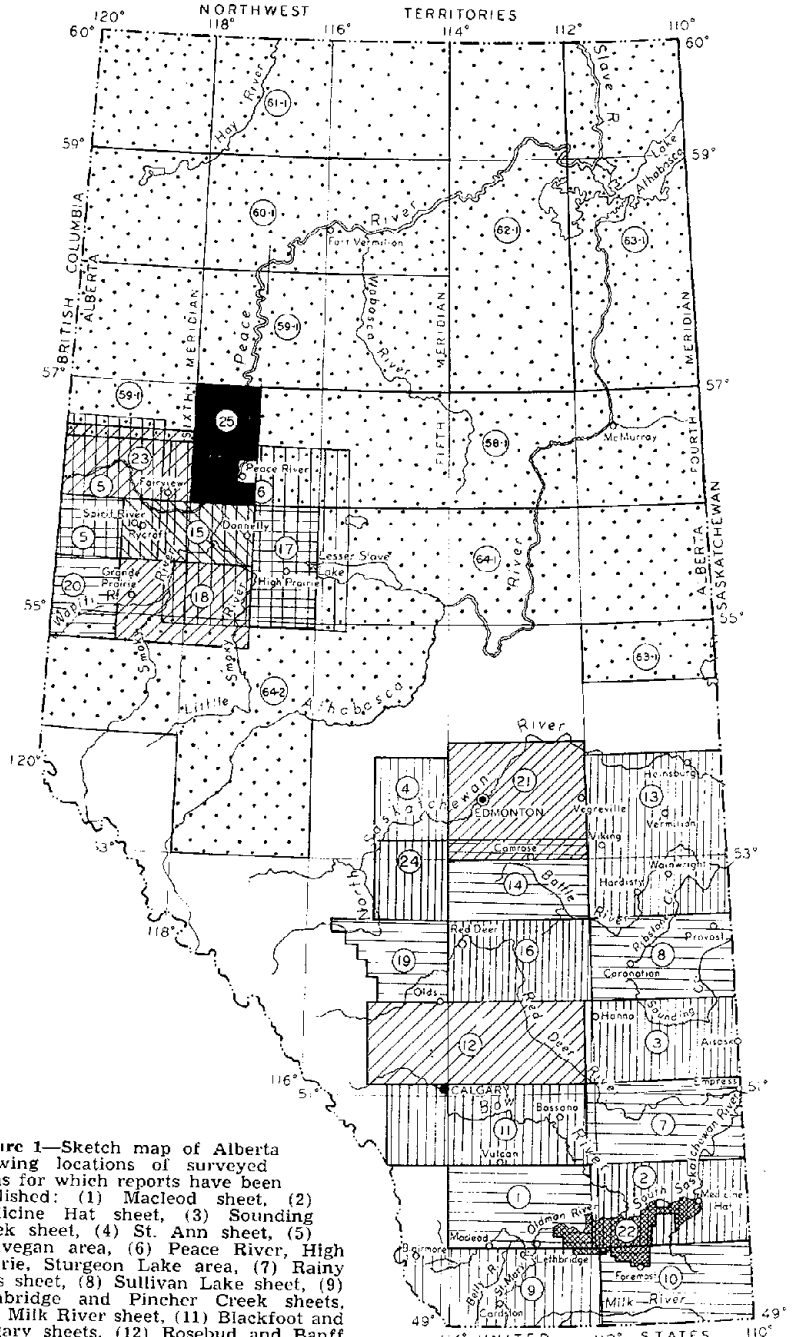


Figure 1—Sketch map of Alberta showing locations of surveyed areas for which reports have been published: (1) Macleod sheet, (2) Medicine Hat sheet, (3) Sounding Creek sheet, (4) St. Ann sheet, (5) Dunvegan area, (6) Peace River, High Prairie, Sturgeon Lake area, (7) Rainy Hills sheet, (8) Sullivan Lake 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 areas, (25) (**In black**) Grimshaw and Notikewin 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 Grimshaw and Notikewin Area

GENERAL DESCRIPTION OF THE AREA

LOCATION AND EXTENT

The Grimshaw and Notikewin area lies in the northern portion of the Peace River District between 56°00′ and 57°00′ north latitude and between 116°45′ and 118°00′ west longitude. It consists of all or portions of townships 81 to 92 in ranges 18 to 26, west of the fifth meridian.

It extends from a point approximately 4 miles south of Nampa on Highway 2 to a point approximately 6 miles north of Manning on Highway 35 and includes about 2,200,000 acres.

The general location of the mapped area is indicated on the sketch map in Figure 1.

HISTORY OF SETTLEMENT AND POPULATION GROWTH

For over half a century this has been an agricultural area and although it is now growing in population it is still relatively sparsely populated.

Sir Alexander Mackenzie was among the first white men to visit this area. His objective was to set up fur trading posts for the North West Company and to find an overland route to the Pacific ocean. He wintered 6 miles upstream from the junction of the Smoky and Peace rivers at Fort Fork in 1792.

In the fur trade days the fertility of the soils on the flats along the Peace river was well known but there was little incentive to develop any type of agriculture. In the late 1800's Anglican and Catholic missions were established at Shaftesbury. For some time Shaftesbury was the commercial, educational, religious, and social centre. Reverend J. Gough Brick, founder of the Anglican mission at Shaftesbury, was probably the first man to grow crops. He won first prize with a sample of wheat at the International Seed Exhibition in Chicago in 1896.

The first group of settlers to arrive in this area came by way of Grouard and Athabasca Landing. This group was small compared to the group that arrived during the period from 1916 to 1921 when the Edmonton, Dunvegan and British Columbia Railway was constructed from Peace River Crossing to Whitelaw. In time the settlers spread out from the vicinity of the railroad to as far north at Notikewin.

The total rural population of the area in 1921 was 2,300, concentrated mostly in the vicinity of the railroad from Nampa to Whitelaw. In 1931 the total rural population was 5,850. Of this total, 1,268 were located in the Manning area and 650 in the Chinook Valley and Dixonville areas. Since this time there has been a gradual increase in both rural and urban population in this area. According to the 1961 Census, the urban population of Peace River, Manning, and Grimshaw was 2,543, 1,756, and 1,095 respectively. The rural population consisted of 2,185 in the Nampa, Three Creeks, and Harmon Valley area, 2,175 in the Grimshaw, Warrensville, Berwyn, and Brownvale area, 769 in the Chinook Valley, Dixonville, and Clear Hills area, and 1,657 in the Manning and Deadwood area.

Figure 2—Historic mission and farm at Shaftesbury.

TRANSPORTATION AND MARKETS

The railways, highways and secondary roads that traverse the mapped area are shown on the soil map.

The Great Slave Lake Railway was completed in 1964. It provides rail-shipping facilities to the Manning and Deadwood farming districts.

The more densely settled portions of the area are well supplied with good market roads but the sparsely settled areas are relatively inaccessible except for a few oil exploration trails that have been kept in fair condition.

Peace River, Manning and Grimshaw are the principal communication and market centres in the area. Regular air passenger service and charter flights operate out of the Peace River airport to Edmonton, Grande Prairie, Dawson Creek, and northern points.

Berwyn, Brownvale, Dixonville, Deadwood, Nampa, Notikewin, and Reno are smaller market centres within the area.

Figure 3—Mackenzie highway north of Dixonville.

CLIMATE

Meteorological data available for this area are limited and of short duration. Records compiled for a period less than about 10 years may not provide a realistic indication of the average climatic conditions of the region and must be used with reservation. Weather data compiled from the records of the Canada Meteorological Service are given in Tables 1 to 3. They may serve to indicate some aspects of climate common to this region and include some long time records from the neighboring stations at Fairview and Keg River for comparison purposes.

The records given in Table 1 indicate that this region may be characterized by relatively cold winters and by a cool growing season. However, the summer temperatures (June, July) are comparatively warm with July having a mean temperature of about 60°F. These conditions appear to be conducive to the satisfactory growth of cool-season crops.

TABLE 1—Average Monthly, Seasonal, and Annual Temperatures (°F) for Selected Stations in or Near the Mapped Area

Month or Season	STATION				
	Fairview (19 years)*	Peace River Airport (5 years)*	Manning (3 years)*	Deadwood (3 years)*	Keg River (15 years)*
August	58	59	58	61	57
September	50	49	48	50	49
October	39	38	37	42	38
Fall	49	49	48	51	48
November	20	18	16	21	15
December	7	8	13	—1	0
January	4	3	0	2	—2
February	6	8	8	2	—2
March	20	19	20	14	17
Winter	11	11	11	8	6
April	36	38	39	36	35
May	50	48	47	48	48
June	56	57	57	59	56
July	60	62	64	60	60
Spring and Growing Season	51	51	52	51	50
Annual	37	37	37	37	35

*Length of period of records.

It is generally considered that a frost-free period in excess of 90 days imposes little or no limitation on the production of a variety of cereal crops. From the estimates prepared by the Agrometeorology Section, Plant Research Institute, Canada Department of Agriculture, Ottawa, it would appear that throughout this Grimshaw-Notikewin area a frost-free period of less than 90 days can be expected. In addition, consideration is sometimes given to the killing-frost-free period which represents the season in which temperatures exceed 29°F. This involves a longer period with the 125 killing-frost-free period being about comparable to the 90 frost-free period. The longer period considers the fact that while temperatures of 32°F may impose some frost damage, 29°F is the level at which most farm crops are killed by frost. Data compiled in Table 2 indicate the variability and range of the killing-frost-free period in the mapped area for the years indicated. However, the years selected may not indicate the average conditions and roughly coincide with the years in which the killing-frost-free period was longer than the average in most stations in Alberta. The variability of the killing-frost-free period in the mapped area may be due to differences in elevation, topography, and air drainage. In a study conducted by the Research Station, Beaverlodge, two sites less than a mile apart and differing in elevation by 134 feet showed a difference of about 60 days in the killing-frost-free period between the high position and the low position. Such variations can be expected in many portions of the mapped area.

Table 3 shows that precipitation is quite variable and may range from about 13 to 19 inches with about 40 per cent occurring

during the months of June, July, and August at a time when crop-plants are at their stage of maximum water requirement. About 20 per cent of the precipitation falls in the fall months and over a third falls as snow during winter months (10 inches snow = 1 inch rain). It is estimated that about half of the water held in snow is lost in the spring run-off and is not available for plant growth. Generally, while this moisture distribution accompanied by relatively low evaporation is favorable for the production of cereal crops, moisture can be a limiting factor and care should be given to the conservation of moisture.

TABLE 2—Length of Killing-Frost-Free Period (more than 29° F) in Days for Selected Stations in or Near the Mapped Area

	Year											
Station	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Fairview	124	161	137	102	134	129	143	146	157	131	117	167
Manning	...	...	...	...	...	...	106	94	...	...	128	154
Deadwood	...	...	...	...	...	...	...	...	...	119	128	137
Peace River Airport	95	...	124	111	...	...	...	94	109	124	128	137
Keg River	94	98	98	105	78	77	100	94	119	109	...	..
Berwyn	125	153	...	...	114	114	...	...	...	...	...	...

TABLE 3—Average Monthly, Seasonal, and Annual Precipitation in Inches for Selected Stations in or Near the Mapped Area

	STATION				
Month or season	Fairview (19 years)	Peace River Airport (5 years)	Deadwood (3 years)	Keg River (15 years)	Peace River Crossing (42 years)
August	2.0	1.8	1.3	1.7	1.4
September	1.5	0.9	1.3	1.4	1.3
October	1.2	1.0	1.4	1.0	0.7
Fall	4.7	3.7	4.0	4.1	3.4
November	1.4	1.1	1.3	1.1	0.6
December	1.4	0.8	1.2	1.1	0.7
January	1.2	1.2	1.8	0.7	0.9
February	1.3	0.9	1.1	0.8	0.6
March	1.0	0.9	0.8	0.7	0.6
Winter	6.3	4.9	6.2	4.4	3.4
April	1.0	0.5	0.6	0.8	0.4
May	1.4	1.2	2.3	1.8	1.3
June	2.3	2.5	2.8	1.8	2.6
July	2.3	2.1	3.3	2.2	1.8
Spring and Growing Season	7.0	6.3	9.0	6.6	6.1
Annual	18.0	14.9	19.2	15.1	12.9

GEOLOGY

Bedrock Geology

The areal distribution of the different geological formations in the mapped area is shown in Figure 6. The bedrock consists mostly of shales and sandstones of Late Cretaceous age and the Fort St. John formation of Early Cretaceous age. Pre-glacial erosion probably removed any beds that were formed after Cretaceous time. Shales of the Kaskapau formation are exposed in the Whitemud

Figure 5—Spring run-off flooding along the Mackenzie highway north of Warrensville.

hills north of Warrensville, and sandstones of the Dunvegan formation are exposed near the Deadwood forestry tower south of Deadwood.

Surface Geology

The surface deposits, from which the majority of soils in this area have been developed, are the result of deposition during glacial and post-glacial times. During the Pleistocene epoch this region was overridden by the Laurentide ice sheet which picked up bedrock materials. On melting of the ice, the accumulated materials were deposited on the pre-glacial land surface.

The glacial deposits recognized in the mapped area consist of till, glacio-fluvial, lacustro-till, lacustrine, alluvial, and aeolian materials. The areal distribution of the different deposits is shown in Figure 7.

Till deposits consist of medium to moderately fine textured unsorted materials. Many of these deposits in the mapped area are comparatively thin and are characterized by containing a high proportion of the underlying bedrock material. Three tills have been recognized in this area. One is moderately fine textured, brown to grayish-brown, somewhat saline till which occurs on the upper slopes in the western portion of the area. Another is a medium textured, yellowish brown to grayish brown, slightly calcareous till which occurs on the till plains on the eastern side of the area. The third, found in the central portion of the area, is a brown to dark grayish brown, noncalcareous till that has an acidic reaction.

Glacio-fluvial deposits consisting of stratified, moderately fine to coarse textured materials were found as a wide belt in the southern portion of the mapped area at an elevation of approximately 2,200 feet.

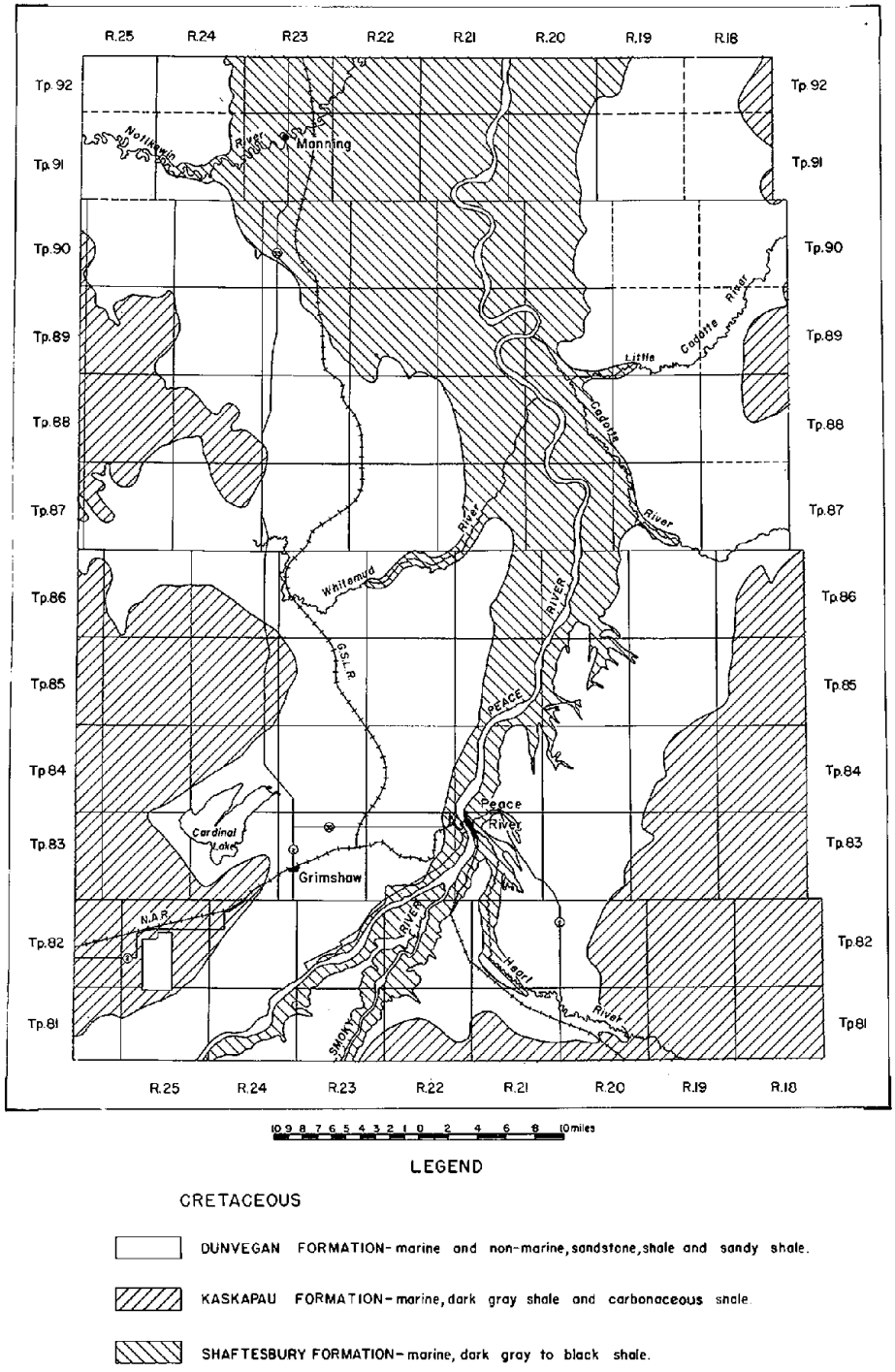


Figure 6—Map showing the geology of the Grimshaw and Notikewin area. (Canada Geological Survey 1951. Geological Map of Alberta, Map 1002A.)

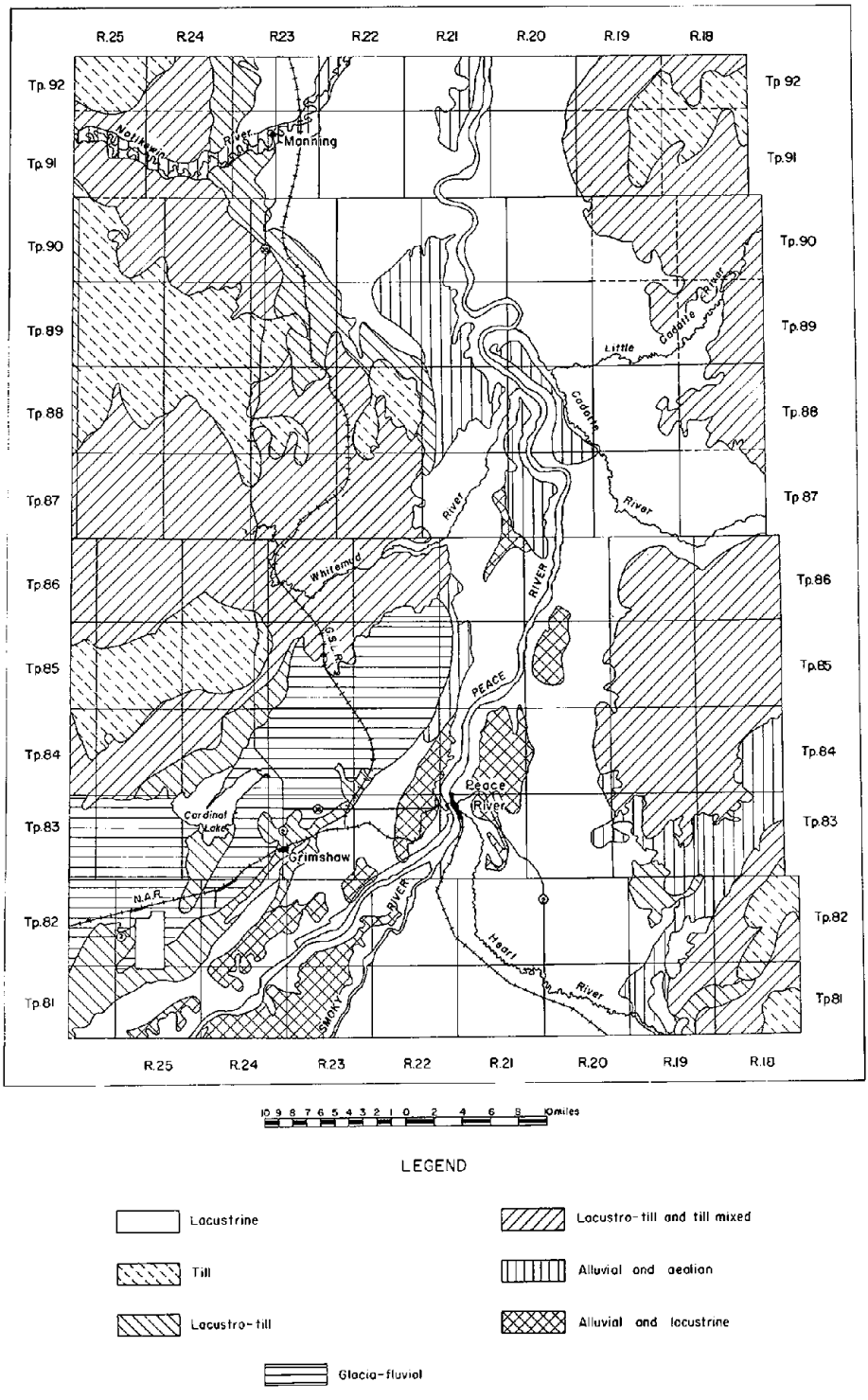


Figure 7—Map showing the soil parent materials in the Grimshaw and Notikewin area.

Lacustro-till deposits consist of fine textured stratified materials that contain some stones. Two types were recognized in this region. One is fairly uniform, gray to dark gray fine textured material that has occasional strata of yellowish brown, medium textured material that may be stony and often resembles till. The other is more variable with the alternating strata of till-like material frequently thicker than the strata of gray fine textured material. These deposits overlie till in this area and have a wide variation in thickness. They occur at elevations of between 2,000 to 2,300 feet in the southern portion of the mapped area and between 1,700 to 2,100 feet in the northern portion.

Lacustrine deposits, as recognized in this area, were confined to the medium to fine textured materials that are stratified and generally free of stones. They were found at elevations between 1,800 to 2,000 feet in the southern portion and between 1,500 to 1,700 feet in the northern portion of the mapped area.

Variable and relatively uniform, coarse to medium textured deposits were designated as of alluvial or aeolian origin. The alluvial deposits are found in river valleys and on some of the upper terraces adjacent to stream courses. Wind sorted or aeolian materials are common to the sand dune area in the southeastern portion of the map sheet. In some portions of the area such deposits occur as a thin mantle overlying other deposits.

Gravelly, generally coarse textured materials have been grouped and referred to as gravelly alluvial or outwash deposits. In this region gravelly deposits are common to the southern portion of the area where they occur as beach or terrace deposits.

RELIEF

The land surface of the mapped area, in general, is composed of high plain remnants, gently sloping areas, flatlands, and incised valleys of the major streams. The maximum difference in elevation between the river level and the top of the high plain remnants is approximately 1,800 feet.

The elevation of the high plain remnants or till plains is between 2,000 and 2,300 feet in the northern portion; and between 2,200 and 2,600 feet in the southern portion of the mapped area.

The gently sloping areas occur in the portion of the region extending from the high plain remnants to the flatlands. They occupy the portion of the mapped area between 1,800 and 2,200 feet in elevation in the southern portion and between 1,650 and 2,000 feet in elevation in the northern portion.

Flatlands occupy that portion of the area with elevations up to 1,650 feet in the northern portion and up to 1,800 feet in the southern portion. In some portions of these flatlands the relief is characterized by numerous low, steep-sided knolls.

Figure 8—Gently rolling topography characteristic of the area east of North Star.

Figure 9—Level topography of the Deadwood area.

VEGETATION

The mapped area lies within the Boreal Forest Region of Canada as delineated by Rowe.* The present native vegetation consists of a mixed tree cover in which aspen poplar is dominant. Other tree species are balsam poplar, white spruce, black spruce, tamarack, jack and lodgepole pines, white birch, willow, and alder. Such shrubs as rose, gooseberry, raspberry, cranberry, chokecherry, saskatoon, and hazlenut occur in mixtures, particularly in the open areas and along eroded stream banks. Sedges, coarse grasses, dwarf birch, sphagnum moss, rushes, reeds, and labrador tea occur in many of the poorly drained areas. Much of the native vegetation has been destroyed by repeated fires and land improvement practices. However, marketable stands of white spruce are found in widely separated locations in the western and eastern portions of the mapped area.

*Rowe, J. S. 1959. Forest regions of Canada. Canada Dept. of Northern Affairs and Natural Resources Bulletin 123.

DRAINAGE

The Peace river and its tributaries provide the drainage for this area. The main tributaries are the Smoky, Heart, Whitemud, and Notikewin rivers. These rivers usually flow throughout the summer. Some of these tributaries have deeply incised valleys approaching 800 feet in depth at their confluence with the Peace river.

The principal lakes in the mapped area are Cardinal, Teddy, Helen, Flood, St. Germain, and Pluvius. Most of these are fed by seasonal streams or replenished by run-off and may be stagnant during much of the year.

Local drainage conditions vary greatly throughout the mapped area. Low lying areas are frequently flooded during wet seasons. A drainage programme has been instituted, in various portions of this area, by the Water Resources Division, Alberta Department of Agriculture.

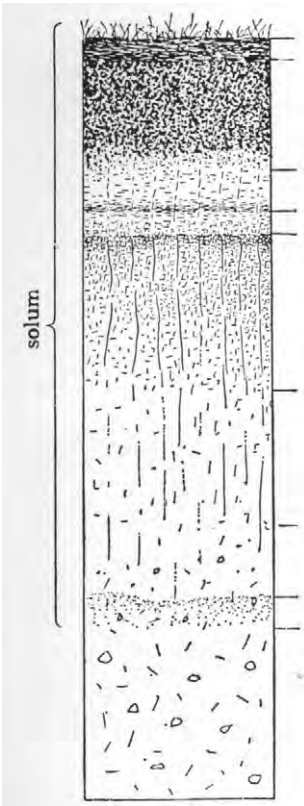
Figure 10—Drainage ditch northeast of Manning.

SOIL FORMATION, CLASSIFICATION, AND MAPPING

SOIL FORMATION

Soils consist of unconsolidated mineral matter that has been subjected to and influenced by the genetic and environmental factors of parent material, climate, vegetation, living organisms, and topography all acting over a period of time. The weathering of rocks provides for the unconsolidated mineral matter. In the mapped area, glaciation has altered and provided differing parent materials. Further alteration has taken place through the accumulation of organic material accompanied by changes in the chemical, physical, biological, and morphological properties. These changes are evidenced in the development of *soil horizons*. The main horizons which make up the soil profile consist of an organic horizon over-

lying a sequence of horizons designated as A, B, and C. Each of these horizons may be subdivided using the suffixes described in the glossary. Figure 11 shows, in diagramatical form, a soil profile with its various horizons. The recognition of horizon differences permits the classification of soils in accordance with the processes involved in their formation.



L, F and H—Organic horizon that may be subdivided into: L (raw organic matter), F (partially decomposed organic matter), and H (decomposed organic matter).

A —A mineral horizon at or near the surface. It may be a dark colored horizon in which there is an accumulation of humus (Ah), or a light colored horizon from which clay, iron, and humus have been leached (Ae).

AB —Transition horizon.

B —Mineral horizons that (1) may have an enrichment of clay (Bt), iron (Bf), or organic matter (Bh); or (2) may be characterized by a columnar structure and a significant amount of exchangeable sodium (Bn); or (3) may be altered to give a change in color or structure (Bm). Usually lime and salts have been leached out of this horizon. (4) The symbol (j) is used with the above suffixes to denote a failure to meet the specified limits of the suffix.

BC —Transition horizon.

C —Mineral horizon comparatively unaffected by the soil forming process operative in the A and B horizons except for the process of gleying (Cg) and the accumulation of calcium and/or magnesium carbonates (Ck) and soluble salts (Cs).

Figure 11—Diagram of a soil profile showing various horizons. Further separations may may be made by the use of suffixes as defined in the glossary.

SOIL CLASSIFICATION

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 profile 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 external 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 classified according to the proposals made by the committee in 1963 an attempt was made in the preparation of this report to incorporate, where possible, the changes proposed in the committee meetings of 1965. Accordingly, the soils identified in this region are listed under the type of parent material, separated on the basis of drainage characteristics and their classification is indicated in Table 4. The following is a brief description of the dominant groups of soils of this region:

Soils of the *Chernozemic Order* are well to imperfectly drained soils developed under grassland or under grassland-forest vegetative cover and are characterized by a dark colored, humus-mineral surface horizon. Recognition of the differences in color of the Ah horizon provides a basis of separating soils in this order into the Black and Dark Gray great groups. Further separations are made on the basis of the characteristics of the horizons providing for a grouping at the subgroup level of categorization. Thus, those profiles that are accepted as normal or standard for the great group are grouped as *Orthic.* Those that show some evidence of leaching through the occurrence of a thin Ae horizon are referred to as *Eluviated Black.* Similarly those profiles that show some evidence of Solod or Gleysol are indicated in the *Solodic* and *Gleyed* subgroups.

Soils of the *Solonetzic Order* consist of imperfectly drained soils developed under a variable vegetative cover from saline parent materials. Chemical standards provide a guide in the characterization of these soils, but the separations into the great group category are made mainly on the morphological differences evident in the profile. In both of these great groups, however, the profile must have a solonetzic B horizon characterized by a ratio of exchangeable calcium to exchangeable sodium of 10 or less.

Generally, the soil identified as *Solonetz* in this region have the chemical requirements indicated in the classification system. However, there is a marked variation in the chemical characteristics of the soils identified as *Solods.* Frequently many of these soils, having a similar morphology, do not have the specified ratio of exchangeable calcium to exchangeable sodium but occur intimately associated with those that meet the chemical requirements. Thus, it was not possible to fully implement the proposal made in 1965 by the National Soil Survey Committee in the classification of these soils in this area.

TABLE 4—Classification of the Soils of the Grimshaw and Notikewin Area as Related to Drainage and Parent Materials.

Order	Great Group	Subgroup	Soils and Parent Materials						
			Till	Clacio-Fluvial	Lacustro-Till	Lacustrine	Alluvial & Aeolian	Gravelly Alluvial & Outwash	Residual
Well Drained to Imperfectly Drained Soils									
Chernozemic	Black	Orthic Black					Spirit River		
		Solonetzic Black			Ryeroft				
		Eluviated Black					Peoria		
	Dark Gray	Solodic Dark Gray			Albright				
		Gleyed Dark Gray					High Prairie		
Solonetzic	Solonetz	Black			Grimshaw	Notikewin Kleskun			
	Solod	Black			Esher	Falher Doig			
		Gray			Donnelly	Namps Beatton			
	Gray Wooded	Orthic Gray Wooded	Braeburn Dixonville	Whitelaw		Kathleen	Davis Culp Codesa	Clouston Codesa(Gr.*)	
		Solodic Gray Wooded	Alcan		Hazelmere	Cadotte			

Podzolic	Dark Gray Wooded	Orthic Dark Gray Wooded		Berwyn		Judah	Leith Tangent Cardinal Belloy	Grouard Belloy(Gr.*)	
		Solodic Dark Gray Wooded				Peace River			
	Undifferentiated Podzolic and Brunisolic						Heart		Boundary Teepee

Poorly Drained to very Poorly Drained Soils

Gleysolic	Humic Gleysolic	Orthic Humic Gleysol	Goose	Goose	Goose Prestville	Goose Prestville	Codner Enilda	Codner	
		Carbonated Rego Humic Gleysol				Griffin	Griffin		
		Saline Rego Humic Gleysol			Helen	Helen	Helen		
	Eluviated Gleysol	Low Humic Eluviated Gleysol	Snipe	Snipe	Snipe	Snipe	Wanham		

Notes: 1. Alluvium is undifferentiated river flat and river bench deposits.
2. Organic soils have been classified as (a) Sphagnum or moss peat - Kenzie complex.
(b) Fibrous or sedge peat - Eaglesham complex.

*Gravelly Phase.

Soils of the *Podzolic Order* are well to imperfectly drained soils developed in a moderately cool climate under a forest vegetation. They are characterized by a profile containing an organic surface horizon that contains an accumulation of organic matter, sesquioxide, or clay (Bh, Bf, Bt), or any combination of these. In this region the main accumulation product is clay, permitting a grouping into the *Gray Wooded* great group. While there is usually a thin Ah horizon in the Gray Wooded profile, similar profiles having an Ah horizon usually thicker than 2 inches are indicated in the *Dark Gray Wooded* great group. Representatives of both of these great groups are of common occurrence in the mapped area (see Table 4).

Soils of the *Gleysolic Order* are associated with wetness. They have been developed under various climatic and vegetative conditions in the presence of a high or a highly fluctuating water table. These soils may have an accumulation of peat not exceeding a compact thickness of 12 inches and are characterized by dull grayish colors throughout the profile which may be accompanied by the presence of prominent yellowish or reddish colored mottles. The characteristics of the A horizon provide a guide to grouping at the great group level. Thus, the *Humic Gleysol* great group consists of soils that have an Ah horizon that is more than 3 inches in thickness, whereas the *Eluviated Gleysol* great group is characterized by a prominent Ae horizon. Further separations are made permitting a grouping at the subgroup level. These involve, in this region, consideration of salts, carbonates, or the absence of a B horizon permitting the designation of *Saline, Carbonated,* or *Rego* subgroups.

Soils of the *Organic Order* are wet soils characterized by an accumulation of peat exceeding a compact thickness of 12 inches. Organic soils in this area have been tentatively classified as either *Moss Peat* or *Sedge Peat*. Further studies will be required to implement the classification proposed in 1965 by the National Soil Survey Committee.

The classification indicated in Table 4 is based on a study of virgin profiles. Cultivation changes the soil profile, and other considerations, as for example the color of the plowed layer, must be used for classification purposes.

SOIL MAPPING

The recognition of soil series is largely governed by the scale used in mapping. While the field information is recorded on township plans at a scale of 1 mile to 2 inches, the accompanying soil map is prepared on a scale of 3 miles to 1 inch. Thus, there is a limit imposed on the size of areas that can be shown on this map. As a result, in mapping an area characterized by a complex soil pattern, in most cases an effort is made to indicate this pattern by recording the presence of the dominant soil series. Most of the map units shown on the accompanying soil map are indicated as a

soil association containing several soil series shown in their order of dominance.

Topography separations were made in the field and on the soil map based on steepness, shape and variations of slope according to the following classification:

Simple Topography (regular surface)	Complex Topography (irregular surface)	Per cent slopes
A Depressional to level	a Level	0 - 0.5
B Very gently sloping	b Gently undulating	0.5- 2.0
C Gently sloping	c Undulating	2 - 5
D Moderately sloping	d Gently rolling	6 - 9
E Strongly sloping	e Rolling	10 -15
F Steeply sloping	f Hilly	16 -30

Rough land that borders and forms the banks of drainage courses in this area is indicated on the soil map by the symbol RB (Rough, broken land).

DESCRIPTION OF SOILS

As indicated in Table 4, the soils of the Grimshaw and Notikewin area are grouped according to their drainage characteristics and on the basis of similarity of parent material. In the classification of the well drained to imperfectly drained soils, parent material has a marked effect on profile characteristics. Soils formed under poorly drained conditions are characterized by profiles that show little difference over a much wider range of parent materials with the result that they are grouped according to their dominant textural characteristics.

In the descriptions to follow, information is presented on the profile features that characterize each soil, supplemented by an indication of the extent, topography, and the commonly associated soils. The number of acres indicated for each soil represents the acreage in which that soil is of dominant occurrence in the various map units shown on the accompanying soil map. Analytical information is provided for some of the representative soils of this region, and land use is discussed in the following sections of this report.

I. WELL TO IMPERFECTLY DRAINED SOILS

A. SOILS DEVELOPED ON TILL

1. Brown to dark grayish brown, weakly calcareous, weakly saline, clay loam and clay.

This till is believed to be derived from the Kaskapau and Dunvegan formation of late Cretaceous age and is generally finer textured and somewhat darker in color than the till on which Braeburn soils have developed.

(a) Alcan Series (Ac.)

Alcan soils are often difficult to distinguish from Hazelmere soils. Very careful examination must be made to determine if any stratified materials are present. They usually have firmer Bt horizons than those common to the Braeburn soils and generally salts

are found in the C horizons. These soils often occur on relatively shallow deposits of till overlying strongly acid shales and vary in some of their chemical properties. The following is a description of a Solodic Gray Wooded profile representative of the Alcan series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 6.4.
Ae	0-4	(0-10)	Light brownish gray (10YR 6/2, moist) silt loam, platy, friable. pH 5.4.
AB	4-7	(10-18)	Brown (10YR 5/3, moist) clay loam, subangular blocky, firm. pH 4.8.
Btnj	7-15	(18-38)	Dark yellowish brown (10YR 4/4, moist) clay, weak columnar, subangular blocky, very firm. pH 4.7.
BC	15-23	(38-58)	Dark brown (10YR 3/3, moist) clay, subangular blocky, firm. pH 5.1.
Csk	below 23	(below 58)	Dark grayish brown (10YR 4/2, moist) clay loam, with some stones. Lime and salt accumulations occur in scattered small pockets. pH 6.9.

Extent: 120,780 acres.

Topography: Undulating (c).

Associated Soils: Boundary, Codesa, Snipe, Albright, Hazelmere, Prestville, Kenzie, and Eaglesham soils.

2. Yellowish brown to grayish brown, weakly calcareous, clay loam.

This till is believed to be derived from the Kaskapau and Dunvegan formations in this area but it has many of the properties common to the till derived from the Smoky and Wapiti formations which has been referred to in previous reports as the parent material of the Braeburn series. Further research is required to differentiate these tills.

(a) Braeburn Series (Bb.)

Braeburn soils may be distinguished from Whitelaw soils by the absence of stratification in the C horizon. They are slightly coarser in texture and generally have browner sola than the soils common to the Alcan series. A slight lime concentration usually occurs at depths of 30 to 40 inches. The following is a description of an Orthic Gray Wooded profile representative of the Braeburn series:

Horizon	Depth in.	Depth cm.	Description
L-H	2-0	(5-0)	Dark grayish brown (10 YR 4/2, moist) leaf litter. pH 6.0.
Ae	0-3	(0-8)	Light gray (10YR 7/2, moist) silt loam, platy, friable. pH 6.3.
AB	3-10	(8-25)	Dark brown (10YR 4/3, moist) clay loam, subangular blocky, firm. pH 4.9.
Bt1	10-19	(25-48)	Dark brown (10YR 4/3, moist) clay loam, weak columnar, subangular blocky, firm. pH 4.2.
Bt2	19-25	(48-63)	Dark grayish brown (10YR 4/2, moist) clay loam, subangular blocky, firm. pH 5.0.
BC	25-36	(63-90)	Very dark grayish brown (10YR 3/2, moist) clay loam, subangular blocky, firm. pH 6.9.
Ck	36-60	(90-150)	Very dark grayish brown (10YR 3/2, moist) clay loam with stones and coal flecks. Lime occurs in small pockets. pH 7.2.

Extent: 35,190 acres.

Topography: Undulating (c) and gently undulating (b).

Associated Soils: Codesa, Hazelmere, Snipe, Kenzie, and Eaglesham soils.

3. Brown to grayish brown, noncalcareous, clay loam.

This till appears to carry a high percentage of sandstone which is believed to be of Dunvegan origin. Lime does not usually occur within profile depth and soil material is characterized by an acidic reaction.

(a) Dixonville Series (Dx.)

Dixonville soils may be distinguished from Braeburn and Alcan soils in having more friable Bt horizons, deeper and more friable AB horizons, and in having acidic reactions with no evidence of lime or salts. The following is a description of an Orthic Gray Wooded profile representative of the Dixonville series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	2-0	(5-0)	Black (10YR 2/1, moist) leaf litter. pH 5.9.
Ae	0-4	(0-10)	Light gray (10YR 7/2, moist) silt loam, platy, friable. pH 5.9.
AB	4-10	(10-25)	Dark brown (10YR 3/3, moist) with brown (10YR 5/3, moist) coatings, clay loam, coarse granular, friable. pH 4.3.
Bt	10-18	(25-45)	Dark brown (10YR 3/3, moist) clay loam, subangular blocky, friable. pH 4.2.
BC	18-24	(45-60)	Dark brown (10YR 4/3, moist) clay loam, fine subangular blocky, friable. pH 4.1.
C1	24-33	(60-83)	Very dark grayish brown (10YR 3/2, moist) clay loam with some stones. pH 4.4.
C2	33-43	(83-108)	Very dark grayish brown (10YR 3/2, moist) clay loam with dark yellowish brown (10YR 4/4, moist) loamy sand fragments of sandstone material. pH 4.7.
C3	43+	108+	Dark yellowish brown (10YR 4/4, moist) sandy loam with pockets of very dark grayish brown (10YR 3/2, moist) clay loam. pH 5.9.

Extent: 12,040 acres.

Topography: Undulating (c).

Associated Soils: Hazelmere, Snipe, and Kenzie soils.

B. SOILS DEVELOPED ON GLACIO-FLUVIAL MATERIALS

1. Dark brown to dark grayish brown, noncalcareous, loam and clay loam.

This material is somewhat variable, usually gravelly, and is stratified. Salts in small quantities may be present but usually at depths greater than 5 feet. In appearance it often resembles a gravelly till.

(a) Whitelaw Series (Wh.)

Whitelaw soils resemble Braeburn soils except that they are generally coarser textured and more variable. The Bt horizons of these soils are not as firm as those of the Hazelmere or Alcan soils. The following is a description of an Orthic Gray Wooded profile representative of the Whitelaw series:

Horizon	Depth in.	Depth cm.	Description
L-H	2-0	(5-0)	Very dark brown (10YR 2/2, moist) leaf litter. pH 6.0.
Ahe	0-1	(0-3)	Dark gray (10YR 4/1, moist) loam, weak granular, loose. pH 5.8.
Ae	1-6	(3-15)	Pale brown (10YR 6/3, moist) silt loam, platy, friable. pH 5.6.
AB	6-14	(15-35)	Brown (10YR 4/3, moist) clay loam, subangular blocky, firm. pH 4.6.
Bt	14-24	(35-60)	Dark brown (10YR 3/3, moist) clay loam, subangular blocky, firm. pH 4.3.
BC	24-29	(60-72)	Dark grayish brown (10YR 4/2, moist) clay loam, subangular blocky, firm. pH 4.4.
C	below 29	(below 72)	Dark grayish brown (10YR 4/2, moist) clay loam, gravelly, with occasional silty strata. pH 4.6.

Extent: 58,180 acres.

Topography: Gently undulating (b) and undulating (c).

Associated Soils: Berwyn, Hazelmere, Albright, Belloy, Codesa, and Snipe soils.

(b) Berwyn Series (Bw.)

Berwyn soils are similar to Whitelaw soils except for the presence of Ahe horizons 3 to 5 inches thick. The following is a description of an Orthic Dark Gray Wooded profile representative of the Berwyn series:

Horizon	Depth in.	Depth cm.	Description
Ahe	0-4	(0-10)	Dark grayish brown (10YR 4/2, moist) silt loam, granular, loose. pH 6.6.
Ae	4-7	(10-18)	Pale brown (10YR 6/3, moist) silt loam, platy, friable. pH 6.3.
AB	7-10	(18-26)	Brown (10YR 5/3, moist) silty clay loam, subangular blocky, firm. pH 5.8.
Bt	10-19	(26-48)	Dark brown (10YR 4/3, moist) loam, somewhat gravelly, subangular blocky, firm. pH 5.7.
BC	19-24	(48-60)	Dark grayish brown (10YR 4/2, moist) clay loam, subangular blocky, firm. pH 4.9.
C	below 24	(below 60)	Dark grayish brown (10YR 4/2, moist) silty clay loam with strata of gravelly and sandy loam. pH 4.9.

Extent: 52,360 acres.

Topography: Gently undulating (b) and undulating (c).

Associated Soils: Whitelaw, Belloy, Albright, Hazelmere, and Snipe soils.

C. SOILS DEVELOPED ON LACUSTRO-TILL MATERIALS

1. Variable, gray and very dark grayish brown, weakly calcareous and weakly saline to saline, clay loam and clay.

This fine textured material has strata of sandy loam or loam, that may be gravelly or stony, alternating with strata of clay. The loam strata are of varying thickness and often resemble till.

(a) Hazelmere Series (Hz.)

Hazelmere soils differ from Donnelly soils in having thicker Ae horizons and somewhat browner sola. Frequently they occur

in close association with soils developed on till. Careful examination is required to determine the presence of stratification in the parent material of Hazelmere soils. Generally, the Bt horizon of the Hazelmere soils is much firmer than that of the Braeburn or Whitleaw soils and salts are found in the C horizon. Following is a description of a Solodic Gray Wooded profile typical of the Hazelmere series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 6.4.
Ae	0-4	(0-10)	Light brownish gray (10YR 6/2, moist) silt loam, platy, friable. pH 5.8.
AB	4-8	(10-20)	Brown (10YR 5/3, moist) clay loam, subangular blocky, firm pH 5.3.
Btnj	8-20	(20-50)	Dark brown (10YR 4/3, moist) clay, weak columnar, subangular blocky, very firm. pH 4.8.
BC	20-26	(50-65)	Dark brown (10YR 3/3, moist) clay, subangular blocky, firm. pH 5.6.
Ck	26-34	(65-85)	Very dark grayish brown (10YR 3/2, moist) clay loam, consisting of somewhat stony till-like strata intermixed with strata of clay. pH 7.3.
Csk	below 34	(below 85)	Same as Ck but with numerous gypsum crystals. pH 7.6.

Extent: 413,510 acres.

Topography: Gently undulating (b) and undulating (c).

Associated Soils: Albright, Alcan, Codesa, Whitelaw, Berwyn, Braeburn, Snipe, Goose, Eaglesham, and Kenzie soils.

(b) Albright Series (Ab.)

Albright soils are similar to Hazelmere soils except for the presence of Ah horizons of 3 to 6 inches in thickness. The following is a description of a Solodic Dark Gray profile representative of the Albright series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
Ah	0-5	(0-13)	Very dark brown (10YR 2/2, moist) silt loam, granular, friable. pH 5.9.
Ae	5-7	(13-18)	Pale brown (10YR 6/3, moist) silt loam, platy friable. pH 5.6.
AB	7-11	(18-28)	Brown (10YR 5/3, moist) clay loam, subangular blocky, firm. pH 5.3.
Btnj	11-27	(28-68)	Dark brown (10YR 4/3, moist) clay, weak columnar, subangular blocky, very firm. pH 5.5.
BC	27-33	(68-83)	Dark grayish brown (10YR 4/2, moist) clay, subangular blocky, firm. pH 7.1.
Ck	33-41	(83-103)	Very dark grayish brown (10YR 3/2, moist) clay strata alternating with yellowish brown (10YR 5/4, moist) clay loam strata, often stony. Lime occurs in pockets. pH 7.5.
Csk	below 41	(below 103)	Same as Ck but with salt accumulations occurring in pockets. pH 7.6.

Extent: 85,990 acres.

Topography: Level (A), gently undulating (b), and undulating (c).

Associated Soils: Hazelmere, Grimshaw, Whitelaw, Berwyn, Belloy, Codesa, Snipe, and Goose soils.

(c) Grimshaw Series (Gm.)

Grimshaw soils differ from Albright soils in having salts at relatively shallow depths and more pronounced solonetzic characteristics. Their Btn horizons are extremely firm, organic stained and have strong columnar structure. These soils differ from Notikewin soils in having thicker Ae horizons and may have thin AB horizons. The following is a description of a Black Solonetz profile representative of the Grimshaw series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
Ah	0-4	(0-10)	Very dark grayish brown (10YR 3/2, moist) silt loam, granular, friable. pH 5.8.
Ae	4-8	(10-20)	Grayish brown (10YR 5/2, moist) silt loam, platy, friable. pH 5.9.
AB	8-9	(20-22)	Very dark gray (10YR 3/1, moist) with grayish brown (10YR 5/2, moist) coatings, clay loam, subangular blocky, very firm. pH 6.5.
Btn1	9-12	(22-30)	Very dark gray (10YR 3/1, moist) clay loam, prominent organic coatings, strong columnar, strong blocky, very firm. pH 7.2.
Btn2	12-15	(30-38)	Very dark grayish brown (10YR 3/2, moist) clay, prominent organic coatings, strong columnar, strong blocky, very firm. pH 7.5.
BC	15-18	(38-46)	Very dark grayish brown (10YR 3/2, moist) clay loam, subangular blocky, firm. pH 8.0.
Csak	18-34	(46-85)	Dark grayish brown (10YR 4/2, moist) silty clay loam, with stones, and a concentration of salts. pH 7.9.
Csk	below 34	(below 85)	Similar to Csak except for occasional yellowish brown (10YR 5/4, moist) till-like strata. pH 7.7.

Extent: 9,270 acres.

Topography: Gently undulating (b).

Associated Soils: Albright, Hazelmere, Esher, Helen, and Belloy soils.

2. Uniform, dark gray to dark grayish brown, weakly to moderately calcareous and saline, clay.

This fine textured material may have occasional, lighter colored, thin till-like strata of loamy material that may be gravelly or stony. It occurs at elevations intermediate between the more variable material common to the Hazelmere series and the somewhat darker, stone-free, fine textured material common to the Nampa series.

(a) Donnelly Series (Do.)

Donnelly soils differ from Hazelmere soils in having a grayer profile and a somewhat thinner Ae horizon. They resemble Nampa soils but are differentiated through the presence of stones. They have firm Bt horizons and weakly saline to saline parent materials. The following is a description of a Gray Solod profile common to the Donnelly series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 6.5.
Ahe	0-1	(0-3)	Dark grayish brown (10YR 4/2, moist) silt loam, granular, friable. pH 6.2.
Ae	1-3	(3-8)	Light brownish gray (10YR 6/2, moist) silt loam, platy, friable. pH 6.0.
AB	3-6	(8-15)	Grayish brown (10YR 5/2, moist) clay loam, subangular blocky, firm. pH 5.5.
Btn	6-18	(15-45)	Dark grayish brown (10YR 4/2, moist) clay, weak columnar, subangular blocky, very firm. pH 5.5.
BC	18-24	(45-60)	Very dark grayish brown (10YR 3/2, moist) clay, subangular blocky, firm. pH 6.8.
Csk	below 24	(below 60)	Dark gray (10YR 4/1, moist) clay with occasional stones, and lime and salt in small pockets. pH 7.7.

Extent: 7,780 acres.

Topography: Gently undulating (b).

Associated Soils: Esher, Codesa, Snipe, and Goose soils.

Figure 12—Baled forage crop on Donnelly soils in the Deadwood area.

(b) Esher Series (Es.)

Esher soils are similar to Donnelly soils except for the presence of Ah horizons of 3 to 6 inches in thickness. They differ from Albright soils in having somewhat grayer sola, and from Falher soils in having thicker, more distinct Ae and AB horizons. The following is a description of a Black Solod profile representative of the Esher series:

Horizon	Depth in.	Depth cm.	Description
L-H	2-0	(5-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 6.0.
Ah	0-3	(0-8)	Very dark grayish brown (10YR 3/2, moist) silt loam, granular, friable. pH 5.8.
Ae	3-5	(8-13)	Light brownish gray (10YR 6/2, moist) silt loam, platy, friable. pH 5.3.
AB	5-8	(13-21)	Dark brown (10YR 4/3, moist) with light brownish gray (10YR 6/2, moist) coatings, clay loam, subangular blocky, firm. pH 4.8.

Horizon	Depth in.	Depth cm.	Description
Btn	8-20	(21-50)	Dark grayish brown (10YR 4/2, moist) clay, weak columnar, subangular blocky, very firm. pH 4.5.
BC	20-28	(50-70)	Very dark grayish brown (10YR 3/2, moist) clay, subangular blocky, firm. pH 6:5.
Csk	below 28	(below 70)	Dark gray (10YR 4/1, moist) to very dark gray (10YR 3/1, moist) clay with occasional strata of clay loam in which pebbles are of common occurrence. Salts occur in pockets. pH 7.2.

Extent: 17,050 acres.

Topography: Gently undulating (b).

Associated Soils: Donnelly, Snipe, and Goose soils.

D. SOILS DEVELOPED ON LACUSTRINE MATERIALS

1. Uniform, gray to dark gray, weakly calcareous and saline clay.

This material occurs at a lower elevation and has a more level to depressional land form than the material on which Donnelly and Esher soils are developed. It is usually stone-free and may be varved.

(a) Nampa Series (Np.)

Nampa soils differ from Beatton soils in having thinner Ae and AB horizons and differ from both Beatton and Cadotte soils in having grayer sola. Mottling is often present in the lower portion of the Ae horizons and the upper portion of the Bt horizons of these soils. The following is a description of a Gray Solod profile common to the Nampa series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf mat. pH 6.3.
Ahe	0-1	(0-3)	Dark grayish brown (10YR 4/2, moist) clay loam, weak granular, friable. pH 6.3.
Ae	1-3	(3-8)	Light brownish gray (10YR 6/2, moist) silty clay loam, platy, friable, with some mottling. pH 6.0.
AB	3-5	(8-13)	Grayish brown (10YR 5/2, moist) clay loam, subangular blocky, firm. pH 5.7.
Btn1	5-13	(13-33)	Dark grayish brown (10YR 4/2, moist) clay, weak columnar, subangular blocky, very firm. pH 5.4.
Btn2	13-21	(33-53)	Dark brown (10YR 3/3, moist) clay, weak colunmnar, subangular blocky, very firm. pH 5.3.
BC	21-31	(53-78)	Dark gray (10YR 4/1, moist) clay, subangular blocky, firm. pH 7.2.
Csk	below 31	(below 78)	Gray (10YR 5/1, moist) clay, with lamina of yellowish brown (10YR 5/4, moist) silt loam, occasional lime and salt pockets. pH 7.8.

Extent: 4,210 acres.

Topography: Level to depressional (A).

Associated Soils: Falher, Doig, Beatton, Snipe, Goose, and Prestville soils.

(b) Falher Series (Fa.)

Falher soils are similar to Nampa soils except for the presence of Ah horizons of 3 to 6 inches in thickness. They differ from Doig soils in having grayer sola and thinner Ae and AB horizons. The following is a description of a Black Solod profile representative of the Falher series:

Horizon	Depth in.	Depth cm.	Description
Ah	0-5	(0-12)	Very dark gray (10YR 3/1, moist) silty clay, granular, friable. pH 5.2.
Ae	5-7	(12-18)	Gray (10YR 5/1, moist) silty clay loam, coarse platy, friable. pH 5.3.
AB	7-11	(18-28)	Dark grayish brown (10 YR 4/2, moist) silty clay loam, subangular blocky, firm. pH 5.2.
Btn	11-18	(28-46)	Dark brown (10YR 3/3, moist) clay, weak columnar, subangular blocky, firm. pH 6.1.
BC	18-25	(46-63)	Very dark grayish brown (10YR 3/2, moist) clay, subangular blocky, firm. pH 7.0.
Csk	25-35	(63-87)	Very dark gray (10YR 3/1, moist) clay, lime and salts in pockets. pH 7.4.
IICs	at 35	(at 87)	Very dark grayish brown (10YR 3/2, moist) clay, some stones, pockets of salts. pH 7.6.

Extent: 89,570 acres.

Topography: Level to depressional (A), gently undulating (b), and undulating (c).

Associated Soils: Nampa, Doig, Goose, Notikewin, and Prestville soils.

Figure 13—Farmstead on Falher soils west of Deadwood.

(c) Rycroft Series (Ry.)

Rycroft soils are similar to Falher soils except that their Ah horizons are darker in color and their Ae horizons are either thin or absent. The following is a description of a Solonetzic Black profile common to the Rycroft series:

Horizon	Depth in.	Depth cm.	Description
Ah	0-5	(0-12)	Very dark brown (10YR 2/2, moist) silty clay, weak granular, friable. pH 6.2.
AB	5-7	(12-17)	Brown (10YR 5/3, moist) clay, subangular, blocky, firm. pH 5.6.
Btnj1	7-14	(17-35)	Very dark brown (10YR 2/2, moist) clay, weak columnar, blocky, very firm. pH 4.7.
Btnj2	14-20	(35-50)	Very dark gray (10YR 3/1, moist) clay, strong blocky, very firm. pH 5.1.
BC	20-28	(50-70)	Dark gray (10YR 4/1, moist) clay, subangular blocky, firm. pH 7.1.
Csk	below 28	(below 70)	Gray (10YR 5/1, moist) clay, varved. Lime and salts occur in pockets. pH 8.0.

Extent: Associated with other soils but not of dominant occurrence.

Topography: Level to depressional (A) and gently undulating (b).

Associated Soils: Falher, Doig, Nampa, Goose, and Prestville soils.

(d) Notikewin Series (Nk.)

Notikewin soils differ from Falher soils in having salts at relatively shallow depths and a more pronounced solonetzic morphology. The Btn horizons are extremely firm, prominently coated with organic staining and have a whitecapped, colmunar structure. They differ from Grimshaw soils in having less definite Ae horizons and indistinct or no AB horizons. The following is a description of a Black Solonetz profile representative of the Notikewin series:

Horizon	Depth in.	Depth cm.	Description
Ah	0-4	(0-10)	Very dark grayish brown (10YR 3/2, moist) silt loam, granular, friable. pH 5.5.
Ae	4-5	(10-13)	Light brownish gray (10YR 6/2, moist) silt loam, platy, friable. pH 5.9.
Btn1	5-9	(13-23)	Dark grayish brown (10YR 4/2, moist) clay, whitecapped columnar, strong blocky, organic stained, very firm. pH 6.4.
Btn2	9-17	(23-43)	Very dark grayish brown (10YR 3/2, moist) clay, weak columnar, blocky, organic stained, very firm. pH 7.6.
Csaca	below 17	(below 43)	Very dark gray (10YR 3/1, moist) clay, laminated. Moderately saline, and calcareous. pH 7.7.

Extent: 15,720 acres.

Topography: Level to depressional (A).

Associated Soils: Falher, Nampa, Kleskun, Doig, Peoria, Goose, and Prestville soils.

(e) Kleskun Series (Kk.)

Kleskun soils differ from Notikewin soils in usually having thinner Ah horizons and very little or no grayish Ae or AB horizons over the whitecapped columnar Btn horizons. The following is a description of a Black Solonetz profile representative of the Kleskun series:

Horizon	Depth in.	Depth cm.	Description
Ah	0-2	(0-5)	Very dark gray (10YR 3/1, moist) clay, granular, friable. pH 6.2.
Btn	2-14	(5-35)	Very dark grayish brown (10YR 3/2, moist) clay, whitecapped columnar, strong blocky, organic stained, very firm. pH 6.3.
BC	14-20	(35-50)	Very dark gray (10YR 3/1, moist) clay, strong blocky, very firm. pH 7.5.
Csaca	below 20	(below 50)	Very dark gray (10YR 3/1, moist) clay, with brown (10YR 4/3, moist) silty laminae. Moderately saline and calcareous. pH 8.0.

Extent: 2,650 acres.

Topography: Level to depressional (A).

Associated Soils: Notikewin, Falher, Goose, and Prestville soils.

2. Variable, brown to dark grayish brown, weakly calcareous, saline, silty clay loam and silty clay.

This material usually has strata of dark gray silty clay and clay, and yellowish brown silt loam.

(a) Beatton Series (Bt.)

Beatton soils differ from Kathleen soils in having firmer Bt horizons and from Nampa soils in having browner colored sola and thicker Ae and AB horizons. In this region, Solod soils vary in their chemical characteristics. Due to the scale of mapping, it was not possible to separate those closely associated soils whose chemical characteristics did not meet the requirements for the Solonetzic Order. The following is a description of a Gray Solod profile common to the Beatton series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark grayish brown (10YR 4/2, moist) leaf litter. pH 6.7.
Ahe	0-1	(0-3)	Dark grayish brown (10YR 4/2, moist) silt loam, weak granular, friable. pH 6.0.
Ae	1-5	(3-13)	Very pale brown (10YR 7/3, moist) silt loam, platy, friable. pH 5.3.
AB	5-9	(13-23)	Grayish brown (10YR 5/2, moist) silty clay, subangular blocky, firm. pH 5.1.
Btn	9-19	(23-48)	Dark brown (10YR 3/3, moist) clay, weak colunar, subangular blocky, slight organic staining, very firm. pH 5.1.
BC	19-27	(48-68)	Dark brown (10YR 3/3, moist) silty clay, subangular blocky, firm. pH 5.3.
Csk	below 27	(below 68)	Dark brown (10YR 4/3, moist) silty clay, with very dark grayish brown (2.5Y 3/2, moist) clay strata. Salts and lime occur in pockets. pH 8.0.

Extent: 13,310 acres.

Topography: Gently undulating (b) and undulating (c).

Associated Soils: Doig, Nampa, and Prestville soils.

(b) Doig Series (Dg.)

Doig soils are similar to Beatton soils except for the presence of Ah horizons which vary from 3 to 6 inches in thickness. They differ from Falher soils in having browner colored sola and thicker,

more distinct Ae and AB horizons. The following is a description of a Black Solod profile representative of the Doig series:

Horizon	Depth in.	Depth cm.	Description
Ah	0-5	(0-12)	Dark brown (10YR 3/3, moist) silt loam, weak granular, friable. pH 6.1.
Ae	5-7	(12-17)	Pale brown (10YR 6/3, moist) silt loam, platy, friable. pH 5.9.
AB	7-10	(17-25)	Grayish brown (10YR 5/2, moist) silty clay, subangular blocky, firm. pH 5.6.
Btn	10-22	(25-55)	Dark brown (10YR 3/3, moist) clay, weak columnar, subangular blocky, very firm. pH 6.4.
BC	22-30	(55-75)	Dark grayish brown (10YR 3/2, moist) clay, subangular blocky, firm. pH 6.8.
Cca	30-33	(75-83)	Dark grayish brown (10YR 4/2, moist) silty clay, varved. Moderately calcareous. pH 7.4.
Csk	below 33	(below 83)	Dark grayish brown (10YR 4/2, moist) silty clay alternating with very dark grayish brown (2.5Y 3/2, moist) clay strata. Lime and salts occur in pockets. pH 7.6.

Extent: 10,310 acres.

Topography: Gently undulating (b) and undulating (c).

Associated Soils: Beatton, Nampa, Falher, Judah, and Goose soils.

3. Variable, dark brown, moderately calcareous, silty clay loam and silty clay.

This material usually contains alternating strata of brown to grayish brown silty clay loam and silty clay, and yellowish brown silt loam.

(a) Kathleen Series (Kt.)

Kathleen soils are distinguished from Beatton soils in having more friable Bt horizons that tend to break down easily even if the individual peds are firm when moist. Adjacent to the Peace river in the southern portion of this area the Bt horizons of these soils are thin and the Cca horizons occur at depths of from 8 to 10 inches from the surface. Such soils have been defined as shallow phase Kathleen soils. The following is a description of an Orthic Gray Wooded profile representative of the Kathleen series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 6.6.
Ae	0-4	(0-10)	Pale brown (10YR 6/3, moist) silt loam, platy, friable. pH 6.2.
AB	4-8	(10-20)	Brown (10YR 5/3, moist) with light brownish gray (10YR 6/2, moist) coatings, silty clay loam, subangular blocky, firm. pH 5.2.
Bt	8-18	(20-45)	Brown (10YR 5/3, moist) clay, subangular blocky, firm. pH 4.9.
BC	18-24	(45-60)	Brown (10YR 4/3, moist) silty clay, subangular blocky, firm. pH 6.1.
Cca	below 24	(below 60)	Dark brown (10YR 3/3, moist) silty clay with yellowish brown (10YR 5/6, moist) silt laminate. pH 7.8.

Extent: 30,470 acres.

Topography: Gently undulating (b)

Associated Soils: Judah, Beatton, Whitelaw, and Wanham soils.

(b) Judah Series (Ju.)

Judah soils may be distinguished from Kathleen soils by the presence of an Ahe horizon that is from 3 to 5 inches thick. They differ from many Dark Gray Wooded soils in this area in that there is usually a gradual graying in the lower portions of the Ah horizons rather than distinct Ae horizons. The following is a description of a profile representative of the Judah series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 7.2.
Ahe	0-3	(0-8)	Brown (10YR 4/3, moist) silty clay loam, weak platy, friable. pH 6.8.
AB	3-7	(8-18)	Brown (10YR 5/3, moist) silty clay loam, subangular blocky, firm. Aggregates have grayish brown (10YR 5/2, moist) coatings. pH 5.5.
Bt	7-17	(18-43)	Dark yellowish brown (10YR 3/4, moist) silty clay, subangular blocky, firm. pH 6.1.
BC	17-27	(43-68)	Brown (10YR 4/3, moist) silty clay loam, subangular blocky, firm. pH 7.5.
Cca	below 27	(below 68)	Dark brown (10YR 3/3, moist) silty clay, with yellowish brown (10YR 5/6, moist) silt laminae. Lime accumulation. pH 7.8.
Ck			Grayish brown (10YR 5/2, moist) silty clay loam with brownish yellow (10YR 6/6, moist) laminae of silt. pH 7.6.

Extent: 7,200 acres.

Topography: Gently undulating (b).

Associated Soils: Doig, Kathleen, Tangent, Nampa, Wanham, and Goose soils.

4. Uniform, grayish brown to dark olive gray, moderately calcareous and weakly saline, silty clay and clay.

(a) Cadotte Series (Cte.)

Cadotte soils differ from Nampa and Beatton soils in having moderately calcareous material at relatively shallow depths and from Kathleen soils in having firmer Bt horizons, and finer textures in the C horizons. Usually there is a variation in the firmness of their Bt horizons, and it will be noted in Table 5 that these soils have a relatively low percentage of exchangeable sodium but a high percentage of exchangeable magnesium. The following is a description of a Solodic Gray Wooded profile common to this series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	3-0	(8-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 5.9.
Ae	0-3	(0-8)	Light gray (10YR 7/2, moist) silt loam, platy, friable. pH 5.5.
AB	3-6	(8-16)	Brown (10YR 5/3, moist) silty clay, subangular blocky, firm. pH 4.8.
Btnj	6-15	(16-38)	Dark brown (10YR 3/3, moist) clay, weak columnar, subangular blocky, very firm. pH 4.9.
BC	15-19	(38-48)	Very dark grayish brown (10YR 3/2, moist) clay, subangular blocky, firm. pH 5.7.
Ck	19-33	(48-83)	Dark gray (10YR 4/1, moist) and grayish brown (10YR 5/2, moist) clay strata. pH 7.6.
Csk	at 33	(at 83)	Similar to above with salts in pockets. pH 7.7.

Extent: 291,510 acres.

Topography: Level to depressional (A), gently undulating (b), and undulating (c).

Associated Soils: Peace River, Snipe, Goose, and Prestville soils.

(b) Peace River Series (P.R.)

Peace River soils differ from Doig and Falher soils in having moderately calcareous material at relatively shallow depths and from Judah soils in having firmer Bt horizons and finer textures in their C horizons. They resemble Cadotte soils except for having thicker Ah horizons—usually 3 to 4 inches thick—and thinner Ae horizons. Usually there is a variability in some of the chemical characteristics creating a problem in the classification of these soils. The following is a description of a Solodic Dark Gray Wooded profile common to the Peace River series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
Ah	0-4	(0-10)	Very dark grayish brown (10YR 3/2, moist) silty clay loam, granular, friable. pH 6.5.
Ae	4-7	(10-18)	Light gray (10YR 7/2, moist) silt loam, platy, friable. pH 5.8.
AB	7-10	(18-25)	Dark grayish brown (10YR 4/2, moist) silty clay, subangular blocky, firm. pH 5.4.
Btnj	10-15	(25-38)	Very dark grayish brown (10YR 3/2, moist) silty clay, weak columnar, subangular blocky, very firm. pH 5.6.
BC	15-19	(38-48)	Dark gray (10YR 4/1, moist) silty clay, subangular, blocky, firm. pH 6.9.
Ck	19-38	(48-95)	Dark gray (10YR 4/1, moist) silty clay, calcareous. pH 7.6.
Csk	at 38	(at 95)	Dark gray (10YR 4/1, moist) silty clay with lime and salts in pockets. pH 7.6.

Extent: 62,090 acres.

Topography: Level (A), gently undulating (b), undulating (c), and gently rolling (d).

Associated Soils: Cadotte, Judah, Goose, Snipe, and Prestville soils.

Figure 14—Farmstead on Peace River soils east of North Star.

E. SOILS DEVELOPED ON ALLUVIAL AND AEOLIAN MATERIALS

These deposits are usually found adjacent to river channels. They are stratified, with the strata consisting of alternating beds of sand, silt, and clay. These deposits frequently overlie till or lacustrine materials. The formation of sand dunes and other evidence indicates that wind has played a role in the deposition of some of these materials.

The soils developed on these deposits are grouped according to their dominant textural characteristics.

1. Variable, brown to yellowish brown, moderately calcareous and noncalcareous silty materials.

These materials usually have strata of varying textures and thicknesses with the average texture being generally silty.

(a) Davis Series (Dv.)

Davis soils are characterized by brownish colored sola which have a friable consistency. Adjacent to the Peace river in the southern portion of the area these soils have very thin AB and Bt horizons and the Cca horizons occur within 8 to 10 inches from the surface. Such profiles have been designated as shallow phase Davis soils. The following is a description of an Orthic Gray Wooded profile representative of the Davis series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	2-0	(5-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 7.2.
Ae	0-4	(0-10)	Light brown (7.5YR 6/4, moist) very fine sandy loam, platy, very friable. pH 6.8.
AB1	4-7	(10-18)	Pale brown (10YR 6/3, moist) silt loam, weak subangular blocky, friable. pH 6.4.
AB2	7-15	(18-38)	Yellowish brown (10YR 5/4, moist) silty clay loam, subangular blocky, friable. pH 5.6.
Bt	15-21	(38-53)	Brown (10YR 4/3, moist) silty clay, subangular blocky, firm. pH 6.5.
Cca	21-30	(53-75)	Light brownish gray (10YR 6/2, moist) silty clay with light yellowish brown (10YR 6/4, moist) silt loam strata. Moderately calcareous. pH 8.2.
Csk	below 30	(below 75)	Yellowish brown (10YR 5/4, moist) silt loam. Weakly calcareous. pH 8.1.

Extent: 64,910 acres.

Topography: Gently undulating (b), undulating (c), and rolling (e).

Associated Soils: Culp, Codner, Tangent, and Wanham soils.

(b) Tangent Series (Ta.)

Tangent soils are similar to Davis soils except for the presence of Ahe horizons of 3 to 5 inches in thickness. Shallow phase Tangent soils are of common occurrence adjacent to the Peace river in the southern portion of the mapped area. The following is a description of an Orthic Dark Gray Wooded profile representative of the Tangent series:

Figure 15—Farmstead on Tangent soils south of Judah.

Horizon	Depth in.	Depth cm.	Description
Ahe	0-4	(0-10)	Dark grayish brown (10YR 4/2, moist) silt loam, weak granular, friable. pH 5.8.
Ae	4-6	(10-15)	Very pale brown (10YR 7/4, moist) very fine sandy loam, platy, friable. pH 6.0.
AB	6-9	(15-23)	Light yellowish brown (10YR 6/4, moist) silt loam, weak subangular blocky, friable. pH 6.4.
Bt	9-15	(23-38)	Light olive brown (2.5Y 5/4, moist) silty clay loam, subangular blocky, firm. pH 6.7.
BCk	15-19	(38-48)	Olive brown (2.5Y 4/4, moist) silt loam, weak subangular blocky, friable. pH 7.5.
Cca	19-23	(48-58)	Yellowish brown (10YR 5/4, moist) silt loam. Moderately calcareous. pH 8.0.
Ck	below 23	(below 58)	Brown (10YR 5/3, moist) silt loam with pale brown (10YR 6/3, moist) very fine sandy loam strata. Weakly calcareous.

Extent: 36,400 acres.

Topography: Gently undulating (b), undulating (c), and rolling (e).

Associated Soils: Davis, Leith, Culp, Kathleen, Judah, Codner, and Wanham soils.

(c) Cardinal Series (Cr.)

Cardinal soils differ from Tangent soils in that their C horizons are, generally, noncalcareous. These soils are associated with the glacio-fluvial materials in the vicinity of Berwyn. Occasional stones are found throughout the profile. The following is a description of an Orthic Dark Gray Wooded profile representative of the Cardinal series:

Horizon	Depth in.	Depth cm.	Description
Ahe	0-4	(0-10)	Brown (10YR 4/3, moist) silt loam, granular, weak platy, friable. pH 6.4.
Ae	4-7	(10-18)	Pale brown (10YR 6/3, moist) silt loam, platy, friable. pH 6.3.
Bt1	7-11	(18-28)	Dark yellowish brown (10YR 4/4, moist) silty clay loam, subangular blocky, firm. pH 6.3.
Bt2	11-17	(28-43)	Yellowish brown (10YR 5/4, moist) silty clay loam, subangular blocky, firm. pH 6.3.
BC	17-25	(43-63)	Light yellowish brown (10YR 6/4, moist) loam, weak subangular blocky, friable. pH 5.8.
C	below 25	(below 63)	Light yellowish brown (10YR 6/4, moist) silt loam. pH 5.7.

Extent: 9,040 acres.

Topography: Gently undulating (b).

Associated Soils: Berwyn, Culp, Leith, Wanham, and Codner soils.

2. Variable, brown to yellowish brown, weakly calcareous, sandy materials.

These sandy, stratified materials usually have thin strata of fine textured material.

(a) Culp Series (Cu.)

Culp soils are brownish colored sandy soils that have fairly well developed Bt horizons. The following is a description of an Orthic Gray Wooded profile typical of the Culp series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 7.0.
Ahe	0-1	(0-3)	Dark grayish brown (10YR 4/2, moist) sandy loam, granular, loose. pH 7.1.
Ae	1-7	(3-18)	Light brownish gray (10YR 6/2, moist) grading into light yellowish brown (10YR 6/4, moist) loamy sand, weak platy, loose. pH 6.8.
AB	7-11	(18-28)	Light yellowish brown (10YR 6/4, moist) to yellowish brown (10YR 5/4, moist) loamy sand, slightly firmer than Ae horizon. pH 6.1.
Bt1	11-17	(28-43)	Yellowish brown (10YR 5/4, moist) to brown (10YR 5/3, moist) sandy clay loam, subangular blocky, firm. pH 6.6.
Bt2	17-23	(43-58)	Dark yellowish brown (10YR 4/4, moist) sandy clay loam, subangular blocky, sand on cleavage faces, firm. pH 6.7.
BC	23-29	(58-73)	Yellowish brown (10YR 5/4, moist) loamy sand with occasional sandy clay loam laminae. pH 7.2.
Cca	below 29	(below 73)	Similar to BC horizon but with accumulation of lime. pH 7.7.

Extent: 53,680 acres.

Topography: Gently undulating (b), undulating (c), and rolling (e).

Associated Soils: Leith, Tangent, Davis, Heart, Codner, and Wanham soils.

(b) Leith Series (Le.)

Leith soils resemble Culp soils except for the presence of Ahe horizons of 3 to 5 inches in thickness. The following is a descrip-

tion of an Orthic Dark Gray Wooded profile representative of the Leith series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf and grass litter. pH 6.0.
Ahe	0-4	(0-10)	Dark grayish brown (10YR 4/2, moist) sandy loam, weak granular, friable. pH 5.7.
Ae	4-7	(10-18)	Pale brown (10YR 6/3, moist) loamy sand, strong platy, friable. pH 5.6.
AB	7-10	(18-25)	Brown (10YR 5/3, moist) sandy loam, weak subangular blocky, friable. pH 5.9.
Bt	10-18	(25-45)	Dark yellowish brown (10YR 4/4, moist) sandy clay loam, subangular blocky, firm. pH 5.6.
BC	18-24	(45-60)	Yellowish brown (10YR 5/4, moist) sandy loam with occasional very thin sandy clay loam laminae, granular, friable. pH 6.4.
Cca	below 24	(below 60)	Similar to BC horizon but with an accumulation of lime. pH 7.8.

Extent: 570 acres.
Topography: Gently undulating (b).
Associated Soils: Culp, Tangent, Davis, and Wanham soils.

3. Uniform, brown to light yellowish brown, medium acid to mildly alkaline, sand.

Heart Complex (Ht.)

Heart soils exhibit a variety of profiles. Both Podzolic and Brunisolic soils have been recognized but because these soils are so intimately associated it is difficult to separate them on the scale of mapping used in this area. The following is a description of a Podzol profile common to the Heart complex:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Very dark grayish brown (10YR 3/2, moist) leaf and grass litter. pH 6.2.
Ae	0-4	(0-10)	Pinkish white (7.5 YR 8/2, moist) grading with depth to pinkish gray (7.5 YR 7/2, moist) sand, very weakly platy, loose. pH 6.0.
AB	4-7	(10-18)	Light brown (7.5YR 6/4, moist) sand, single grained, loose. pH 6.0.
Bf	7-14	(18-36)	Strong brown (7.5YR 5/6, moist) sand, single grained, loose. pH 6.4.
BC	14-20	(36-50)	Light yellowish brown (10YR 6/4, moist) sand, single grained, loose. pH 6.6.
Ck	below 20	(below 50)	Light yellowish brown (10YR 6/4, moist) sand, loose. Occasional flecks of lime. pH 6.8.

Extent: 5,930 acres.
Topography: Gently undulating (b) and undulating (c).
Associated Soils: Culp, Davis, Eaglesham, and Kenzie soils.

4. Variable, brown to pale brown, weakly calcareous, comparatively recent deposits.

A wide variety of profiles have developed on this material. Soils developed on the upper, older terraces commonly have thick

Ah horizons and weakly developed illuvial horizons whereas soils developed on the lower, younger terraces may have thin Ah horizons and show no evidence of illuviation. The soils also exhibit such a complex pattern that it is impractical to separate them on the scale of mapping used.

(a) High Prairie Complex (H.P.)

High Prairie soils are quite variable in texture. They have surface horizons that are very dark gray to dark grayish brown in color. Their subsoils are usually brown and consist of stratified materials that show weak horizon development and some evidence of gleying. The following is a description of a Gleyed Dark Gray profile common to the High Prairie complex:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf and grass litter. pH 6.0.
Ahe	0-6	(0-15)	Very dark grayish brown (10YR 3/2, moist) with spots of dark gray (10YR 4/1, moist) silty clay loam, weak granular, friable. pH 5.9.
Btjg	6-14	(15-35)	Brown (10YR 5/3, moist) silty clay loam, weak subangular blocky, firm. Splotched with dark gray (10YR 4/1, moist) stains. The degree of development in this horizon is quite variable. pH 5.5.
C	14-24	(35-60)	Brown to dark brown (10YR 4/3, moist) silt loam. pH 6.1.
Ckg	below 24	(below 60)	Dark grayish brown (10YR 4/2, moist) and brown (10YR 4/3, moist) very fine sandy and silty clay loam strata. Little uniformity as to thickness of strata. Iron staining common. Weakly calcareous. pH 7.1.

Extent: 10,710 acres.

Topography: Level (A) and undulating (b).

Associated Soils: Enilda, Tangent, and Codner soils.

(b) Spirit River Series (S.R.)

Spirit River soils are distinguished by thick Ah Horizons that are very dark brown to black in color. The brownish colored B horizons have little definite structure. The C horizons usually consist of strata of variable textures and thicknesses. The following is a description of an Orthic Black profile typical of the Spirit River series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
Ah	0-6	(0-15)	Very dark brown (10YR 2/2, moist) silt loam, granular, friable. pH 6.0.
Bm	6-26	(15-65)	Brown (10YR 5/3, moist) silt loam, weak granular, friable. pH 6.2.
Ck	below 26	(below 65)	Brown (10YR 5/3, moist) and light yellowish brown (10YR 6/4, moist) strata of loamy sand and silt loam. pH 7.6.

Extent: 3,170 acres.
Topography: Level to depressional (A).
Associated Soils: High Prairie, Enilda, and Codner soils.

(c) Alluvium (A.)

Alluvium consists of a variable parent material occurring in the valleys adjacent to the major stream courses. Since these flats and terraces are variable in size, frequently 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 have gravelly subsoils. The following is a description of a Rego Black soil profile examined on a river bench adjacent to the Peace river in the Shaftesbury area:

	Depth		
Horizon	*in.*	*cm.*	*Description*
Ah	0-6	(0-15)	Black (10YR 2/1, moist) silt loam, weak granular, friable. pH 6.8.
C	6-18	(15-45)	Variable strata of brown (10YR 5/3, moist) silt loam and yellowish brown (10YR 5/6, moist) very fine sandy loam.
II C	below 18	(below 45)	Gravel.

Extent: 30,700 acres.

Topography: Level to gently undulating flats and benches dissected by stream channels, oxbows, and erosion banks.

Associated Soils: High Prairie, Spirit River, Enilda, and other undifferentiated soils.

5. Variable, brown to yellowish brown, noncalcareous, coarse to medium textured materials, usually less than 30 inches in thickness, lying over finer textured materials of a different deposition.

This material may consist of beach, alluvial or aeolian material. The soils formed on this material often show weak horizon development when compared with soils formed on similar and deeper materials. The classification of these soils is subject to change with further study.

(a) Codesa Series (Co.)

Codesa soils have gravelly or sandy materials 12 to 30 inches in thickness overlying till, lacustro-till, glacio-fluvial or lacustrine materials. Although this accumulation of material when shallow resembles the Ae horizons of soils formed on the finer textured underlying material, they should not be mistaken for such Ae horizons because of their coarser texture and the depth of the accumulation. Usually, careful examination permits separation of weakly developed eluviated and illuviated horizons in this material. The following is a description of a Gray Wooded profile formed on uniform sandy material that is underlain by lacustro-till at a depth of 13 inches:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 6.1.
Ahe	0-1	(0-3)	Grayish brown (10YR 5/2, moist) sandy loam, weak granular, friable. pH 6.2.
Ae	1-5	(3-13)	Light yellowish brown (10YR 6/4, moist) loamy fine sand, very weak platy, friable. pH 5.3.
AB	5-8	(13-20)	Brown (10YR 5/3, moist) sandy loam, weak subangular blocky, friable. pH 5.1.
Btj	8-13	(20-33)	Yellowish brown (10YR 5/4, moist) sandy loam, weak subangular blocky, friable. pH 5.0.
II BC	13-16	(33-41)	Dark grayish brown (10YR 4/2, moist) clay, strong blocky, very firm. Sand grains on surface of peds. pH 6.5.
II Ck	below 16	(below 41)	Very dark grayish brown (10YR 3/2, moist) clay. pH 7.5.

Extent: 20,390 acres.

Topography: Gently undulating (b), undulating (c), and strongly sloping (E).

Associated Soils: Hazelmere, Whitelaw, Braeburn, Donnelly, Clouston, Culp, and Kenzie soils.

(b) Belloy Series (Be.)

Belloy soils differ from Codesa soils in having Ahe horizons of 3 to 5 inches in thickness. The following is a description of an Orthic Dark Gray Wooded profile common to the Belloy series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Very dark grayish brown (10YR 3/2, moist) leaf and grass litter. pH 6.2.
Ahe	0-4	(0-10)	Dark gray (10YR 4/1, moist) grading with depth to dark grayish brown (10YR 4/2, moist) sandy loam, weak granular, friable. pH 6.1.
Ae	4-6	(10-15)	Light yellowish brown (10YR 6/4, moist) loamy fine sand, very weak platy, friable. pH 5.5.
AB	6-8	(15-20)	Brown (10YR 5/3, moist) sandy loam, weak subangular blocky, friable. pH 5.7.
Btj	8-12	(20-30)	Yellowish brown (10YR 5/4, moist) sandy loam, weak subangular blocky, friable. A gravelly contact occurs with the underlying material. pH 5.9.
II BC	12-14	(30-35)	Dark grayish brown (10YR 4/2, moist) clay, strong blocky, firm. Sand grains coat the surface of the aggregates. pH 6.6.
II Ck	below 14	(below 35)	Very dark grayish brown (10YR 3/2, moist) clay, weakly calcareous. pH 7.4.

Extent: 17,280 acres.

Topography: Gently undulating (b).

Associated Soils: Albright, Berwyn, Falher, Peace River, Judah, Grouard, and Wanham soils.

(c) Peoria Series (Pe.)

Peoria soils are characterized by their thick, dark colored Ah horizons. These soils are developed on silty material 12 to 30 inches in thickness overlying lacustro-till or lacustrine material.

The lower portions of the Ah horizons are usually slightly bleached and lighter in color than the upper portions. The following is a description of an Eluviated Black profile representative of the Peoria series:

Horizon	Depth in.	Depth cm.	Description
Ah	0-4	(0-10)	Black (10YR 2/1, moist) loam, weak granular, friable. pH 6.0.
Ahe	4-10	(10-25)	Dark grayish brown (10YR 4/2, moist) loam, weak granular, friable. pH 6.0.
AB	10-12	(25-30)	Brown (10YR 5/3, moist) loam, weak subangular blocky, friable. pH 5.8.
Btj	12-18	(30-45)	Yellowish brown (10YR 5/4, moist) silt loam, weak subangular blocky, friable. pH 5.8.
II BC	18-21	(45-53)	Dark grayish brown (10YR 4/2, moist) clay, strong blocky, firm. pH 6.5.
II Ck	below 21	(below 63)	Very dark grayish brown (10YR 3/2, moist) clay. Weakly calcareous. pH 7.5.

Extent: 5,700 acres.

Topography: Gently undulating (b).

Associated Soils: Albright, Grimshaw, Notikewin, and Judah soils.

F. SOILS DEVELOPED ON GRAVELLY ALLUVIAL AND OUTWASH MATERIALS

In this region, gravelly deposits consist of stratified deposits composed of alternating strata of coarse sand, gravel, and cobbles. They are found as shoreline remnants of post-glacial lakes, along river channels, and as areas of varying size associated with till, glacio-fluvial, and lacustro-till deposits.

(a) Clouston Series (Cl.)

Clouston soils are gravelly soils characterized by a profile resembling that of a Gray Wooded profile. While they have prominent Ae horizons there is some doubt whether there is enough clay accumulation to justify a Bt horizon. The present classification of these gravelly soils is subject to change with further study. The following is a description of a profile common to the Clouston series:

Horizon	Depth in.	Depth cm.	Description
L-H	2-0	(5-0)	Very dark grayish brown (10YR 3/2, moist) leaf litter. pH 6.4.
Ahe	0-1	(0-3)	Dark grayish brown (10YR 4/2, moist) gravelly sandy loam, single grain, loose. pH 5.3.
Ae	1-5	(3-13)	Light brownish gray (10YR 6/2, moist) gravelly loamy sand, weak platy, very friable. pH 5.3.
AB	5-10	(13-25)	Grayish brown (10YR 5/2, moist) gravelly loamy sand, very weak subangular blocky, very friable. pH 5.6.
Btj	10-22	(25-55)	Yellowish brown (10YR 5/4, moist) gravelly coarse loamy sand, very weak subangular blocky, slight detectable firmness, friable. pH 6.0.

Horizon	Depth in.	Depth cm.	Description
BC	22-32	(55-80)	Brown (10YR 5/3, moist) gravelly coarse loamy sand, single grain, loose. pH 6.5.
Cca	below 32	(below 80)	Brown (10YR 5/3, moist) gravelly and stony coarse loamy sand, lime on undersides of pebbles. pH 7.0.

Extent: 5,240 acres.
Topography: Undulating (c) and strongly sloping (E).
Associated Soils: Codesa, Belloy, and Grouard soils.

(b) Grouard Series (Gr.)

Grouard soils are similar to Clouston soils except for the presence of Ahe horizons of 3 to 5 inches in thickness and thinner Ae horizons. The following is a description of an Orthic Dark Gray Wooded profile representative of the Grouard series:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Very dark grayish brown (10YR 3/2, moist) leaf litter. pH 6.2.
Ahe	0-4	(0-10)	Dark grayish brown (10YR 4/2, moist) gravelly sandy loam, single grain, loose. pH 6.0.
Ae	4-6	(10-15)	Light brownish gray (10YR 6/2, moist) gravelly loamy sand, weak platy, very friable. pH 5.6.
AB	6-10	(15-25)	Grayish brown (10YR 5/2, moist) gravelly loamy sand, weak subangular blocky, very friable. pH 6.0.
Btj	10-20	(25-50)	Yellowish brown (10YR 5/4, moist) gravelly loamy sand, weak subangular blocky, slight detectable firmness not evident in other horizons, friable. pH 6.2.
BC	20-28	(50-70)	Brown (10YR 5/3, moist) gravelly coarse loamy sand, single grain, loose. pH 6.6.
Cca	below 28	(below 70)	Brown (10YR 5/3, moist) gravelly coarse loamy sand, with lime on undersides of pebbles. pH 7.0.

Extent: 1,440 acres.
Topography: Undulating (c).
Associated Soils: Clouston and Belloy soils.

G. SOILS DEVELOPED ON RESIDUAL AND MODIFIED RESIDUAL MATERIALS

1. Grayish colored, extremely acid, weathered shale material.

This material, presumably derived from the Kaskapau formation of Late Cretaceous age, has an extremely acid reaction accompanied by a relatively low base saturation, and consists of a gray colored silty clay to clay material in which fragments of shale are of common occurrence.

Boundary Complex (Bd.)

Boundary soils exhibit a variety of Podzolic profiles that are difficult to separate on the scale of mapping used. They occur in the western portion of the area on the slopes extending from the Clear hills and on some of the plain remnants. Boundary soils

have a bright, brown colored B horizon lying below a prominent Ae horizon. The following is a description of a Podzolic profile common to the Boundary complex:

Horizon	Depth in.	Depth cm.	Description
L-H	1-0	(3-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 5.8.
Ae	0-2	(0-5)	Light yellowish brown (10YR 5/4, moist) silt loam, platy, friable. pH 5.2.
Btfj1	2-10	(2-25)	Brown (7.5YR 5/4, moist) silty clay, weak subangular blocky, firm. pH 4.8.
Btfj2	10-22	(25-55)	Brown (10YR 5/3, moist) to yellowish brown (10YR 5/4, moist) silty clay, weak subangular blocky, friable. pH 4.7.
BC	22-28	(55-70)	Olive gray (5Y 5/2, moist) silty clay, weak subangular blocky, layered shale. pH 4.4.
C	below 28	(below 70)	Olive gray (5Y 5/2, moist) to dark gray (5Y 4/1, moist) clay, layered shale characterized by occasional yellow streaks. pH 4.2.

Extent: 17,050 acres.

Topography: Undulating (c) and strongly sloping (E).

Associated Soils: Alcan, Hazelmere, Snipe, Kenzie, Prestville, and Eaglesham soils.

2. Brown to grayish brown weathered sandstone.

This material is believed to be derived from the Dunvegan formation of Late Cretaceous age.

Teepee Complex (Tp.)

Teepee soils exhibit a variety of profiles. Eluviated horizons may or may not be present and illuviated horizons are usually difficult to detect if present. Pieces of unweathered sandstone are often found throughout the profile. The following is a description of a Gray Wooded profile common to the Teepee complex:

Horizon	Depth in.	Depth cm.	Description
L-H	2-0	(5-0)	Dark brown (10YR 3/3, moist) leaf litter. pH 6.6.
Ae	0-3	(0-8)	Light gray (10YR 7/2, moist) very fine sand, weak platy, friable. pH 5.5.
Btj	3-15	(8-38)	Brown (10YR 5/3, moist) loamy fine sand, single grain, slight detectable firmness. pH 4.7.
BC	15-23	(38-58)	Grayish brown (10YR 5/2, moist) fine sand, single grain, loose, with occasional fragments of sandstone. pH 5.0.
Ck	below 23	(below 58)	Same as BC but with flecks of lime prevalent. pH 7.0.

Extent: 1,260 acres.

Topography: Undulating (c).

Associated Soils: Alcan, Snipe, and Kenzie soils.

II. POORLY DRAINED TO VERY POORLY DRAINED SOILS

These soils are developed under wet conditions in the presence of a high or a highly fluctuating water table. They show gley characteristics distinguished by dull colors and the presence of brownish or reddish colored mottles. Soils with organic horizons exceeding thicknesses of 12 inches of consolidated peat are excluded from this Order but are included in the Organic Order. In the mapped area, separations of these soils were made in the following manner:

A. SOILS DEVELOPED ON MODERATELY FINE TO FINE TEXTURED MATERIALS

1. Brown to gray, clay loam to clay.

(a) Snipe Series (Sn.)

Snipe soils are characterized by organic horizons less than 12 inches in thickness and by relatively thick, strongly mottled Aeg horizons. The colors of the Btg horizons are more drab than those of the better drained soils with which these soils are associated. The following is a description of a Low Humic Eluviated Gleysol profile representative of the Snipe series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L	6-2	(15-5)	Dark brown (10YR 4/3, moist) peaty material. pH 5.5.
H	2-0	(5-0)	Very dark brown (10YR 2/2, moist) decomposed peat. pH 5.5.
Ahe	0-1	(0-3)	Dark grayish brown (10YR 4/2, moist) silt loam, weak granular, friable. pH 5.6.
Aeg	1-7	(3-18)	Light gray (10YR 7/2, moist) silt loam with yellowish brown (10YR 5/4, moist) mottles, platy, friable. pH 5.2.
ABg	7-10	(18-25)	Gray (10YR 5/1, moist) silty clay loam, subangular blocky, firm. pH 4.9.
Btg	10-21	(25-53)	Gray (10YR 5/1, moist) clay, strong blocky, very firm. pH 5.3.
BCg	21-28	(53-70)	Dark gray (10YR 4/1, moist) clay, subangular blocky, firm. pH 6.9.
Ckg	below 28	(below 70)	Grayish brown (10YR 5/2, moist) clay, weakly calcareous. pH 7.5.

Extent: 40,200 acres.

Topography: Level to depressional (A).

Associated Soils: Alcan, Hazelmere, Albright, Donnelly, Esher, Whitelaw, Berwyn, Braeburn, Nampa, Falher, Boundary, Goose, Prestville, Kenzie, and Eaglesham soils.

(b) Goose Series (Go.)

Goose soils are characterized by having relatively thin organic horizons and relatively thick Ah horizons which have a shot-like structure. The Btjg horizons usually have dull gray colors with numerous brownish colored mottles. The following is a description of an Orthic Humic Gleysol profile representative of the Goose series:

Horizon	Depth in.	Depth cm.	Description
L-H	2-0	(5-0)	Dark brown (10YR 3/3, moist) organic matter. pH 6.4.
Ah	0-6	(0-15)	Very dark gray (10YR 3/1, moist) silty clay loam, shot-like, granular, friable. pH 6.2.
ABg	6-10	(15-25)	Dark gray (10YR 4/1, moist) silty clay with yellowish brown (10YR 5/4, moist) mottles, fine subangular blocky, firm. pH 6.0.
Btjg	10-18	(25-45)	Dark gray (7.5YR 4/0, moist) clay with brown (7.5YR 4/4, moist) mottles, massive, plastic when wet and very hard when dry. pH 6.5.
BCkg	18-22	(45-55)	Gray (7.5YR 5/0, moist) clay with brown (7.5YR 4/4, moist) mottles, massive, plastic when wet. On drying breaks to hard blocky fragments. pH 7.4.
Cskg	below 22	(below 55)	Dark gray (7.5YR 4/0, moist) clay, plastic when wet. Weakly calcareous and weakly saline. pH 7.6.

Extent: 15,000 acres.

Topography: Level to depressional (A).

Associated Soils: Falher, Nampa, Peace River, Cadotte, Judah, Snipe, Prestville, and Eaglesham soils.

Figure 16—Oat crop on Prestville soils in an area east of Nampa.

(c) Prestville Series (Pr.)

Prestville soils are distinguished from Goose soils in having organic horizons of 4 to 12 inches in thickness and usually thinner Ah horizons. The Btjg horizons are dull gray in color and strongly mottled. The following is a description of an Orthic Humic Gleysol profile representative of the Prestville series:

Horizon	Depth in.	Depth cm.	Description
L	10-4	(25-10)	Brown (10YR 4/3, moist) grading to dark brown (10YR 3/3, moist) fibrous peat. pH 5.8.
F	4-0	(10-0)	Dark brown (10YR 3/3, moist) semidecomposed peat. pH. 6.8.
Ah	0-3	(0-8)	Very dark brown (10YR 2/2, moist) silty clay loam, weak granular, friable. pH 7.2.

Horizon	Depth in.	Depth cm.	Description
ABg	3-4	(8-10)	Dark grayish brown (10YR 4/2, moist) silty clay, massive. pH 7.4.
Btjg	4-10	(10-25)	Dark gray (7.5YR 4/0, moist) clay, massive, plastic when wet. pH 7.8.
BCg	10-16	(25-40)	Gray (7.5YR 5/0, moist) clay, granular to shot-like, firm, plastic when wet. pH 7.6.
Cskg	below 16	(below 40)	Gray (7.5YR 5/0, moist clay. Weakly calcareous and weakly saline. pH 8.0.

Extent: 42,880 acres.

Topography: Level to depressional (A).

Associated Soils: Nampa, Falher, Cadotte, Peace River, Snipe, Goose, Kenzie, and Eaglesham soils.

(d) Helen Series (He.)

Helen soils are frequently characterized by the presence of surface crusts of salt crystals which are usually concentrated to such an extent that only salt-tolerant grasses flourish. The following is a description of a Saline Rego Humic Gleysol profile representative of the Helen series:

Horizon	Depth in.	Depth cm.	Description
Ahs	0-6	(0-15)	Black (10YR 2/1, moist) clay loam, weak granular, friable. pH 8.0.
Csg1	6-12	(15-30)	Dark grayish brown (2.5Y 4/2, moist) clay loam. pH 8.0.
Csg2	below 12	(below 30)	Dark gray (5Y 4/1, moist) clay. pH 7.8.

Extent: 960 acres.

Topography: Level to depressional (A).

Associated Soils: Grimshaw, Albright, and Prestville soils.

B. SOILS DEVELOPED ON MODERATELY COARSE TO MODERATELY FINE TEXTURED MATERIALS

1. Pale brown to gray sandy loam to clay loam.

(a) Enilda Series (En.)

Enilda soils are found on relatively recent flood plains. Except for dark colored Ah horizons, these soils have very weak horizon development with the C horizons consisting of differing depositional strata that are usually iron stained. The following is a description of an Orthic Humic Gleysol profile common to the Enilda series.

Horizon	Depth in.	Depth cm.	Description
L	1-0	(3-0)	Dark brown (10YR 3/3, moist) sedge peat. pH 7.2.
Ahg	0-3	(0-8)	Very dark brown (10YR 2/2, moist) with occasional gray (10YR 5/1, moist) splotches, silt loam, granular, friable. pH 7.1.
Bg	3-9	(8-23)	Grayish brown (10YR 5/2, moist) silt loam, mottled. pH 6.5.
Cg1	9-12	(23-30)	Light brownish gray (10YR 6/2, moist) silt loam, mottled. pH 6.7.
Cg2	below 12	(below 30)	Pale brown (10YR 6/3, moist) silt loam with laminae of fine sand and clay, mottled. pH 6.9.

Extent: 12,500 acres.

Topography: Level to depressional (A).

Associated Soils: High Prairie, Spirit River, Prestville, and Eaglesham soils.

(b) Wanham Series (Wm.)

Wanham soils have relatively thin L-H and Ah horizons overlying Aeg horizons which are 4 to 6 inches thick. The Btg horizons are usually dull grayish brown in color with numerous brownish colored mottles. The following is a description of a Low Humic Eluviated Gleysol profile representative of the Wanham series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	3-0	(8-0)	Dark brown (10YR 3/3, moist) sedge peat and semi-decomposed plant remains. pH 6.0.
Ah	0-2	(0-5)	Very dark brown (10YR 2/2, moist) silt loam, weak granular, friable. pH 6.0.
Aeg	2-6	(5-15)	Light gray (10YR 7/2, moist) very fine sandy loam with yellowish brown (10YR 5/4, moist) mottles, platy, friable. pH 5.2.
ABg	6-9	(15-23)	Grayish brown (10YR 5/2, moist) silty clay loam, with yellowish brown (10YR 5/4, moist) mottles, subangular blocky, firm. pH 5.1.
Btg	9-15	(23-38)	Dark grayish brown (10YR 4/2, moist) silty clay with yellowish brown (10YR 5/6, moist) mottles, subangular blocky, firm. pH 5.6.
BCg	15-19	(38-48)	Gray (10YR 5/1, moist) silty clay loam with yellowish brown (10YR 5/6, moist) mottles, subangular blocky, firm. pH 6.8.
Cgk	below 19	(below 48)	Gray (5Y 5/1, moist) silt loam with yellowish brown (10YR 5/6, moist) streaks and mottles and with occasional laminae of very fine sandy loam. Moderately calcareous. pH 7.8.

Extent: 2,130 acres.

Topography: Level to depressional (A).

Associated Soils: Tangent, Culp, Kathleen, Davis, Judah, and Codner soils.

(c) Codner Series (Cn.)

Codner soils have relatively thick dark colored Ah horizons overlying dull grayish colored subsurface horizons that have numerous brownish colored mottles. The following is a description of an Orthic Humic Gleysol profile representative of the Codner series:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L-H	3-0	(8-0)	Very dark brown (10YR 2/2, moist) semidecomposed plant remains. pH 5.8.
Ah	0-6	(0-15)	Very dark gray (10YR 3/1, moist) loam, weak granular, friable. pH 5.7.
ABg	6-8	(15-20)	Dark gray (10YR 4/1, moist) silt loam with yellowish brown (10YR 5/4, moist) mottles, granular, friable. pH 5.8.
Btjg	8-12	(20-30)	Dark grayish brown (10YR 4/2, moist) silt loam with strong brown (7.5YR 5/6, moist) mottles, weak subangular blocky, firm. pH 5.8.

Horizon	Depth in.	Depth cm.	Description
Ckg	below 12	(below 30)	Gray (10YR 4/1, moist) silt loam with laminae of silty clay and sandy loam. Reddish brown (5YR 5/4, moist) mottles. Weakly calcareous. pH 7.0.

Extent: 4,150 acres.

Topography: Level to depressional (A).

Associated Soils: Davis, Tangent, Kathleen, Culp, Judah, Goose, and Wanham soils.

(d) Griffin Series (Gf.)

Griffin soils differ from Codner soils in having free carbonates at or near the surface. The Cgk horizons are moderately calcareous and usually are nonsaline to weakly saline. The Ckg horizons are dull colored but have very little evidence of mottling. The following is a description of a Carbonated Rego Humic Gleysol profile representative of the Griffin series:

Horizon	Depth in.	Depth cm.	Description
L-H	2-0	(5-0)	Very dark brown (10YR 2/2, moist) semidecomposed plant remains. pH 7.0.
Ahk	0-4	(0-10)	Very dark grayish brown (10YR 3/2, moist) loam, granular, friable, weakly calcareous. pH 7.5.
Ckg	below 4	(below 10)	Gray (10YR 5/1, moist) loam, moderately calcareous. pH 8.0.

Extent: 4,830 acres.

Topography: Level and depressional (A).

Associated Soils: Codner, High Prairie, and Goose soils.

C. SOILS DEVELOPED ON ORGANIC MATERIALS

1. Dark brown to black fibrous peat.

(a) Eaglesham Complex (Eg.)

Eaglesham soils are characterized by having LFH horizons from 12 inches to 5 feet in thickness that consist of the remains of coarse grasses, sedges and reeds. The following is a description of a relatively shallow peat soil common to the Eaglesham complex in the mapped area:

Horizon	Depth in.	Depth cm.	Description
L	0-16	(0-40)	Dark brown (10YR 3/3, moist) easily discernible sedge and grass remains. pH 5.8.
F	16-24	(40-60)	Very dark brown (10YR 2/2, moist) partly decomposed sedge and grass remains. pH 6.8.
H	24-28	(60-70)	Black (10YR 2/1, moist) well decomposed peat. pH 7.3.
Ckg	below 28	(below 70)	Gray (5Y 6/1, moist) clay, plastic when wet. Numerous rusty stains and streaks. Weakly calcareous. pH 7.8.

Extent: 72,920 acres.

Topography: Depressional (A).

Associated Soils: Eaglesham soils are found in many of the depressions throughout all parts of the mapped area.

2. Brown to dark brown moss peat.

(a) Kenzie Complex (Kz.)

Kenzie soils have LFH horizons that are from 12 inches to about 10 feet thick consisting of undecomposed and semidecomposed sphagnum moss, labrador tea, and woody plant remains. Ice often occurs at depths of 24 inches or less in these soils during the latter portion of the summer. The following is a description of a profile common to the Kenzie complex:

	Depth		
Horizon	*in.*	*cm.*	*Description*
L	0–10	(0–25)	Dark brown (10YR 4/3, moist) undecomposed moss and labrador tea. pH 4.7.
F	10–26	(25–65)	Brown (10YR 5/3, moist) partially decomposed peat containing recognizable remains of sphagnum moss. pH 4.8.
H	26–34	(65–85)	Dark brown (10YR 3/3, moist) well decomposed peat with no recognizable remains of plants. pH 4.8.
Cg	below 34	(below 85)	Gray (5Y 6/1, moist) clay, strongly mottled, plastic when wet. pH 6.8.

Extent: 149,470 acres.

Topography: Depressional (A).

Associated Soils: Kenzie soils are found in many of the depressions throughout all parts of the mapped area.

Figure 17—Cover typical of the Kenzie soil areas

Figure 18—Cover typical of the Eaglesham soil areas.

ANALYSES OF SOME REPRESENTATIVE SOIL PROFILES

Soil samples were obtained from virgin sites representative of the major soil series found in the mapped area. The results of the analyses of these soil samples are presented in Table 5.

The analytical methods used in determining the reported results were as follows:

1. **Particle Size Analyses**—Pipette method of Kilmer and Alexander as modified by Toogood and Peters, 1953. Can. J. Agr. Sci. 33: 159-171.
2. **Reaction (pH)**—Soil paste method of Doughty, 1941. Soil Sci. 22: 135-138, and utilizing the Coleman Glass Electrode apparatus.
3. **Nitrogen**—Kjeldahl method of Prince, 1945. Soil Sci. 59: 47-52, using a mixture of selenium, copper sulphate and potassium sulphate as a catalyst.
4. **Organic Carbon**—By difference between total carbon and inorganic carbon. Total carbon by dry combustion as per instruction manual for operation of Leco Carbon Analyzers. Nos. 577-100.
5. **Exchange Capacity**—Ammonium acetate method by displacement of ammonium with NaCl. Methods of Analysis, Agronomy No. 4, 1965.
6. **Exchangeable Cations**—A.O.A.C. extraction method, 8th Edition, 1955. Washington, D.C. Calcium, magnesium, sodium, and potassium were determined by EDTA titration and atomic absorption spectrometry.
7. **Conductivity and Soluble Salts**—Saturated soil extract methods proposed by Hayward, et al, 1954. U.S. Regional Salinity Laboratory. Agr. Handbook 60. U.S. Dept. Agr., Washington, D.C.
8. **Calcium Carbonate Equivalent**—Schollenberger. 1945. Soil Sci. 59: 57-63.

TABLE 5 - Analyses of some Representative Soil Profiles

Horizon	Depth in.	Depth cm.	Mechanical Analysis: Particle Size Sand %	Silt %	Clay % <2u	Clay % <.2u	pH	N %	Org. C %	C/N Ratio	Chemical Analysis: C.E.C. (Det.) me/100 g	Exchangeable Cations: Ca %	Mg %	Na %	K %	H %	Base Sat. %	Ca/Na Ratio	Cond. (Sat.Ext.) mmhos/cm	$CaCO_3$ Equiv. %
WELL DRAINED TO IMPERFECTLY DRAINED SOILS																				
Alcan Series - Solodic Gray Wooded - NW 17-92-25-W5																				
L-H	1-0	3-0					6.4				52.7	63	20	0	4	13	87			
Ae	0-4	0-10	29	50	21	8	5.4	.059	.73	12.4	9.1	48	20	0	4	28	72			
AB	4-7	10-18	23	17	60	20	4.8	.063	.63	10.0	17.4	51	21	3	2	23	77	17		
Btnj	7-15	18-38	24	36	40	24	4.7	.056	.60	10.5	24.0	40	37	2	2	19	81	20		
BC	15-23	38-58	20	34	46	31	5.1				25.0	46	47	2	1	4	96	23		
Csk	23+	58+	27	33	40	19	6.9												3.0	2.35
Dixonville Series - Orthic Gray Wooded - NE 36-87-24-W5																				
L-H	2-0	5-0					5.9				54.6	73	6	0	4	17	83			
Ae	0-4	0-10	11	73	16	3	5.9	0.06	0.065	11.0	11.6	68	14	1	2	15	85			
AB	4-10	10-25	1	54	45	27	4.3	0.07	0.065	9.3	28.4	45	23	0	2	30	70	45		
Bt	10-18	25-45	3	52	45	25	4.2	0.06	0.059	10.0	26.4	38	24	1	2	35	65	38		
BC	18-24	45-60	4	51	45	26	4.1				25.2	44	22	0	1	33	67	44		
C1	24-33	60-83	15	52	33	20	4.4													0.00
C2	33-43	83-108	24	45	31	19	4.7													0.00
C3	43+	108+	22	42	36	18	5.9												0.0	0.00
Whitelaw Series - Orthic Gray Wooded - SW 28-84-23-W5																				
L-H	2-0	5-0					6.0													
Ahe	0-1	0-3	28	58	14	0	5.8	0.530	8.84	16.7	37.7	87	0	0	2	11	89			
Ae	1-6	3-15	25	60	15	1	5.6	0.061	0.67	11.0	9.8	68	2	2	2	26	74	34		
AB	6-14	15-35	22	47	31	8	4.6	0.056	0.55	9.9	19.8	67	13	1	1	18	82	67		
Bt	14-24	35-60	20	44	36	14	4.3	0.046	0.68	14.7	24.5	52	18	1	1	28	72	52		
BC	24-29	60-72	22	45	33	10	4.4	0.046	0.59	12.8	21.8	52	19	2	0	27	73	26		
C	29+	72+	22	46	32	9	4.6	0.057	0.71	12.4									0.0	0.00
Berwyn Series - Orthic Dark Gray Wooded - SW 22-83-25-W5																				
Ahe	0-4	0-10	19	58	23	13	6.6	0.634	6.39	10.1	39.6	90	5	0	0	5	95			
Ae	4-7	10-18	26	61	13	9	6.3	0.084	0.92	11.0	10.1	73	10	3	2	12	88			
AB	7-10	18-26	18	53	29	17	5.8	0.084	0.90	10.7	17.6	68	17	2	2	11	89	34		
Bt	10-19	26-48	34	40	26	18	5.7	0.052	0.67	13.0	17.9	66	19	2	1	12	89	33		
BC	19-24	48-60	20	47	33	17	4.9	0.060	0.73	12.2	21.0	60	17	2	0	21	79	30		
C	24+	60+	20	50	30	15	4.9	0.065	0.74	11.4									0.0	0.00
Hazelmere Series - Solodic Gray Wooded - SW 15-84-25-W5																				
L-H	1-0	3-0					6.4													
Ae	0-4	0-10	34	50	16	12	5.8	0.045	0.34	7.6	11.4	81	0	2	6	11	89			
AB	4-8	10-20	23	38	39	25	5.3	0.065	0.44	6.8	16.9	64	18	3	3	12	88	21		
Btnj	8-20	20-50	18	25	57	38	4.8	0.059	0.75	12.7	23.7	59	20	3	2	16	84	20		
BC	20-26	50-65	20	32	48	34	5.6				19.1	64	31	3	2	0	100	21		
Ck	26-34	65-85	21	37	42	25	7.3												0.5	5.40
Csk	34+	85+	20	37	43	24	7.6												2.5	5.48

Horizon	Depth in.	Depth cm.	Mechanical Analysis: Particle Size Sand %	Silt %	Clay % <2u	Clay % <.2u	pH	N %	Org. C %	C/N Ratio	Chemical Analysis: C.E.C. (Det.) me/100 g	Exchangeable Cations: Ca %	Mg %	Na %	K %	H %	Base Sat. %	Ca/Na Ratio	Cond. (Sat.Ext.) mmhos/cm	$CaCO_3$ Equiv. %
WELL DRAINED TO IMPERFECTLY DRAINED SOILS																				
Albright Series - Solodic Dark Gray - SW 26-87-25-W5																				
Ah	0-5	0-13	25	45	30	17	5.9	0.541	5.50	10.2	31.5	64	15	0	2	19	81			
Ae	5-7	13-18	29	49	22	12	5.6	0.080	0.78	9.8	9.4	58	14	3	2	23	77			
AB	7-11	18-28	25	39	36	21	5.3	0.080	0.74	9.3	16.6	48	30	3	2	17	83	16		
Btnj	11-27	28-68	20	32	48	36	5.5	0.057	0.86	15.1	23.6	49	36	4	2	9	90	12		
BC	27-33	68-83	22	35	43	30	7.1													
Ck	33-41	83-103	25	31	44	24	7.5												1.5	1.79
Csk	41+	103+	24	38	38	15	7.6												6.5	2.46
Grimshaw Series - Black Solonetz - SW 25-87-25-W5																				
Ah	0-3	0-8	27	51	22	6	5.8	0.799	8.76	11.0	41.7	57	11	2	2	28	72			
Ae	3-7	8-18	25	54	21	7	5.9	0.302	3.34	11.1	19.0	34	16	10	2	38	62	3		
Bntl	7-12	18-30	20	44	36	23	7.2	0.242	1.66	6.8	27.5	30	39	28	1	2	98	1		
Bnt2	12-15	30-38	20	37	43	27	7.5	0.083	1.87	22.0	26.2	30	39	29	2	0	100	1	6.0	
BC	15-18	38-46	20	36	44	25	8.0				22.1	28	48	23	1	0	100	1	10.5	
Csak	18-34	46-85	21	41	38	21	7.9												11.0	2.61
Csk	34+	85+	23	45	32	15	7.7												10.5	1.14
Falher Series - Black Solod - SE 3-91-23-W5																				
Ah	0-5	0-12	8	50	42	28	5.2	0.820	8.80	10.7	43.2	34	23	2	3	38	62			
Ae	5-7	12-18	13	56	31	10	5.3	0.200	2.38	11.9	19.0	22	26	2	1	49	51			
AB	7-11	18-28	9	56	35	29	5.2	0.210	2.39	11.4	27.5	26	39	2	2	31	69	13		
Bnt	11-18	28-46	3	29	68	42	6.1	0.120	1.82	15.2	26.2	25	55	12	2	6	94	2		
BC	18-25	46-63	3	32	65	32	7.0				22.1	34	52	12	2	0	100	3		
Csk	25-35	63-87	6	24	70	28	7.4												6.0	3.40
IICs	35+	87+	13	42	45	25	7.6												6.5	3.20
Notikewin Series - Black Solonetz - NW 34-91-23-W5																				
Ah	0-4	0-10	16	47	37	11	5.5	0.476	4.86	10.2	12.4	22	9	3	2	64	36			
Ae	4-5	10-13	21	55	24	2	5.9	0.131	1.42	10.9	13.4	26	27	12	2	33	67	2		
Bntl	5-9	13-23	8	33	59	33	6.4	0.114	1.49	13.0	29.7	22	54	17	2	5	95	1		
Bnt2	9-17	23-43	4	19	77	32	7.6	0.063	1.13	17.9									4.5	
Csaca	17+	43+	8	25	67	21	7.7												8.0	2.99
Kleskun Series - Black Solonetz - NW 23-82-24-W5																				
Ah	0-2	0-5	7	37	56	27	6.2	0.752	10.20	13.5	41.2	22	54	5	7	12	88	4		
Bnt	2-14	5-35	6	20	74	51	6.3	0.232	3.02	13.0	35.9	30	46	14	4	6	94	2		
BC	14-20	35-50	3	15	82	46	7.5												3.5	
Csaca	20+	50+	3	19	78	32	8.0												7.5	3.06

Horizon	Depth in.	Depth cm.	Mechanical Analysis: Particle Size Sand %	Silt %	Clay % <2u	Clay % <.2u	pH	N %	Org. C %	C/N Ratio	Chemical Analysis: C.E.C. (Det.) me/100 g	Exchangeable Cations: Ca %	Mg %	Na %	K %	H %	Base Sat. %	Ca/Na Ratio	Cond. (Sat.Ext.) mmhos/cm	$CaCO_3$ Equiv. %
WELL DRAINED TO IMPERFECTLY DRAINED SOILS																				
Cadotte Series - Solodic Gray Wooded - SE 18-83-20-W5																				
L-H	3-0	8-0					5.9				39.9	38	29	1	4	28	72			
Ae	0-3	0-8	12	65	23	1	5.5	0.060	0.48	8.0	10.2	26	40	2	2	30	70	13		
AB	3-6	8-16	7	51	42	15	4.8	0.070	0.60	8.6	21.8	19	51	2	2	26	74	10		
Btnj	6-15	16-38	5	32	63	36	4.9	0.040	0.74	18.5	32.2	40	39	4	2	15	85	10		
BC	15-19	38-48	10	32	58	25	5.7				30.7	30	64	3	1	2	98	10		
Ck	19-33	48-83	7	37	56	33	7.6												0.5	9.70
Csk	33+	83+	1	40	59	27	7.7												5.0	10.92
Peace River Series - Solodic Dark Gray Wooded - SW 5-90-22-W5																				
Ah	0-4	0-10	9	58	33	10	6.5	0.350	6.31	18.0	40.4	72	14	0	3	11	89			
Ae	4-7	10-18	10	65	25	7	5.8	0.140	1.42	10.1	16.4	35	37	2	2	24	76			
AB	7-10	18-25	7	49	44	22	5.4	0.080	0.81	10.0	23.2	39	40	2	3	16	84	19		
Btnj	10-15	25-38	2	43	55	44	5.6	0.070	0.83	11.9	33.3	40	49	2	2	7	93	20		
BC	15-19	38-48	2	37	61	33	6.9				31.1	54	43	2	1	0	100	27		
Ck	19-38	48-95	1	34	65	29	7.6												1.0	12.20
Csk	38+	95+	1	40	59	26	7.6												5.0	10.50
Cardinal Series - Orthic Dark Gray Wooded - SW 3-83-25-W5																				
Ahe	0-4	0-10	16	68	16	6	6.4	0.197	2.11	10.7	16.6	73	9	0	6	12	88			
Ae	4-7	10-18	18	69	13	5	6.3	0.063	0.53	8.4	8.1	70	10	2	6	12	88			
Btl	7-11	18-28	6	63	31	19	6.3	0.067	0.52	7.9	14.8	72	13	2	6	7	93	36		
Bt2	11-17	28-43	13	57	30	15	6.2	0.061	0.37	6.1	11.9	72	15	2	3	8	92	36		
BC	17-25	43-63	47	40	13	8	5.8				8.9	70	19	2	2	7	94	35		
C	25+	63+	19	67	14	8	5.7												0.0	0.14

Horizon	Depth in.	Depth cm.	Mechanical Analysis: Particle Size — Sand %	Silt %	Clay % ≤ 2u	Clay % ≤ .2u	pH	N %	Org. C %	C/N Ratio	Chemical Analysis: Soluble Cations (m.e./l.) Ca^{++}	Mg^{++}	Na^{+}	Total	Cond. (Sat.Ext.) mmhos/cm	$CaCO_3$ Equiv. %
POORLY DRAINED SOILS																
Helen Series - Saline Rego Humic Gleysol - SW 17-87-24-W5																
Ahs	0-6	0-15	56	24	20	4	8.0	0.253	3.19	12.6	63.0	234.8	648.0	945.8	7.0	
Csg1	6-12	15.30	16	31	43	19	8.0	0.074	0.75	10.1	58.2	201.9	648.0	908.1	11.0	16.90
Csg2	12+	30+	5	41	54	23	7.8				48.5	226.6	667.4	942.5	7.5	16.90
Griffin Series - Carbonated Rego Humic Gleysol - NW 33-81-25-W5																
Ahk	0-8	0-20	21	42	37	20	7.5	0.787	6.85	8.7						2.38
Ckg1	8-16	20-40	28	42	30	20	8.0	0.155	1.80	11.6						18.82
Ckg2	16-20	40-50	29	37	34	21	7.9									10.11
Cks	20+	50+	25	37	38	28	7.7				28.4	11.8	2.2	42.4	2.8	8.21

Particle Size Analyses

The determination of the sand, silt, and clay particles provides the key to the textural classification according to the chart indicated in Figure 24. The data in Table 5 indicate that medium to fine textured soils predominate in the mapped area and that lacustrine soils usually are very fine textured. In all cases, well to imperfectly drained soils show a depletion of clay in surface horizons and an accumulation in the subsurface or B horizons. While the accumulation of clay may be distributed in B and BC horizons, usually the accumulation of the fine clay is confined to the Bt horizons.

Chemical Analyses

Reaction (pH)—Soil reaction is expressed in terms of the pH scale. Soils with pH 7 are neutral in reaction. Ranges below 7 indicate degree of acidity while those above 7 indicate degree of alkalinity. The data in Table 5 indicate that all of the well and imperfectly drained soils have acidic reactions in some part of the solum, ranging from slightly acid (pH 6.1-6.5) to extremely acid (pH <4.5). Dixonville, Whitelaw, Berwyn and Cardinal soils are characterized by profiles that have acidic reactions to depths of 3 feet. Solodic, Solod, and Solonetz soils have acidic reactions in the upper part of the solum but are characterized by alkaline reactions in the lower part of the solum and in the C horizon.

Nitrogen and Organic Carbon—The data in Table 5 show that there is an appreciable variation in nitrogen content with the lowest usually occurring in the sola of Gray Wooded soils. Apart from the organic surface accumulation, the Ah horizon when present is typically the horizon in which there is a very marked enrichment of nitrogen. Usually these Ah horizons contain from 0.4 to 0.8 per cent nitrogen.

There is a relationship between organic matter and organic carbon. Generally it is assumed that soil organic matter contains 58 per cent carbon and that an estimate of organic matter is made by multiplying the amount of organic carbon by the factor 1.724. An indication of the easily decomposed organic matter is provided through a consideration of the carbon-nitrogen ratio. Thus it has been considered that a desirable ratio should be less than 15 for Ah horizons and a ratio of less than 17 for the surface 6 inches in the mixed plow layer.

Exchangeable Cations—The Exchange capacity of a soil is governed by the contents of clay and organic matter. As indicated in Table 5, the highest exchange capacity is found in the Ah and Bt horizons, whereas the Ae horizons have the lowest exchange capacity. Furthermore, it will be noted that calcium is usually the dominant exchangeable cation. However, magnesium is of significant occurrence and in some of the Solodic, Solod, and Solonetz soils exceeds calcium.

A high base saturation usually implies that adequate amounts of calcium, magnesium, and potassium are available for plant growth. In addition, despite the acidic reactions common to these soils, the base saturation for all of the soils reported is quite high, suggesting that liming may not be necessary for satisfactory crop production.

A criterion used in the classification of Solonetzic soils is the ratio of exchangeable calcium to exchangeable sodium. A ratio of less than 10 is considered as diagnostic for this Order of soils. The Solonetz soils (Grimshaw, Notikewin, and Kleskun series) have the desired ratio. However, with respect to the soils identified as Solods in this region, there is a marked variation in the ratio making it extremely difficult to separate those members that do not have the desired chemistry.

Conductivity—Soil or soil materials designated as saline should have a conductivity in a saturation extract of more than 4 mmhos/cm. It will be noted in Table 5 that many of the soils in this region have saline C horizons.

LAND USE

Land is required for agriculture, forestry, housing and industrial development, roads, railways, airports, wildlife reserves, and recreation. Land has also to serve as a base for the disposal of waste and as a medium for carrying, either above or below its surface, the pipes, cables, and other requirements of such services as water, natural gas, electricity and communications.

Soil is the major component of land. Thus, a study of soil properties is a basic requirement for the interpretation of soils for any specific land use.

Soil survey maps are important tools of the land use planner. Differences in soil properties are reflected by the separation of different soil areas. However, the limitations of reconnaissance soil survey maps of the type found in this report should be recognized if they are to be interpreted for any specific land use. It is impossible to set up reasonably homogeneous soil associations and to show them on a map of this type at a reasonable scale. Approximately 15 per cent of other soils often occur which are not accounted for in most of the mapped soil associations.

Land use in this area is largely confined to agriculture. There is not an appreciable amount of commercial white spruce and pine in the area. However, with further research into possible uses for aspen poplar for commercial purposes and the feasibility of reforestation projects, land use for forestry may become important in the future. In addition, studies are underway concerning the potential uses of land in this area for wildlife and recreation.

Since agriculture is the major land use in this area it will be the subject of most of the following discussion.

AGRICULTURE

Development

Much of the mapped area can be considered as part of the fringe area of the presently settled areas of the Peace River country. The use of modern machinery has resulted in the movement of settlers into these areas to clear and break land with results ranging from poverty to prosperity.

The map in Figure 19 shows the distribution of those farms on which cultivation was observed at the time of survey. In certain portions of the area, this situation has changed significantly since that time.

Table 6 shows the number of farms, the occupied and improved acreage for each year of the census* years from 1916 to 1961. The data show marked fluctuations in the number of farms and a gradual increase in the occupied and improved acreage. This indicates that there has been incorporation of smaller holdings into larger holdings.

TABLE 6—Number of Farms, Acres Occupied, and Acres Improved in the Grimshaw-Notikewin Area (1916 to 1961)

Year	Number of Farms	Acres Occupied	Acres per Farm	Acres Improved	Per Cent of Land Improved
1916	345	76,685	222	13,866	18
1921	692	157,414	227	31,977	20
1926	627	160,702	256	53,614	33
1931	1,690	450,982	266	138,746	31
1936	1,746	465,210	261	160,148	34
1941	1,729	541,727	313	225,598	42
1946	1,599	541,012	339	250,608	46
1951	1,785	684,482	384	343,746	50
1956	1,594	716,625	450	403,166	56
1961	1,543	787,681	510	471,532	60

Table 7 shows the acreage sown to different field crops in the area for each of the same census years. Wheat has generally been the dominant crop grown but there has been a gradual increase in coarse grain and forage crop production, and recently a rapid increase in flax and rape acreage.

TABLE 7—Total Acreage Cropped and Acreage of Principal Crops in the Grimshaw-Notikewin Area (1916-1961)

Year	Total Field Crops	Wheat	Barley	Oats	Rape	Flax	Hay
1916	9,343	3,325	521	4,579	....	8	882
1921	25,592	9,729	1,328	9,962	....	..	4,172
1926	41,651	26,718	809	12,538	....	..	1,080
1931	100,363	65,592	2,474	26,324	....	..	1,053
1936	110,828	63,372	5,992	30,147	....	55	8,989
1941	142,103	82,158	9,346	39,226	....	3,246	6,843
1946	178,681	104,349	6,945	50,356	..	2,162	13,712
1951	249,080	100,795	27,139	74,924	....	6,453	36,292
1956	269,376	87,450	63,324	52,819	....	31,396	31,704
1961	310,112	90,492	58,237	43,979	42,553	12,044	57,735

*Census information obtained from data compiled by the Dominion Bureau of Statisics.

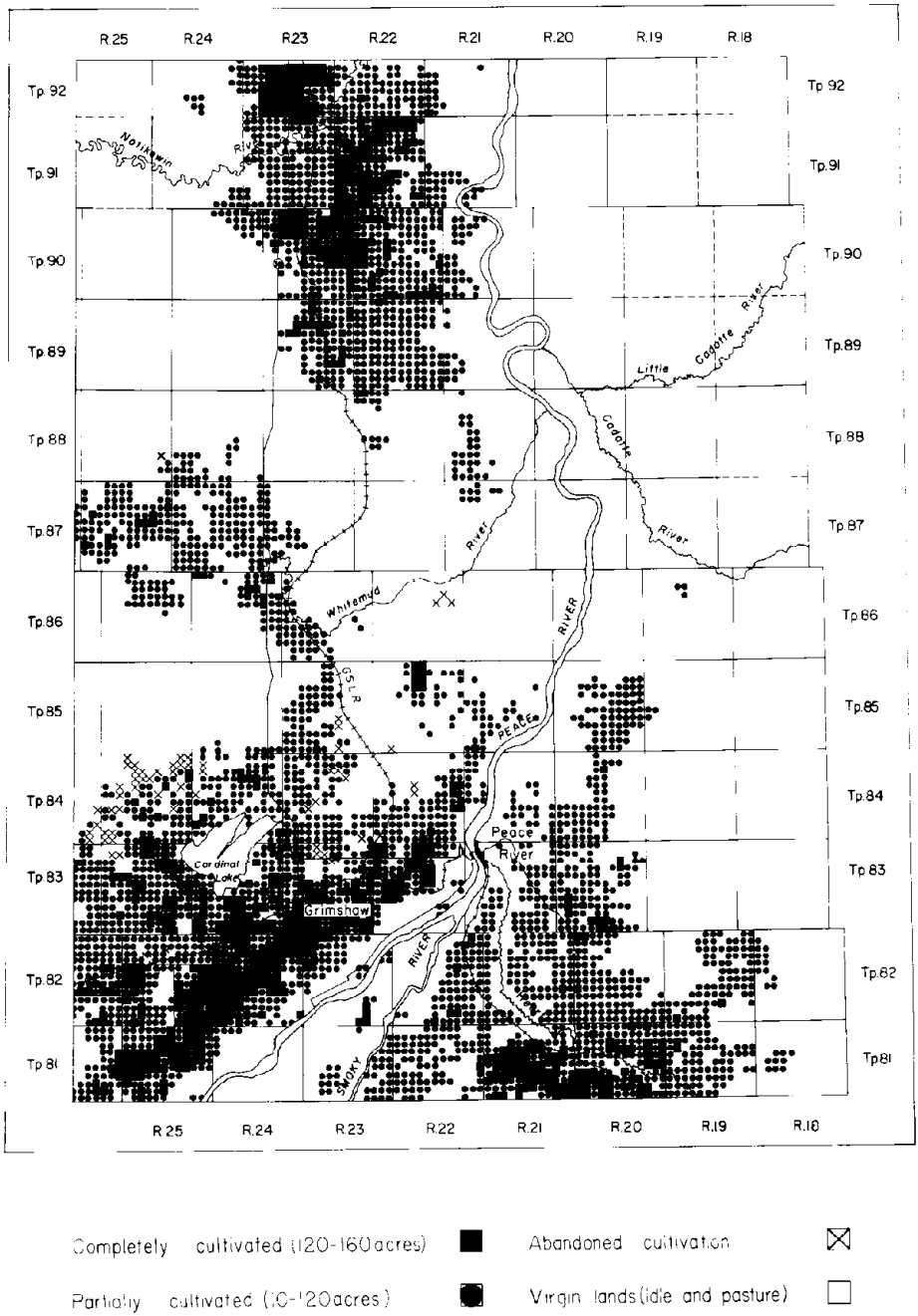


Figure 19—Map showing cultivated, abandoned, and virgin lands in the mapped area at the time of survey.

Table 8 shows the average yields of cereal grains at shipping points in the mapped area as compared to yields at selected shipping points throughout Alberta for the years 1940 to 1964, as compiled by the Sanford Evans Statistical Service. These figures indicate that yields compare favorably in this area to other parts of the province.

TABLE 8—Average Yields in Bushel per Acre of Cereal Grains Recorded in Shipping Points of the Grimshaw and Notikewin Area* as Compared to Average Yields Recorded in Selected Shipping Points in Other Parts of the Province

Town	No. of Years Recorded	Yield Wheat	Oats	Barley
Berwyn*	25	23	38	30
Brownvale*	25	18	37	26
Camrose	25	21	41	27
Grimshaw*	25	21	40	23
Monarch	25	18	34	30
Mirror	25	21	37	30
Nampa*	10	23	40	28
Ponoka	25	22	48	29
Stony Plain	25	25	43	26
Strome	25	21	41	29

Canada Research Station records at Beaverlodge show that the average crop yields for the Peace River district were as follows: wheat—20 bu./ac., oats—38 bu./ac., barley—25 bu./ac., flax—10 bu./ac., sweet clover seed—400 lb./ac., alfalfa seed—100 lb./ac. and brome grass seed—250 lb./ac. These figures include yields from a variety of soils under differing farming practices and may not be typical of the better managed farms.

Table 9 shows the numbers of horses, cattle, swine, and poultry in the area for each of the census years. The gradual decrease in horses was probably caused by a trend towards mechanized farming. Census data show that there have been very small numbers of sheep in the area.

TABLE 9—Livestock Population in the Grimshaw-Notikewin Area (1931 to 1961)

Year	Horses	Cattle	Swine	Poultry
1931	6,854	6,159	8,812	72,301
1936	7,751	12,777	10,057	67,040
1941	8,476	9,535	18,136	101,930
1946	6,677	10,005	8,046	73,878
1951	4,160	9,212	8,837	76,678
1956	1,739	13,845	13,337	125,830
1961	1,190	19,030	19,290	126,037

Development Problems

Tree Cover

Agricultural development of this area is largely dependent on an economical removal of tree cover. The present practice of using V-blade clearing machinery is quite expensive. Recent custom charges have averaged from $10.00 per hour to $15.00 per hour (depending on the size of the machinery used) for clearing and

piling and about $9.00 per acre for breaking. Open areas or those with a light tree cover can be cleared at a rate of 4 acres per hour, whereas in those areas that have a fairly heavy tree cover the rate of clearing may not exceed 1 acre per hour. An indication of the density of tree cover in this region is given in Figure 22.

Climate

Climatic limitations may restrict the range of crops that can be grown, particularly in the eastern and western portions of this area. Frost damage has been a problem discouraging the cropping to wheat with the result that coarse grains have found considerable favor. From the records compiled by the Alberta Wheat Pool, a seventeen year average shows that the percentage grade distribution of wheat raised in the entire Peace River Region was 35 per cent feed grade, 25 per cent Grade 4 Northern, and only 4 per cent Grade 1 Northern.

Figure 20—Light tree cover being cleared for farming.

Figure 21—Medium tree cover being cleared for farming.

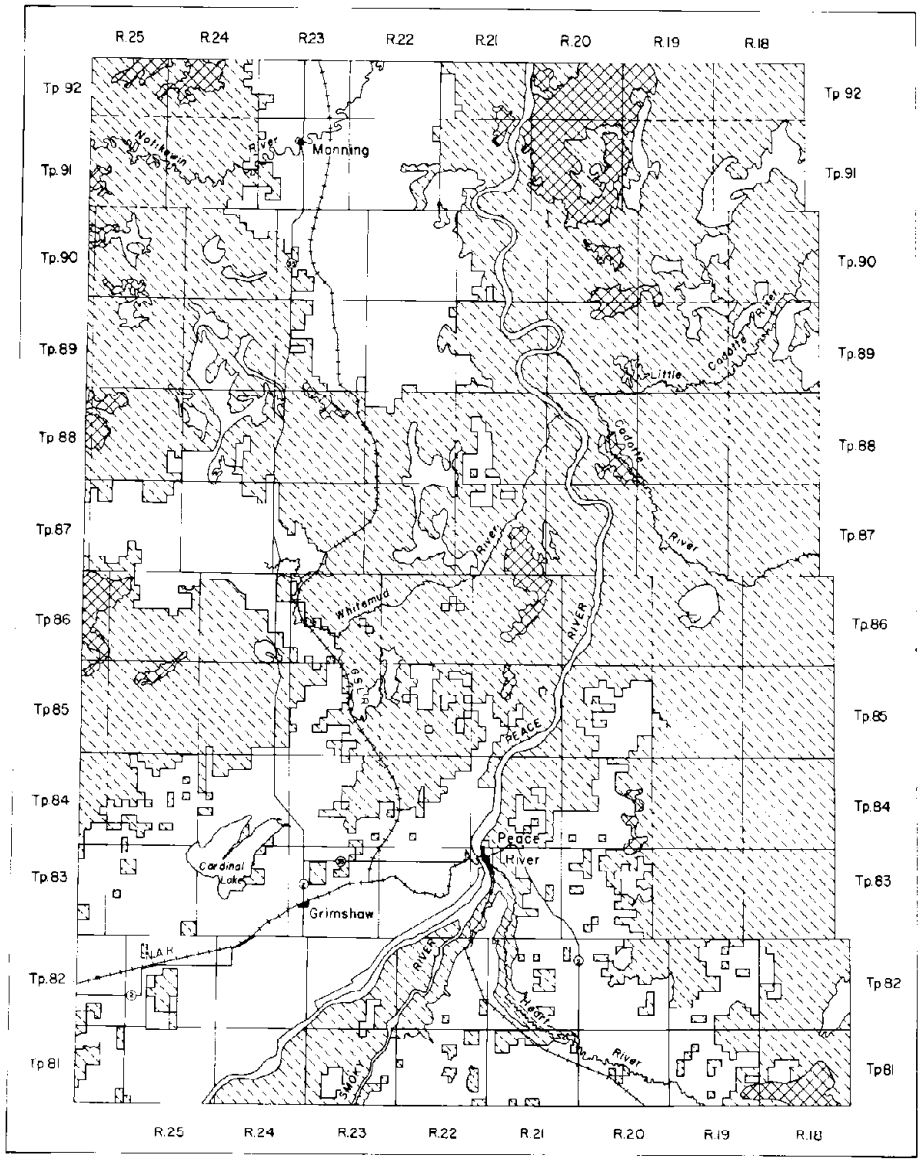


Figure 22—Map showing the relative distribution of tree cover in the mapped area.

Water Supply

The problem of obtaining a suitable well-water supply is a matter of grave concern in many portions of the Peace River area. In the mapped area suitable water is available from wells and springs in a region extending from township 86 in ranges 21 and 22 to township 81, range 26. In addition, well-water can be found in areas where the Dunvegan formation can be reached within 200 feet of the surface. Elsewhere, surface water is generally the most common source of water in this area. Dugouts and dams have been found to be satisfactory sources of domestic water supply if they have been properly constructed and well maintained.

Figure 23—Springs provide an excellent source of water in the Brownvale area.

Soil Management

Most of the soils in this region are characterized by a prominent, leached horizon that occurs at or near the surface. The cultivation of such soils produces a grayish plowed layer that is usually low in fertility and organic matter and is frequently subject to erosion and to crusting. Generally it is recommended that the successful agricultural utilization of these soils will involve the consideration of suitable crop rotations supplemented by the application of fertilizers recommended for this region.

Field tests conducted by the Research Station, Beaverlodge, showed that on a Gray Wooded soil (Nampa series) at McLennan the yields of wheat following the breaking of the sod of a forage mixture containing alfalfa were 10 bu. per acre on unfertilized plots, whereas those plots that were fertilized yielded in the range of 40 bu. per acre. Similarly, their tests on Falher soils in the vicinity of Deadwood showed that following the application of 120 lbs. of a nitrogen-phosphorus fertilizer on stubble crops there was an increase of 5.5 bu. of wheat, 12.2 bu. of oats, and 11.3 bu. of barley per acre. Furthermore, such tests have shown that fertilizer application can speed up the maturity of cereal crops by about a week.

Guidance on management and fertilizer practices can be obtained from the District Agriculturist, the Research Station, Canada Department of Agriculture, Beaverlodge, or from the Soils Department, The University of Alberta, Edmonton.

Soil Rating

In addition to the classification and mapping of the soils of the Grimshaw and Notikewin area, a grouping was made to provide a comparative rating of the soils indicating their inherent potential, for grain crop production. This information is presented in map form and accompanies this report.

The soil rating is essentially an interpretation of the morphological features of the soil and the physical characteristics of the area as they affect plant growth and agricultural use. Such factors as type of soil profile, texture of the soil, degree of stoniness and topography are all taken into consideration.

The soil rating serves only to compare the inherent productivity of the soils in this area, and is not intended to indicate potential capabilities. Changing methods of management and the increasing use of commercial fertilizers will greatly affect the future productivity of any of the soils in the mapped area and may cause the present proposed limits for the productivity groups to be changed.

The soil areas are usually mapped as associations of more than one soil series. Thus, the soil rating map should be regarded as presenting an average rating of the soil area outlined rather than a specific rating of the predominant soil series. Table 10 is included in this report to indicate the soil rating of each individual soil series assuming uniform conditions on level to gently rolling topography.

Elevation exerts a marked effect on climate with the result that at critical elevations climatic limitations prevent consideration of grain crop production. Pending a positive evaluation of this relationship it is assumed that, in this area, soils occurring at elevations exceeding approximately 2,000 feet in the northern portion, 2,150 feet in the central portion, and 2,300 feet in the southern portion are not arable and have been indicated as Pasture and

TABLE 10—Soil Productivity Rating for Individual Soil Series in the Grimshaw and Notikewin Area Occurring on Level to Gently Rolling Topography

Soil Rating	Pasture and Woodland	Poor Arable	Fair Arable	Fairly Good Arable	Good Arable	Very Good Arable
Series or Complex	Codner (undr.)*	Boundary	Culp	Alcan	Albright	Peoria
	Eaglesham	Clouston	Griffin (dr.)*	Alluvium	Belloy	Rycroft
	Enilda (undr.)*	Teepee	Grouard	Beatton	Berwyn	Spirit River
	Goose (undr.)*		Snipe (dr.)*	Belloy (gr.)**	Cardinal	
	Griffin (undr.)*		Wanham (dr.)*	Braeburn	Doig	
	Heart			Cadotte	Esher	
	Helen			Codesa	Falher	
	Kenzie			Codesa (gr.)**	High Prairie	
	Prestville (undr:)*			Codner (dr.)*	Judah	
	Snipe (undr.)			Davis	Peace River	
	Wanham (undr.)*			Dixonville	Tangent	
				Donnelly		
				Enilda (dr.)*		
				Goose (dr.)*		
				Grimshaw		
				Hazelmere		
				Kathleen		
				Kleskun		
				Leith		
				Nampa		
				Notikewin		
				Prestville (dr.)*		
				Whitelaw		

*(dr.)—drained
(undr.)—undrained
**(gr.)—gravelly phase

Table 11—Physical Analyses of Some Representative Soils

Soil Series and Location	Horizons	Sand (S) Percent (2.0-0.005mm)	Silt (Si) Percent (0.05-0.002mm)	Clay (C) Percent (<0.002mm)	Fine Clay (FC) Percent (<0.002mm)	Liquid Limit (WL)	Plastic Limit (Wp)	Plasticity Index (Ip)	Activity $A = \frac{Ip}{C-5}$
Till Materials									
ALCAN (Sw-7-89-23-W5)	Bt	20	42	38	23	40.6	21.1	19.5	0.6
	C_1	18	39	43	25	43.1	19.7	23.4	0.6
	C_2	19	41	40	21	40.8	19.2	21.5	0.6
ALCAN (NW17-92-25-W5)	Bt	24	36	40	24	41.2	19.2	22.0	0.6
	C	27	33	40	19	35.9	17.7	18.2	0.5
BRAEBURN (NE32-85-19-W5)	Bt	20	40	40	24	46.9	19.3	27.5	0.8
	C	22	42	36	20	42.7	18.3	24.4	0.8
Glacio-Fluvial Materials									
WHITELAW (SW28-84-23-W5)	Bt	20	44	36	14	45.8	21.0	24.8	0.8
	C	22	45	33	10	42.2	20.6	21.5	0.8
BERWYN (SW22-83-25-W5)	Bt	34	40	26	8	35.3	18.6	16.7	0.8
	C	20	50	30	15	37.9	19.2	18.7	0.8
Lacustro-Till Materials									
HAZELMERE (SW11-86-25-W5)	Bt_1	24	46	30	14	36.4	18.9	17.5	0.7
	Bt_2	18	43	39	23	48.9	19.9	29.0	0.9
	C	21	48	38	18	41.4	20.4	21.0	0.6
HAZELMERE (SW15-84-25-W5)	Bt	18	25	57	38	47.1	22.3	24.8	0.5
	C	20	37	43	25	43.5	19.9	23.6	0.6
ALBRIGHT (SW17-83-24-W5)	Bt_1	12	39	49	26	55.4	27.6	27.8	0.6
	Bt_2	12	45	43	24	50.8	22.3	28.5	0.8
	C	26	42	32	9	41.1	21.1	20.0	0.7
ALBRIGHT (SW26-87-25-W5)	Bt	20	32	48	36	45.3	20.8	24.5	0.6
	C	25	34	41	20	43.8	18.2	25.6	0.7
GRIMSHAW (SW25-87-25-W5)	Bnt	20	44	36	23	44.1	21.6	22.5	0.7
	Bnt	20	37	43	27	50.7	20.5	30.2	0.8
	Csk	21	41	38	21	43.0	19.2	23.8	0.7
	Csk	23	35	32	15	37.1	17.8	19.3	0.7

Lacustrine Materials									
CADOTTE (SE15-83-20-W5)	Bt	2	40	58	38	67.0	24.4	42.6	0.8
	Ck	20	46	34	17	39.9	17.8	22.1	0.8
PEACE (SW18-84-20-W5)	Bt	9	34	57	28	57.0	23.7	33.3	0.6
	Ck	3	19	78	34	57.9	23.7	34.2	0.5
	Cks	0	25	75	41	43.5	17.7	25.8	0.4
PEACE (SW5-91-22-W5)	Bt_1	4	33	63	35	59.8	29.3	30.5	0.5
	Bt_2	2	34	64	34	66.2	27.9	38.3	0.6
	Ck_1	2	40	60	26	60.6	27.7	42.9	0.8
	Ck_2	2	44	56	23	56.8	24.1	32.7	0.6
RYCROFT (NE24-83-23-W5)	Bt	2	26	72	38	62.2	27.3	34.9	0.5
	Csk	0	40	60	30	66.5	27.1	39.4	0.7
KLESKUN (NW23-82-24-W5)	Bnt	6	20	74	51	69.1	28.4	40.7	0.6
	C	3	19	78	32	63.8	28.3	35.5	0.5
NOTIKEWIN (NW34-91-23-W5)	Bnt	6	26	68	33	58.1	25.6	32.5	0.5
	C	8	25	67	11	60.1	24.1	36.0	0.6
	II C	6	20	74	27	68.9	26.2	42.7	0.6
DOIG (NW21-81-19-W5)	Bt	7	26	57	43	51.6	22.8	28.8	0.5
	C	3	35	62	38	49.9	21.3	28.6	0.5
JUDAH (NW11-82-24-W5)	Bt	8	42	50	35	50.2	21.5	28.7	0.6
	Ck	7	44	49	31	43.1	20.2	22.9	0.5

Woodland (P.W.) on the accompanying rating map. The following is the approximate acreage of the productivity groups (applicable to grain crop production) as indicated for this region:

P. and W.	Pasture and Woodland (nonarable)	634,220 acres
Group 4	Poor to Fair Arable Land	223,430 acres
Group 5	Fair to Fairly Good Arable Land	883,520 acres
Group 6	Fairly Good to Good Arable Land	398,130 acres
Group 7	Good to Very Good Arable Land	5,870 acres

Canada Land Inventory

The Canada Land Inventory is based on a comparative survey of land capability and use for various purposes. It includes an assessment of land capability for agriculture, forestry, recreation, and wildlife; information on present land use; and assessments of social and economic factors relative to land use. It is being undertaken as a cooperative federal-provincial programme administered under the Agricultural Rehabilitation and Development Act (ARDA) of June, 1961.

The assessment of land capability for agriculture in Alberta is being undertaken by the Alberta Soil Survey. Land capability maps and reports will be available in the near future for various areas at a nominal cost from the Queen's Printer, Ottawa. The soil capability classes, based on considerations of soils, topography, climate, and other features, have been determined for the mapped area and will be available to supplement this report.

ENGINEERING

Disturbed soil samples, representative of some of the soils in the Grimshaw-Notikewin area, were analyzed as part of a co-operative project with the Highway Research Division, Research Council of Alberta. The data in Table 11 may serve as a guide for an engineering classification bearing in mind that the samples of the C horizons were taken at depths usually not exceeding 6 feet. Differences are evident, in Table 11, between soils developed on different parent materials.

The analytical methods used in determining the reported results are outlined in the following:

(a) ASTM procedures for testing soils, 1958. 1916 Race St., Philadelphia 3, Pa. Designations D423-54T and D424-54T.

(b) Pipette method by Toogood and Peters, 1953. Can. J. Agr. Sci. 33:159-171.

GLOSSARY

Alluvium—Water-transported materials recently deposited by streams.

Aggregate (Soil)—A single mass or cluster of soil consisting of many soil particles held together, such as a prism, granule, or crumb, etc.

Calcareous material—Material containing more than two per cent calcium carbonate equivalent. Will effervesce visibly when treated with hydrochloric acid.

The grades of calcareousness are:

Weakly calcareous	2- 5%	$CaCO_3$ equivalent
Moderately calcareous	6-15%	" "
Strongly calcareous	16-25%	" "
Very strongly calcareous	26-40%	" "
Extremely calcareous	>40%	" "

Catena—A group of soil series developed from similar parent material.

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

Claypan—A dense and heavy soil horizon underlying the upper part of the soil; hard when dry and plastic when wet.

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

Color—Soil colors are measured by comparison with a Munsell color chart. The Munsell system specifies the relative degrees of the three simple variables of color: hue, value, and chroma. For example: 10YR 6/4 is a color of soil with a hue of 10YR, a value of 6, and a chroma of 4.

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

Concretions—Local concentration 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.

Consistence (soil)—An expression of the degree and kind of cohesion and adhesion or the resistance to deformation and rupture of soil particles. It deals with the strength of the forces of attraction within a soil mass.

The terms used in describing soils in this report are as follows:

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.

Plastic (specifies plastic when wet)—wire formable by rolling the soil between thumb and forefinger and moderate pressure required for deformation of soil mass.

Drift—Material of any sort moved from one position to another. The term is most commonly used for material deposited by glacial action. Glacial drift includes unstratified glacial till and other stratified glacial deposits.

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.

Field Capacity—The amount of moisture held in a soil after the free water has been drained away into drier soil material below.

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

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

Glacio-fluvial material—Ice-transported material, sorted and deposited by water that originated mainly from the melting of glacial ice. These deposits are stratified and may be in the form of outwash plains, deltas, kames, eskers or kame terraces.

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, mottled appearance, which on drying shows numerous rusty brown iron stains or streaks. It is generally very sticky when wet and hard when dry.

Gravel—Rock fragments less than 3 in. in diameter.

Green manure crops—Any crop that is plowed under for the purpose of improving the soil, especially by the addition of organic matter.

Horizon—A layer in the soil profile approximately parallel to the land surface with more or less well-defined characteristics that have been produced through the operation of soil forming processes. The major organic horizons are defined as follows:

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

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

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

The major mineral horizons are defined as follows:

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

B—A mineral horizon or horizons characterized by one or more of the following: (1) an illuvial enrichment (exclusive of dolomite or salts more soluble in water) of silicate clay, iron, aluminum and/or organic matter (Bt, Bf, Bh, Bfh); (2) a prismatic or columnar structure that exhibits pronounced coatings or stainings and is characterized by the presence of significant amounts of exchangeable sodium and/or magnesium (Bn); (3) an alteration by hydrolysis or oxidation to give a change in color and or structure and does not meet the requirements of (1) and (2) above (Bm).

C—A mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting (1) the process of gleying and (2)the accumulation of dolomite and salts more soluble in water (Cca, Csa, Cg and C).

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

ca—A horizon with secondary carbonate enrichment where the concentration of lime exceeds that present in the unenriched parent material.

e—A horizon characterized by the removal of clay, iron, aluminum or organic matter. Lighter in color by one unit or value or chroma when dry, than the layer below.

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

g—A horizon characterized by reduction and gray colors; often mottled (gley).

h—A horizon enriched with organic matter. When used with A it must show at least one Munsell unit of value darker than the layer immediately below.

j—A horizon whose characteristics are weakly expressed. It must be used with some other suffix.

k—Presence of carbonate as indicated by visible effervescence with dilute hydrochloric acid.

m—A horizon slightly altered by hydrolysis, oxidation and/or solution to give a change in color and/or structure. Suffix to be used with B and then only alone or with suffixes k, s, or g.

n—A horizon with distinctive morphological and physical characteristics as shown by black or dark colorations or coatings on the surface of the peds and characterized by prismatic or columnar structure, and very hard consistency when dry. The ratio of exchangeable Ca^{++} to exchangeable Na^{+} in this horizon must be less than 10.

p—A layer disturbed by man's activities, i.e. by cultivation and/or pasturing. To be used only with A.

s—A horizon with salts including gypsum which may be detected as crystals or veins, or as surface crusts of salt crystals or by distressed crop growth, or presence of salt-tolerant plants.

t—A horizon enriched with silicate clay, used with B alone (Bt) or with Bg (Btg), and meeting the following requirements:

(1) Where an eluviated A horizon remains and there is no lithologic discontinuity between the A and the Bt horizon, it contains more clay as follows:

(a) If the Ae or AB has less than 15 per cent clay, the Bt horizon must contain at least 3 per cent more clay than the Ae or AB horizon.

(b) If the Ae or AB has more than 15 per cent and less than 40 per cent clay, the ratio of the clay in the Bt horizon to that in the Ae or AB horizon must be 1.2 or more.

(c) If the Ae or AB has more than 40 per cent clay the Bt horizon must contain 8 per cent more clay than the Ae or AB horizon.

(2) It must be at least 2 inches thick. In some sandy soils where clay accumulation occurs in lamellae, the total thickness of the lamellae should be more than 4 inches in the upper 60 inches of the profile.

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

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

Lacustrine materials—Materials deposited in or settled out of lake waters and exposed by lowering of the water levels, or elevation of land.

Mature soil—A soil with well-developed characteristics produced by the natural processes of soil formation and in equilibrium with its environment.

Morphology (soil)—The constitution of the soil including texture, structure, consistence, color, and other physical, chemical and biological properties of the various soil horizons that make up the soil profile.

Nutrients—The elements taken in by the plants, essential to its growth, and used by it in the elaboration of its food and tissue. These include nitrogen, phosphorus, calcium, magnesium, potassium, sulphur, iron, manganese, copper, boron and perhaps others, obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Organic Matter—The decomposition residues of plant material derived from (1) plant materials deposited on the surface of the soil; and (2) roots that decay beneath the surface of the soil.

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

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

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

Ped—An individual natural soil aggregate.

Permeability—The ease with which water and air pass through the soil to all parts of the profile.

pH—The intensity of acidity or alkalinity, expressed as the logarithm of the reciprocal of the hydrogen-ion concentration. With this notation pH 7 is neutral; lower values indicate acidity, higher values alkalinity. The classes of alkalinity are:

Mildly alkaline	pH 7.4 to 7.8
Moderately alkaline	pH 7.9 to 8.4
Strongly alkaline	pH 8.5 to 9.0
Very strongly alkaline	above pH 9.0
Neutral reactions are from	pH 6.6 to 7.3

The classes of acidity are:

Slightly acid	pH 6.1 to 6.5
Medium acid	pH 5.6 to 6.0
Strongly acid	pH 5.1 to 5.5
Very strongly acid	pH 4.5 to 5.0
Extremely acid	pH below 4.5

Phase (soil)—The subdivision of a soil series having variations in characteristics not significant to the classification of the soil in its natural landscape but significant to the use and management of the soil.

Podzolization—A general term referring to that process by which soils are depleted of bases, become acid, and develop leached A horizons.

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

Relief—The elevations or inequalities of the land surface when considered collectively. Minor configurations are referred to as "microrelief".

Saline material—Material whose saturated extract has an electrical conductivity greater than 4mmhos./cm. The grades of salinity used in this report are: *Weakly saline*—2 to 6 mmhos./cm., *Saline*—6 to 12 mmhos./cm., and *Strongly saline*—over 12mmhos./cm.

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

(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 for a small but significant period of the year.

(4) *Imperfectly drained*—soil moisture in excess of field capacity remains in the 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.

Solum (plural *sola*)—The part of the soil profile that is above the parent material and in which the processes of soil formation are active. It comprises the A and B horizons.

Stratified—Composed of or arranged in strata or layers as applied to parent materials. Layers less than 1 cm. in thickness are referred to as *laminae*, while those thicker than 1 cm. are referred to as *beds*.

Structure—The aggregation of primary soil particles into compound particles, which are separated from adjoining aggregates by surfaces of weakness. The aggregates differ in grade of development as follows: *weak, moderate* and *strong*. They vary in class as follows: *very fine, fine, medium, coarse* and *very coarse*. They vary in kinds according to the character of the faces and edges of the aggregates as follows: *Single grain*—loose, incoherent mass of individual particles as in sands; *Blocky*—face 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; and *Platy*—horizontal planes more or less developed.

Terraces—A flat or undulating plain bordering a river or a lake. Many streams are bordered by a series of terraces at different levels indicating flood plains at successive periods.

Texture—The relative proportion of the various size groups of individual soil grains in a mass of soil. Specifically, it refers to the proportion of sand, silt and clay. Size groups on which textural classes are based are as follows:

Separates	*Diam. in mm.*
Very coarse sand (VCS)	2.0 -1.0
Coarse sand (CS)	1.0 -0.5
Medium sand (MS)	0.5 -0.25
Fine sand (FS)	0.25-0.10
Very fine sand (VFS)	0.10-0.05
Silt (Si)	0.5-0.002
Clay (C)	less than 0.002
Fine Clay (FC)	less than 0.0002

(Toogood, J.A.—A simplified Textural Classification Diagram. Can. J. Soil Sci. 38:54-55, 1958).

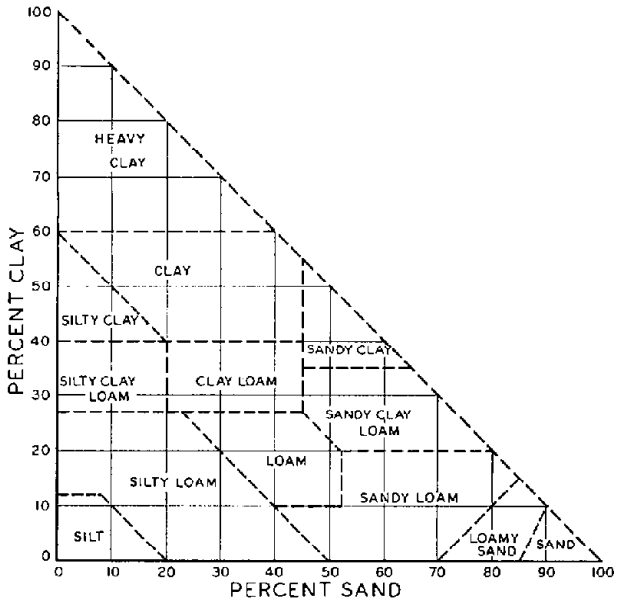


Figure 24—Chart showing proportions of soil separates in various soil textural classes.

The soil textural classes are grouped according to the National Soil Survey Committee of Canada as follows:

(a) *Coarse textured*—sands, loamy sands.
(b) *Moderately coarse textured*—sandy loam, fine sandy loam.
(c) *Medium textured*—very fine sandy loam, silt loam, silt.
(d) *Moderately fine textured*—sandy clay loam, clay loam, silty clay loam.
(e) *Fine textured*—sandy clay, silty clay, clay (40-60%).
(f) *Very fine textured*—more than 60% clay.

Till—See Glacial Till.

Till plain—A level or undulating land surface covered by till.

Topography—Variations in surface features in regard to steepness of slope, and shape and frequency of various slopes which determine the comparative roughness of the surface.

Water table—The upper limit of the part of the soil underlying material wholly saturated with water.

Weathering—The physical and chemical disintegration and decomposition of rocks and minerals.

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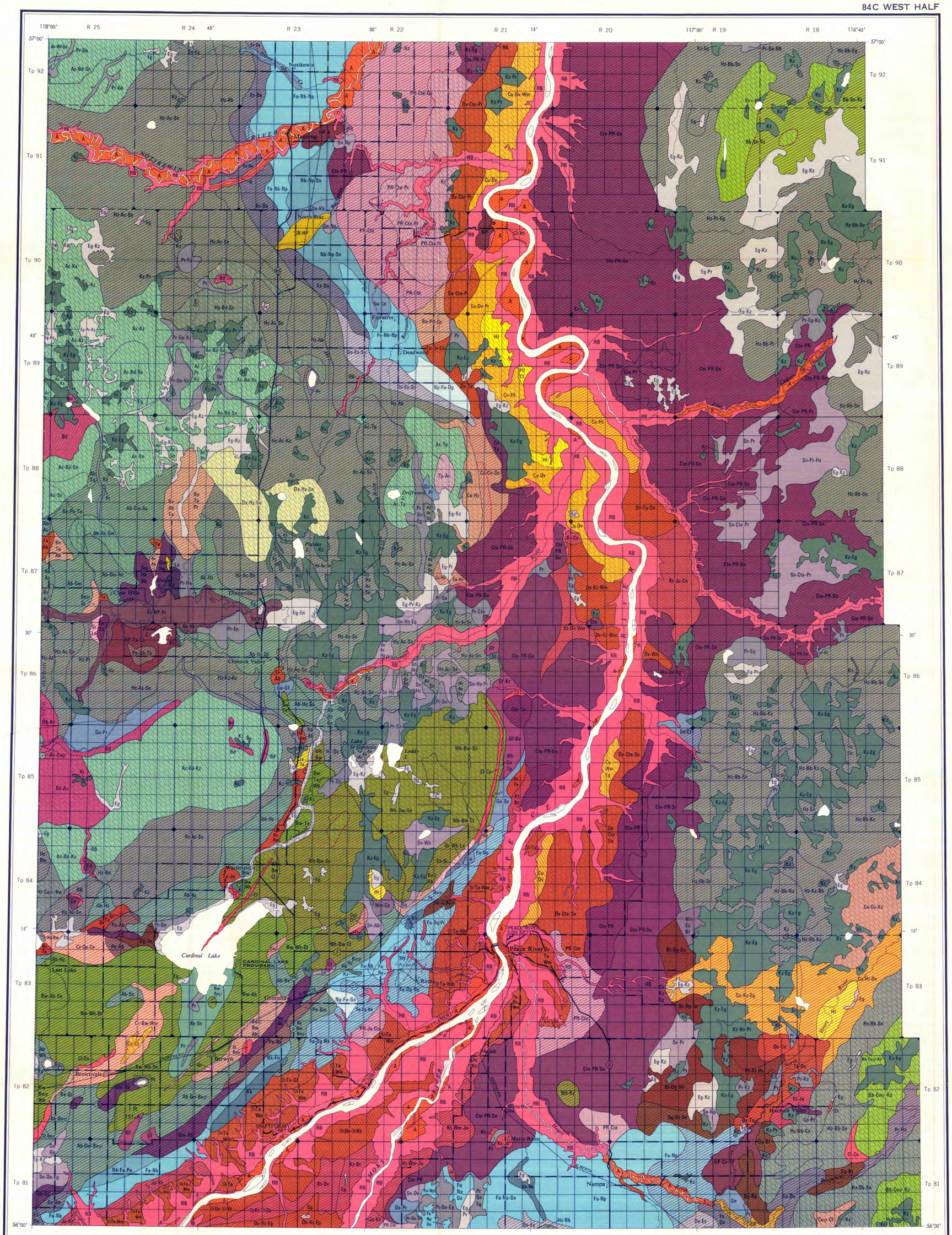
SOIL MAP OF THE GRIMSHAW—NOTIKEWIN AREA

ALBERTA

Scale 3 miles to 1 inch or 1:190,080

Miles 3 2 1 0 3 6 9 12 Miles

84C WEST HALF



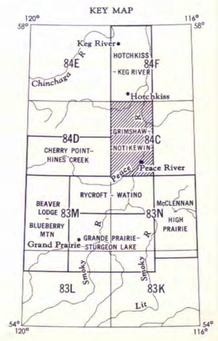
Soil Information by the Soils Division, Research Council of Alberta, with the cooperation of the Research Branch, Canada Department of Agriculture, and the University of Alberta, Edmonton. Map to be used in conjunction with Alberta Soil Survey Report No. 25.

Compiled, Drawn and Published by the Cartography Section, Soil Research Institute, Research Branch, Canada Department of Agriculture, Ottawa 1970. Topographic information supplied by the Technical Division, Alberta Department of Lands and Forest. Printing for Canada Department of Agriculture, by the Surveys and Mapping Branch, Department of Energy, Mines and Resources.

DIAGRAM OF TOWNSHIP

31	32	33	34	35	36
30	29	28	27	26	25
19	20	21	22	23	24
18	17	16	15	14	13
7	8	9	10	11	12
6	5	4	3	2	1

KEY MAP



REFERENCE

Soil Lines	Township and Range (Surveyed)
Topography Lines	Township and Range (Unsurveyed)
Main Highways	Section Lines
Secondary Roads	Reserve, Park Boundary
Other All Weather Roads	Lake, Perennial
Cart Track, Trail	Stream, Perennial
Railway	Post Office P
Town, Village	

LEGEND

MAP SYMBOL	SERIES	CLASSIFICATION	PARENT MATERIAL	TOPOGRAPHIC PHASE	ACREAGES	TOTAL	SOIL RATING
Ac	ALCAN	Solodic Gray Wooded	Brown to dark grayish brown, weakly calcareous and weakly saline, clay loam & clay — TILL	c	120,780	120,780	Fairly Good Arable
Bb	BRAEBURN	Orthic Gray Wooded	Yellowish brown to grayish brown, weakly calcareous clay loam — TILL	b c	10,160 25,030	35,190	Fairly Good Arable
Dx	DIXONVILLE	Orthic Gray Wooded	Brown to grayish brown, non-calcareous, clay loam — TILL	c	12,040	12,040	Fairly Good Arable
Wh	WHITELAW	Orthic Gray Wooded	Dark brown to dark grayish brown, non-calcareous loam and clay loam — GLACIO-FLUVIAL	b c	33,140 25,040	58,180	Fairly Good Arable
Bw	BERWYN	Orthic Dark Gray Wooded	Dark brown to dark grayish brown, non-calcareous loam and clay loam — GLACIO-FLUVIAL	b	52,360	52,360	Good Arable
Hz	HAZELMERE	Solodic Gray Wooded	Variable, gray to very dark grayish brown, weakly calcareous and weakly saline, clay loam and clay — LACUSTRO-TILL	b c	381,350 32,160	413,510	Fairly Good Arable
Ab	ALBRIGHT	Solodic Dark Gray	Variable, gray to very dark grayish brown, weakly calcareous and weakly saline, clay loam and clay — LACUSTRO-TILL	A b c	5,520 77,350 3,120	85,990	Good Arable
Gm	GRIMSHAW	Black Solonetz	Variable, gray to very dark grayish brown, weakly calcareous and saline, clay loam and clay — LACUSTRO-TILL	b	9,270	9,270	Fairly Good Arable
Do	DONNELLY	Gray Solod	Uniform, dark gray to dark grayish brown, weakly calcareous and saline clay — LACUSTRO-TILL	b	7,780	7,780	Fairly Good Arable
Es	ESHER	Black Solod	Uniform, dark gray to dark grayish brown, weakly calcareous and saline clay — LACUSTRO-TILL	b	17,050	17,050	Good Arable
Np	NAMPA	Gray Solod	Uniform, gray to dark gray, weakly calcareous and saline, clay — LACUSTRINE	A	4,210	4,210	Fairly Good Arable
Fa	FALHER	Black Solod	Uniform, gray to dark gray, weakly calcareous and saline, clay — LACUSTRINE	A b c	66,370 20,080 3,120	89,570	Good Arable
Ry	RYCROFT	Solonetzic Black	Uniform, gray to dark gray, weakly calcareous and saline, clay — LACUSTRINE		—	—	Very Good Arable
Nk	NOTIKEWIN	Black Solonetz	Uniform, gray to dark gray, weakly calcareous and saline, clay — LACUSTRINE	A	15,720	15,720	Fairly Good Arable
Kk	KLESKUN	Black Solonetz	Uniform, gray to dark gray, weakly calcareous and saline, clay — LACUSTRINE	A	2,650	2,650	Fairly Good Arable
Bt	BEATTON	Gray Solod	Variable, brown to dark grayish brown, weakly calcareous and saline, silty clay loam and silty clay — LACUSTRINE	b c	11,430 1,880	13,310	Fairly Good Arable
Dg	DOIG	Black Solod	Variable, brown to dark grayish brown, weakly calcareous and saline, silty clay loam and silty clay — LACUSTRINE	b c	9,590 720	10,310	Good Arable
Kt	KATHLEEN	Orthic Gray Wooded	Variable, dark brown, moderately calcareous, silty clay loam and silty clay — LACUSTRINE	b	30,470	30,470	Fairly Good Arable
Ju	JUDAH	Orthic Dark Gray Wooded	Variable, dark brown, moderately calcareous, silty clay loam and silty clay — LACUSTRINE	b	7,200	7,200	Good Arable
Cte	CADOTTE	Solodic Gray Wooded	Uniform, grayish brown to dark olive gray, moderately calcareous, and weakly saline, silty clay and clay — LACUSTRINE	A b c	81,520 207,830 2,160	291,510	Fairly Good Arable
PR	PEACE RIVER	Solodic Dark Gray Wooded	Uniform, grayish brown to dark olive gray, moderately calcareous, and weakly saline, silty clay and clay — LACUSTRINE	A b c d	2,280 40,930 14,600 4,280	62,090	Good Arable
Dv	DAVIS	Orthic Gray Wooded	Variable, brown to yellowish brown, moderately calcareous, silty materials—ALLUVIAL and AEOLIAN	b c e	19,440 35,150 10,320	64,910	Fairly Good Arable Fair Arable
Ta	TANGENT	Orthic Dark Gray Wooded	Variable, brown to yellowish brown, moderately calcareous, silty materials—ALLUVIAL and AEOLIAN	b c e	8,000 18,240 10,160	36,400	Good Arable Fair Arable
Cr	CARDINAL	Orthic Dark Gray Wooded	Variable, brown to yellowish brown, non-calcareous, silty materials — ALLUVIAL and AEOLIAN	b	9,040	9,040	Good Arable
Cu	CULP	Orthic Gray Wooded	Variable, brown to yellowish brown, weakly calcareous, sandy materials—ALLUVIAL and AEOLIAN	b c e	24,920 26,400 2,360	53,680	Fair Arable Poor Arable
Le	LEITH	Orthic Dark Gray Wooded	Variable, brown to yellowish brown, weakly calcareous, sandy materials—ALLUVIAL and AEOLIAN	b	570	570	Fairly Good Arable
Ht	HEART	Undifferentiated	Uniform, brown to light yellowish brown, weakly calcareous sands —ALLUVIAL and AEOLIAN	b c	2,560 3,370	5,930	Pasture & Woodland
HP	HIGH PRAIRIE	Gleyed Dark Gray	Variable, brown to pale brown, weakly calcareous, comparatively recent deposits—ALLUVIAL and AEOLIAN	A b	4,440 6,270	10,710	Good Arable
SR	SPIRIT RIVER	Orthic Black	Variable, brown to pale brown, weakly calcareous, comparatively recent deposits—ALLUVIAL and AEOLIAN	A	3,170	3,170	Very Good Arable
A	ALLUVIUM	Undifferentiated	Variable, brown to pale brown, weakly calcareous, comparatively recent deposits—ALLUVIAL and AEOLIAN	b c	21,700 9,000	30,700	Fairly Good Arable
Co	CODESA	Orthic Gray Wooded	Variable, brown to yellowish brown, non-calcareous, gravelly to silty materials usually less than 30 inches (75 cm) in thickness overlying finer textured materials —ALLUVIAL and AEOLIAN	b c E	4,000 15,270 1,120	20,390	Fairly Good Arable Fair Arable
Be	BELLOY	Orthic Dark Gray Wooded	Variable, brown to yellowish brown, non-calcareous, gravelly to silty materials usually less than 30 inches (75 cm) in thickness overlying finer textured materials —ALLUVIAL and AEOLIAN	b	17,280	17,280	Fairly Good and Good Arable
Pe	PEORIA	Eluviated Black	Variable, brown to yellowish brown, non-calcareous, gravelly to silty materials usually less than 30 inches (75 cm) in thickness overlying finer textured materials —ALLUVIAL and AEOLIAN	b	5,700	5,700	Very Good Arable
Cl	CLOUSTON	Orthic Gray Wooded	Fairly thick alternating layers of coarse sand, gravel and cobbles—GRAVELLY ALLUVIAL and OUTWASH	c E	4,440 800	5,240	Poor Arable Pasture & Woodland
Gr	GROUARD	Orthic Dark Gray Wooded	Fairly thick alternating layers of coarse sand, gravel and cobbles—GRAVELLY ALLUVIAL and OUTWASH	c	1,440	1,440	Fair Arable
Bd	BOUNDARY	Undifferentiated	Grayish colored, extremely acid, weathered shale materials—RESIDUAL and MODIFIED RESIDUAL	c E	11,050 6,000	17,050	Poor Arable Pasture & Woodland
Tp	TEEPEE	Undifferentiated	Brown to grayish brown weathered sandstone—RESIDUAL and MODIFIED RESIDUAL	c	1,260	1,260	Poor Arable
Sn	SNIPE	Low Humic Eluviated Gleysol	Brown to gray, clay loam to clay	A	40,200	40,200	(Drained) Fair Arable
Go	GOOSE	Orthic Humic Gleysol	Brown to gray, clay loam to clay	A	15,000	15,000	(Drained) Fairly Good Arable
Pr	PRESTVILLE	Orthic Humic Gleysol	Brown to gray, clay loam to clay	A	42,880	42,880	(Drained) Fairly Good Arable
He	HELEN	Saline Rego Humic Gleysol	Brown to gray, clay loam to clay	A	960	960	Pasture & Woodland
En	ENILDA	Orthic Humic Gleysol	Pale brown to gray, sandy loam to clay loam	A	12,500	12,500	(Drained) Fairly Good Arable
Wm	WANHAM	Low Humic Eluviated Gleysol	Pale brown to gray, sandy loam to clay loam	A	2,130	2,130	(Drained) Fair Arable
Cn	CODNER	Orthic Humic Gleysol	Pale brown to gray, sandy loam to clay loam	A	4,150	4,150	(Drained) Fairly Good Arable
Gf	GRIFFIN	Carbonated Rego Humic Gleysol	Pale brown to gray, sandy loam to clay loam	A	4,830	4,830	(Drained) Fair Arable
Eg	EAGLESHAM	Sedge Peat	Dark brown to black fibrous peat —ORGANIC MATERIAL	A	72,920	72,920	Pasture & Woodland
Kz	KENZIE	Moss Peat	Brown to dark brown moss peat —ORGANIC MATERIAL	A	149,470	149,470	Pasture & Woodland

SOIL PREFIX

Sh — Shallow phase

SOIL SUFFIX

gr — Gravelly phase

TOPOGRAPHY CLASSES

Symbol		Percent Slope	Description
	A	0–0.5%	Depressional to level
	b	0.5–2%	Gently undulating
	c	2–5%	Undulating
	d	6–9%	Gently rolling
	e	10–15%	Rolling
	E	10–15%	Strongly rolling
RB			Rough broken land adjacent to stream courses

SOIL RATING MAP OF THE GRIMSHAW-NOTIKEWIN AREA, ALBERTA

Scale 3 miles to 1 inch or 1:190,080

Miles 3 2 1 0 3 6 9 12 Miles

84C WEST HALF

Rating based on soil and other physical features as determined by the Soils Division, Research Council of Alberta, with the co-operation of the Research Branch, Canada Department of Agriculture, and the University of Alberta, Edmonton. Map to be used in conjunction with Alberta Soil Survey Report No. 25.

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LEGEND

P-W	Pasture and Woodland
4	Poor to Fair Arable
5	Fair to Fairly Good Arable
6	Fairly Good to Good Arable
7	Good to Very Good Arable