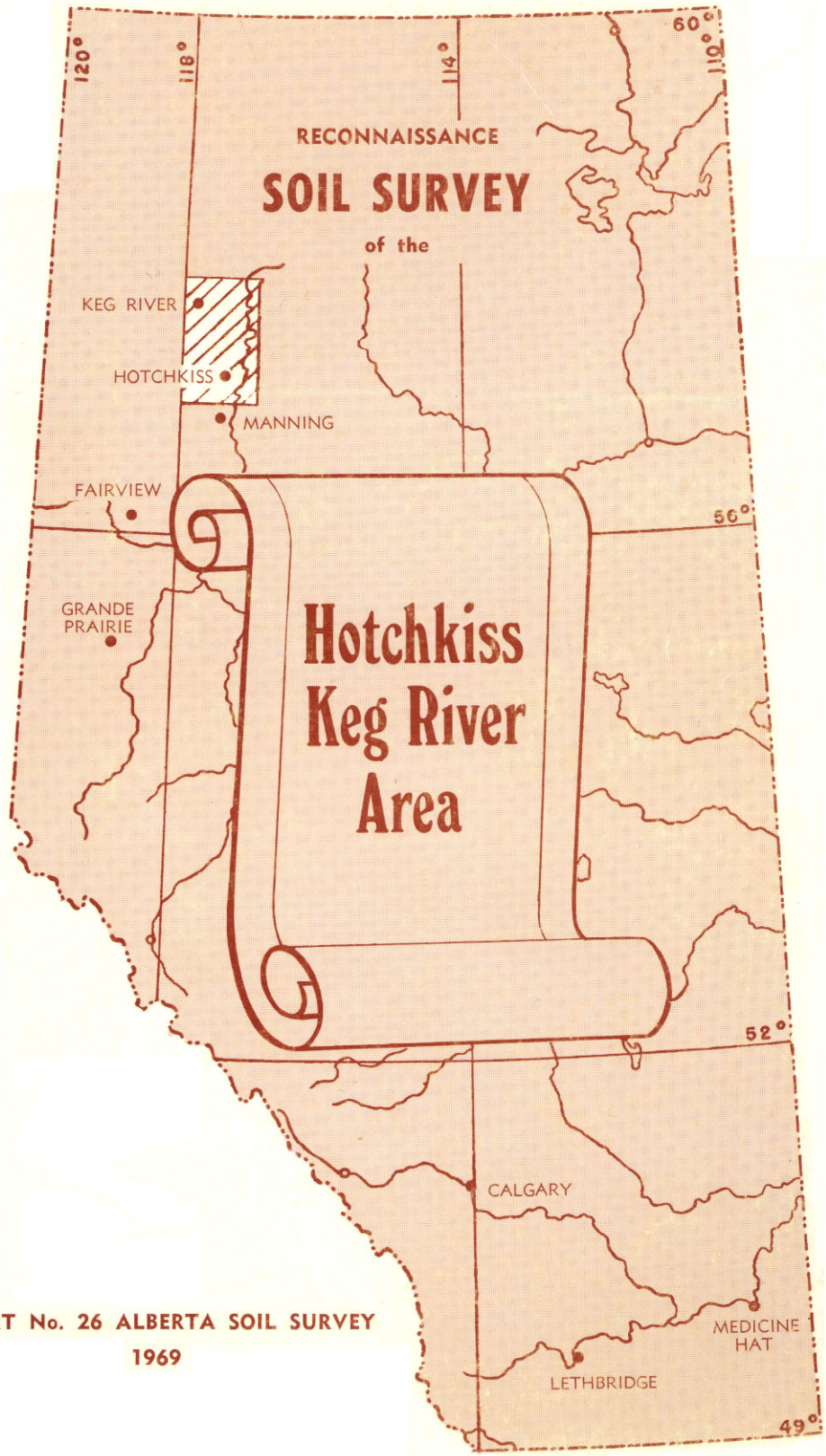

REPORT No. 26 ALBERTA SOIL SURVEY
1969

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RECONNAISSANCE

Soil Survey

of the

Hotchkiss and Keg River Area

BY

S. W. REEDER AND WM. ODYNSKY
Research Council of Alberta

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ACKNOWLEDGMENTS

The soil survey of the Hotchkiss and Keg River area was conducted by the Soils Division, Research Council of Alberta in cooperation with the Soil Survey, Research Branch, Canada Department of Agriculture, and the Departments of Soil Science and Extension, The University of Alberta.

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The base map for this area was prepared by the Technical Division, Department of Lands and Forests, Edmonton. Preparation of the final copies of the soil map and soil rating map and the publication of the maps was made by the Cartographic Section, Soil Research Institute, Research Branch, Canada Department of Agriculture, Ottawa.

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PREFACE

This publication deals with the soils of the Hotchkiss and Keg River area, an area 69 miles from north to south by 44 miles from east to west that is situated in the northern portion of the Peace River district. It is the seventh publication in a series that describe the soils of the Peace River district. Preceding publications dealt with the soils of the Rycroft and Watino sheets (1950), the High Prairie and McLennan sheets (1952), the Grande Prairie and Sturgeon Lake sheets (1956), the Beaverlodge and Blueberry Mountain sheets (1961), the Cherry Point and Hines Creek area (1965), and the Grimshaw and Notikewin area (1968).

The purpose of this publication is to describe the soils of the Hotchkiss and Keg River area, their distribution, and chemical and physical characteristics.

This publication is divided into two main parts: a report and two maps—a soil map and a soil rating map. The report and the accompanying maps are supplementary to each other and both should be used in seeking information regarding the soils of this area.

The report describes the physical and cultural features of the area, the classification of the soils, the morphological characteristics of the soil series, the land use, and discusses the analytical data. The appendix to the report defines terms describing significant features of the mapped area. A glossary is included which gives the definitions of some of the more frequently used descriptive soil terms.

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 agricultural development.

INTRODUCTION

The reconnaissance survey of the soils of the Hotchkiss and Keg River area was initiated in the summer of 1963 and was completed in 1967.

The survey was carried out by making traverses at approximately one mile intervals wherever possible. The traverses were made by vehicle, on foot, and by saddle horse. Along the lines of traverse holes were dug at frequent intervals to determine the morphological features of the soils. Soil boundary lines were determined along the lines of traverse, projected between the lines of traverse, and checked with the use of aerial photographs. Information on soils, improved land, topography, density of tree cover, and other features considered pertinent to the development of this area were recorded in the field on township plans at a scale of one mile to two inches. The methods used in recording some of the features are defined in Appendix II.

The classification proposed by the National Soil Survey Committee of Canada in 1965 was used as far as possible to classify the soils described in this publication.

The basic mapping unit used for this survey was the *soil series*. Well to imperfectly drained soils with similar profile characteristics developed on similar parent materials and poorly drained soils with similar profile characteristics but with a wider range of parent materials were given a soil series name. Names for the soil series were taken from the locality in which the soils were found and include the names of rivers, lakes, towns, and districts.

The base map selected for this area has a scale of three miles to one inch. The detail of the soil separations that could be presented, therefore, had to be limited to soil areas of a quarter section in size with a maximum of three soil series, shown in order of dominance, characterizing these areas. The selection of the dominant soil series that best characterized the complex soil pattern of many of these areas necessitated the elimination of a number of the less prevalent soil series. Thus, further inspections must be made if information of a more detailed nature is required.

All descriptions presented are for virgin soils. Each soil series mapped in this area is described generally and again in detail. The terms used to describe these soils are those recommended by the National Soil Survey Committee of Canada and are defined in Appendix II of this publication. Color descriptions were determined from Munsell soil color charts and indicated by moist color designations.

The profile descriptions represent the central concept for each of the soil series mapped. Additional information regarding the range in profile characteristics for each soil series is also presented.

Only the analytical data that aid in the characterization of the soils are presented. The methods and types of analyses used are those recommended by the National Soil Survey Committee of Canada.

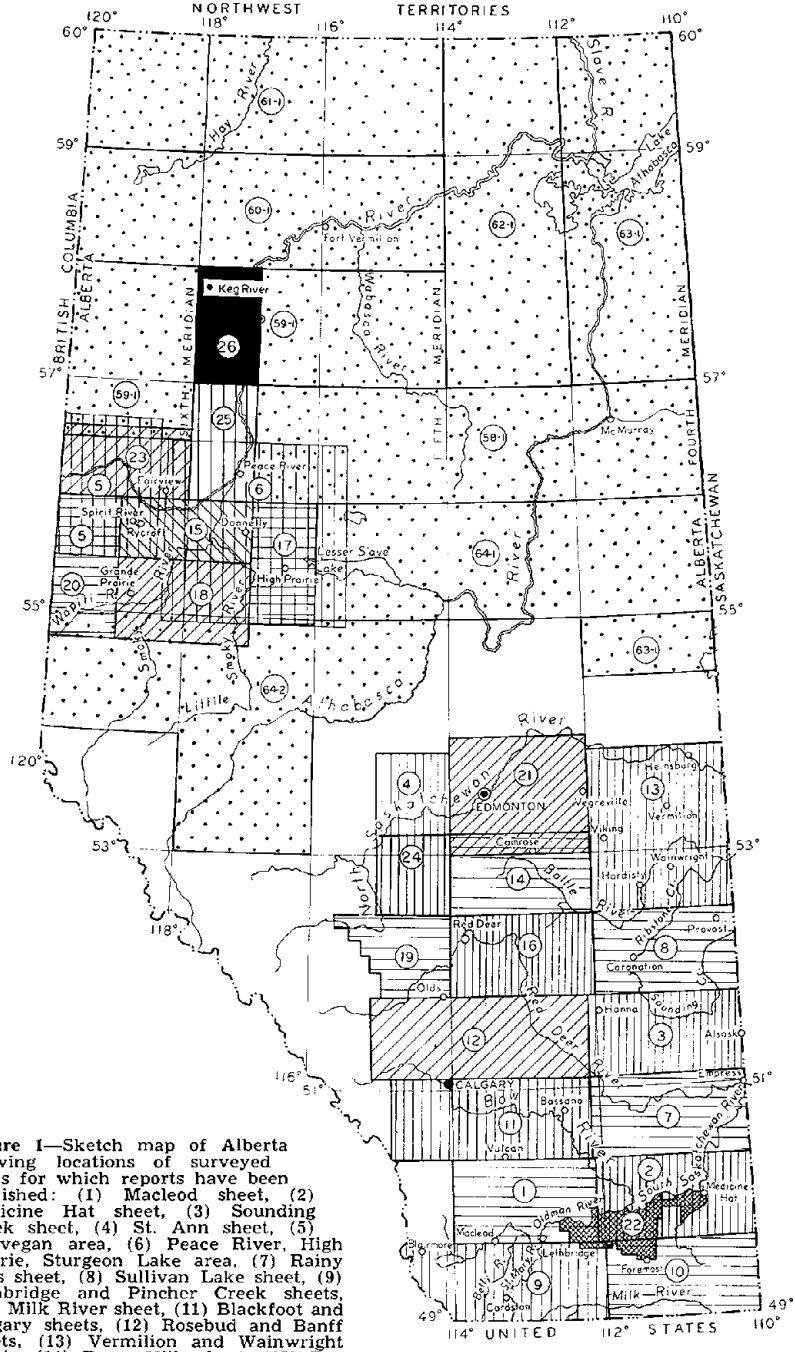


Figure 1—Sketch map of Alberta showing locations of surveyed areas for which reports have been published: (1) Macleod sheet, (2) Medicine Hat sheet, (3) Sounding Creek sheet, (4) St. Ann sheet, (5) Dunvegan area, (6) Peace River, High Prairie, Sturgeon Lake area, (7) Rainy Hills sheet, (8) Sullivan Lake 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) Grimshaw and Notikewin area, (26) (In black) Hotchkiss and Keg River 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 Hotchkiss and Keg River Area

GENERAL DESCRIPTION OF THE AREA

LOCATION AND EXTENT

The Hotchkiss and Keg River area lies in the northern portion of the Peace River district between 57°00′ and 58°00′ north latitude and between 116°50′ and 118°00′ west longitude. It consists of all the townships 93 to 103 in ranges 18 to 24, portions of townships 92 and 104 in ranges 18 to 25, and portions of townships 92 to 104 in range 25, west of the fifth meridian.

The mapped area extends from Hotchkiss to Paddle Prairie and includes the areas adjacent to Hotchkiss, Hawk Hills, Keg River

Figure 2—Horses were used extensively to traverse the wooded portions of this area.

and Paddle Prairie. There are approximately 1,988,700 acres in this area. The general location is shown on the sketch map in Figure 1.

Two of the trading centres in the area, Hotchkiss and Keg River, are situated about 398 and 457 miles respectively by rail northwest of Edmonton.

CLIMATE

The climate of this area is characterized by relatively cold winters, moderately warm summers, and moderately low precipitation as indicated in the summary of the records of the Canada Meteorological Service given in Table 1. While long term records are confined to Keg River in this mapped area, the records of the adjacent stations at Fort Vermilion and Peace River are included in Table 1 for comparison purposes to indicate the range of climatic conditions common to this region.

The temperature data, Table 1, show January to be the coldest month of the year with a mean temperature of about —8°F and July as the warmest month with a mean temperature of about 60°F. The precipitation data, Table 1, show that the mean annual precipitation is between 12 and 15 inches. Approximately two-thirds of this precipitation occurs during the months of May to September. Although July has the highest precipitation, it can be noted that August receives a considerable portion which frequently interferes with crop harvesting operations.

The frost-free period, consisting of the number of consecutive days having a temperature higher than 32°F, is significant in the consideration of the variety of crops which can be grown in any region. Generally, it is assumed that periods exceeding 90 days provided little or no frost hazard in the production of cool season crops. Data in Table 2 provide a comparison in the long time averages of three reporting stations. This comparison indicates a marked difference between what is often referred to as the "Standard Thirty Year Normal" consisting of the mean values obtained between 1921 to 1950, and the period 1951 to 1966. Land clearing may have a bearing on this marked difference but further studies will be required to assess this change. Generally, it is considered that frost is a hazard to crop production in most of this mapped area.

Differences in precipitation, temperature, frost-free periods, and other climatic aspects between localities are frequently due to differences in elevation and topography, or nearness to bodies of water. These variations are evident from the short term records obtained at the forestry look-out stations and forest ranger stations for the period of May to September inclusive. A summary of these records is given in Table 3. Although these short term records must be used with caution, an indication of the variability common to the region can be noted. Thus, in the vicinity of Keg River there is a difference in precipitation and temperature between two stations differing in elevation by about 1,000 feet. Similarly, there is

TABLE 1—Mean Monthly and Annual Temperature and Precipitation for Stations in or near this Area

Station and Location	Elevation	No. of Years		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Fort Vermilion Exp. Farm (58°23′ Lat. N 116°30′ Long. W)	915	41	Temp.	—8.7	—3.9	11.0	32.1	49.1	57.2	62.1	58.2	47.4	34.2	12.5	—4.2	28.9
			Pptn.	0.71	0.66	0.74	0.61	1.36	1.67	1.87	1.76	1.17	0.76	0.89	1.02	13.22
Keg River Post (57°47′ Lat. N 117°52′ Long. W)	1,402	15	Temp.	—2.4	1.6	14.6	34.1	48.2	55.6	59.9	57.2	47.9	36.7	16.2	1.2	30.9
			Pptn.	0.72	0.76	0.72	0.76	1.80	1.76	2.16	2.05	1.46	0.86	1.01	1.00	15.06
Peace River Airport (56°14′ Lat. N 117°26′ Long. W)	1,866	9	Temp.	—8.8	—6.2	14.3	34.8	48.4	56.7	62.6	57.1	50.3	39.3	17.5	4.8	30.9
			Pptn.	0.83	0.74	0.60	0.51	1.09	2.11	1.86	1.58	1.18	0.78	0.58	0.66	12.52

TABLE 2—Comparison of Mean Frost Data for Stations in or near this Area

Station	Mean Frost-free period to 1950		Mean Frost-free period from 1951 to 1966	
	years	days	years	days
Fort Vermilion	41	65	15	100
Keg River	15	57	15	76
Peace River	26	91	9	101

TABLE 3—Mean Monthly Temperature and Precipitation for the Growing Season (May to Sept. Incl.) for Stations in or near this Area

Station and Location	Elevation	Years		May	Jun.	July	Aug.	Sept.	Mean Growing Season
BATTLE RIVER Look-Out			Temp.	46.5	55.0	61.7	58.1	38.5	52.0
57°29′ Lat. N. 117°39′ Long. W.	2,400	1961-65	Pptn.	1.96	2.94	5.12	2.74	1.65	14.41
BISON Look-Out			Temp.	47.4	57.0	61.5	60.0	39.4	53.1
57°05′ Lat. N. 116°32′ Long. W.	2,000	1961-65	Pptn.	1.22	2.59	3.44	1.98	1.58	10.81
DEADWOOD Look-Out			Temp.	47.8	56.9	60.6	60.2	45.6	54.2
56°38′ Lat. N. 117°21′ Long. W.	2,000	1961-65	Pptn.	1.92	2.26	3.08	1.40	1.39	10.05
FORT VERMILION Exp. Farm			Temp.	49.1	57.2	62.1	58.2	47.4	54.8
58°23′ Lat. N. 116°30′ Long. W.	915	1951-65	Pptn.	1.36	1.67	1.87	1.76	1.17	7.83
HAWK HILLS Look-Out			Temp.	46.3	55.6	61.4	61.0	47.5	54.4
57°39′ Lat. N. 117°25′ Long. W.	2,000	1961-65	Pptn.	1.99	2.43	3.49	3.72	2.48	14.11
HIGH LEVEL Ranger Station			Temp.	47.4	56.5	61.2	59.0	45.7	53.9
58°31′ Lat. N. 117°06′ Long. W.	1,063	1961-65	Pptn.	1.63	3.38	3.57	1.28	1.55	11.41
KEG RIVER Post			Temp.	48.2	55.6	59.9	57.2	47.9	53.8
57 47′ Lat. N. 117°52′ Long. W.	1,402	1951-65	Pptn.	1.80	1.76	2.16	2.05	1.46	9.23
KEG RIVER Look-Out			Temp.	44.4	53.9	59.7	57.9	43.2	52.2
57°39′ Lat. N. 118°12′ Long. W.	2,500	1961-65	Pptn.	2.29	4.76	4.77	3.59	2.56	17.97
MANNING Ranger Station			Temp.	48.9	58.1	62.9	60.6	49.4	56.0
56°55′ Lat. N. 117°36′ Long. W.	1,510	1961-65	Pptn.	1.65	1.63	2.80	1.75	1.29	9.12
NAYLOR HILLS Look-Out			Temp.	47.1	54.8	62.2	58.5	38.6	52.2
57°40′ Lat. N. 117°43′ Long. W.	2,400	1961-65	Pptn.	1.70	1.80	3.45	3.51	2.04	12.50
NORTH VERMILION Ranger Station			Temp.	46.6	56.8	63.1	59.4	38.7	52.9
58°24′ Lat. N. 116°20′ Long. W.	810	1961-65	Pptn.	1.66	1.76	2.37	2.23	1.57	9.59
NOTIKEWIN Look-Out			Temp.	45.1	54.3	61.4	58.3	39.8	51.8
56°52′ Lat. N. 118°35′ Long. W.	2,500	1961-65	Pptn.	1.91	2.30	4.03	2.35	1.54	12.13
NOTIKEWIN EAST Ranger Station			Temp.	48.6	58.0	62.8	60.3	43.0	54.5
57°01′ Lat. N. 117°33′ Long. W.	1,600	1961-65	Pptn.	1.24	1.64	3.02	1.64	1.20	8.74
PEACE RIVER Airport			Temp.	48.4	56.7	62.6	57.1	50.3	55.0
56°14′ Lat. N. 117°26′ Long. W.	1,866	1958-65	Pptn.	1.09	2.11	1.86	1.58	1.18	7.82
WHITEMUD Look-Out			Temp.	46.9	55.4	60.1	58.0	39.0	51.9
56°26′ Lat. N. 118°01′ Long. W.	2,800	1961-65	Pptn.	1.92	1.56	2.67	2.84	1.75	10.74

a marked difference between the look-out station on the Hawk hills and the Notikewin east ranger station located in the adjacent lower lying basin.

As indicated previously, the annual and growing season precipitation for the area is quite variable depending on location and elevation. However, it would appear that some major differences occur from year to year as shown in Table 4. Furthermore, the days during the month in which the recorded amount falls are extremely variable. Records show that the total monthly precipitation may occur within a few days or may be scattered as periodic showers throughout the month. The year to year records show extreme variability in precipitation distribution during the growing season.

TABLE 4—Mean Temperature, Total Precipitation, and Frost-free Days during the Growing Season (May to September incl.) for two Stations Located at the North and South Extremes of the Mapped Area, 1962-1966

Year	Keg River Post 57°47′ Lat. N. 117°52′ Long. W. Elevation 1,402 feet			Manning Ranger Station 56°55′ Lat. N. 117°36′ Long. W. Elevation 1,510 feet		
	Temperature degrees F.	Precipitation inches	Frost-free days	Temperature degrees F.	Precipitation inches	Frost-free days
1962	53.6	14.54	109	55.7	12.39	117
1963	—	—	—	57.2	10.07	127
1964	51.5	14.34	101	55.1	14.23	114
1965	54.0	4.43	98	55.1	4.98	106
1966	54.3	7.91	50	55.2	6.18	93

VEGETATION

This area lies within the Boreal Forest Region of Canada as described by Rowe.* Much of the original native vegetation has been destroyed by fires. The present native vegetation is a mixed

Figure 3—Vegetation of poorly drained areas. Sphagnum moss with black spruce.

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

Figure 4—Vegetation of well drained areas. Generally aspen poplar with patches of white spruce.

tree cover with a preponderance of aspen poplar. Other tree species are balsam poplar, white spruce, jack and lodgepole pine, white birch, willow, and alder. The major shrubs are rose, gooseberry, raspberry, cranberry, chokecherry, saskatoon, and hazelnut. In the poorly to very poorly drained areas the native vegetation is generally black spruce, tamarack, dwarf birch, labrador tea, sedges, rushes. reeds, mosses, and coarse grasses.

Good marketable stands of white spruce and pine occur in widely scattered locations throughout the area.

PHYSIOGRAPHY

Land Surface

The land surface of this area consists of highlands, gently sloping lands, flatlands, and incised valleys of the major streams. The maximum difference in elevation between flatlands and highlands is about 1,500 feet. The maximum depth of the incised stream valley is about 500 feet.

The highlands, located in the west-central portion of the area, comprise the Naylor hills and the Hawk hills with maximum elevations of 2,700 feet and 2,400 feet, respectively.

The gently sloping lands form the portion of the area extending from the highlands to the flatlands. They occur generally at elevations between 1,600 and 2,000 feet. Low ridges and knolls are characteristic of these gently sloping lands.

The flatlands occur at elevations below 1,600 feet in the southern, central, and northern portions of the area. In the southeastern and

northern portions of these flatlands the relief is characterized by numerous low, often steep-sided knolls, while in the east-central portion the sand areas are characterized by longitudinal dunes.

Drainage

The drainage for this area is provided by the Peace river and its tributaries and by the Chinchaga river.

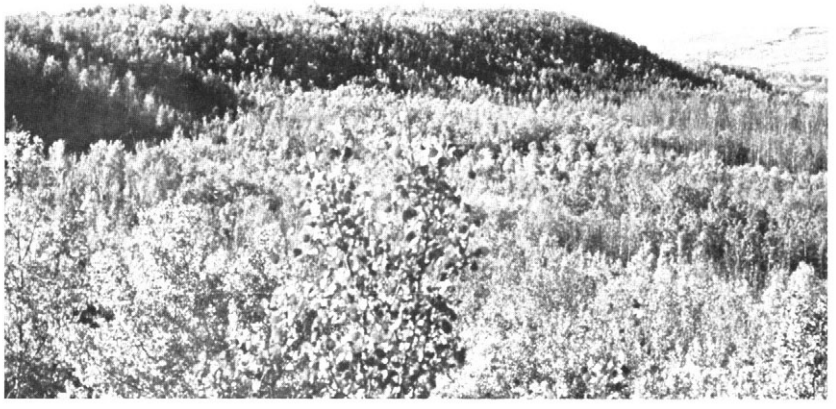
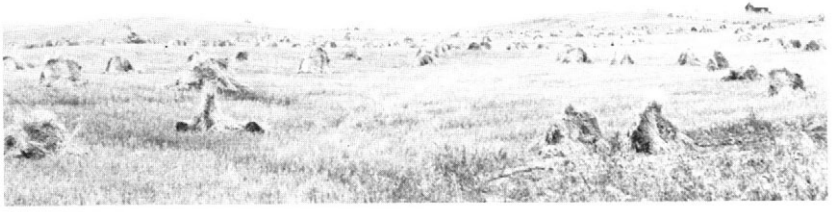


Figure 5—Gently sloping lands merging into the highlands in the background.

Figure 6—Flatlands of the Hawk Hills area.



The Peace river meanders through the area in a south to north direction in a dissected valley approaching a depth of 500 feet. Its main tributaries, the Notikewin, Hotchkiss, Meikle, Kemp, Keg, Boyer, Wolverine, and Buffalo rivers flow into the Peace river at relatively sharp angles either from a southwest or a southeast direction. All of the tributaries of the Peace river have dissected valleys nearly 300 feet in depth. The Peace river and its tributaries provide the drainage for the major portion of this area.

The Chinchaga river, a tributary of the Hay river, provides the drainage for the extreme northwest portion of this area. It drains a flat area and is characterized by an extremely meandering course with many oxbows and low banks.

The area contains several lakes, the largest of which are Nina and Twin lakes. Most of these lakes have no well-defined outlets.

GEOLOGY AND SURFICIAL DEPOSITS

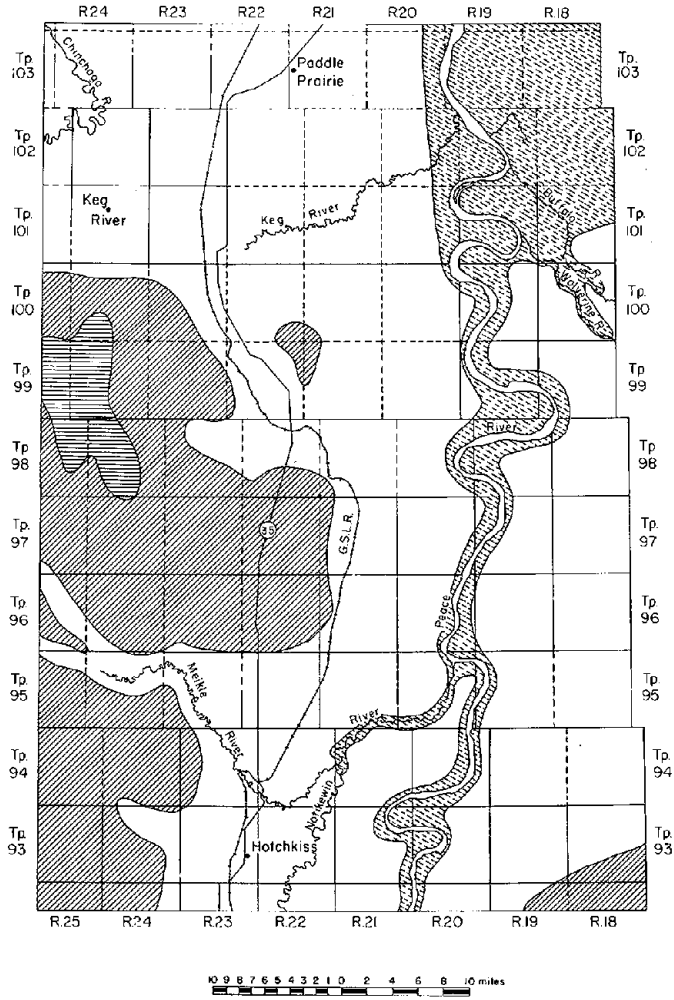
Geology

The area is underlain entirely by shales and sandstones of Late Cretaceous age (Figure 8).

The Loon River and Shaftesbury Formations, composed of dark gray to black shales with ironstone bands and concretions, have the greatest areal distribution. The Shaftesbury Formation underlies relatively all of the gently sloping lands and some of the flatlands in this area, while the Loon River Formation underlies the flatlands adjacent to the Peace river northward from Carcajou.

The Dunvegan Formation, composed of sandstones, sandy shales, and shales mainly of non-marine origin, has the next largest areal distribution. It underlies the highlands with the exception of a small portion of the Naylor hills.

The Kaskapau Formation of the Smoky Group, composed of dark gray shale and carbonaceous shale of marine origin, is of limited extent and occurs at the higher elevations of the Naylor hills.



LEGEND

CRETACEOUS

SMOKY GROUP (Includes Kaskapau and Bad Heart Formations): dark gray shale and carbonaceous shale; reddish brown weathering sandstone; marine.

DUNVEGAN FORMATION: sandstone, shale, and sandy shale, marine and non-marine.

SHAFTESBURY FORMATION: dark gray to black shale; ironstone bands, concretions; partly marine.

LOON RIVER FORMATION: dark gray friable shale; mostly marine.

Figure 8—Map showing the geology of the Hotchkiss and Keg River area (Geology Division, Research Council of Alberta).

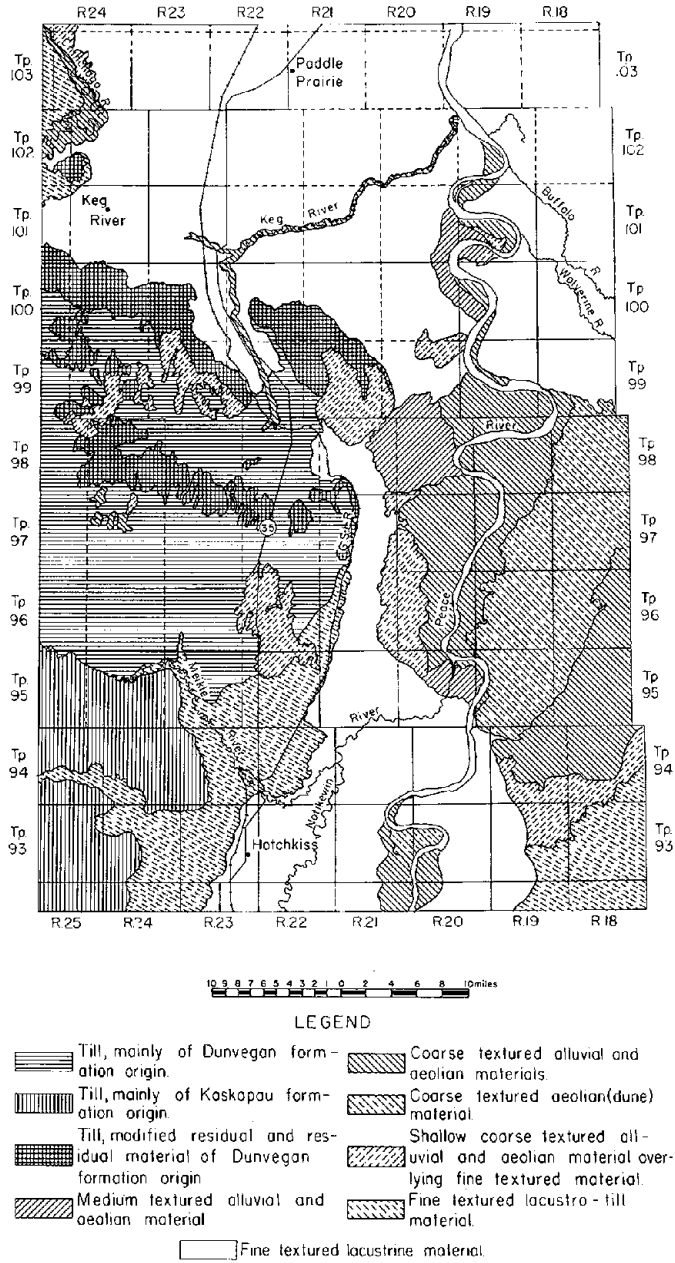


Figure 9—Map showing the surficial deposits of the Hotchkiss and Keg River area.

Surficial Deposits

The surface deposits of this area consist mainly of till, lacustro-till, lacustrine, alluvial, aeolian, and residual materials (Figure 9).

The till deposits are composed of a heterogeneous mixture of medium to fine textured materials deposited through ice action. They occur mainly in the highlands of the area. At the higher elevations they occur as a thin mantle covering the underlying bedrock.

The lacustro-till deposits are composed mainly of fine textured materials that exhibit varying degrees of stratification and contain variable quantities of pebbles and stones. These deposits are considered to consist of till that has been partially sorted or deposited in glacial lakes. Such deposits occur generally on the gently sloping land.

The lacustrine deposits consist of moderately fine to very fine textured materials that are generally stratified and usually stone-free. They consist of materials derived from glacial debris by water sorting and deposition in glacial lakes. They occur in the flatlands adjacent to the Peace river.

The alluvial deposits are composed of coarse to medium textured materials which have been deposited through the action of rapidly moving water. They occur as outwash, river terraces, thin beds overlying other deposits, and on recent river flats. They are found mostly in the east-central portion of the area.

The aeolian deposits consist of coarse to medium textured materials deposited through wind action. They occur as dunes and as thin beds overlying other deposits and are found in the east-central portion of the area.

The residual deposits of this area consist of coarse to moderately fine textured materials derived from the weathering of Dunvegan sandstone, and fine textured acidic materials derived from the weathering of Kaskapau shales. They occur at the higher elevations of the Naylor and Hawk hills.

Figure 10—Lacustrine area rising to a lacustro-till area in background.

Figure 11—Alluvial area with small peat bog areas.

HISTORY AND DEVELOPMENT

The history and development of this area dates back to the fur traders and explorers of the eighteenth century. It has been known to the white man for about 175 years, and settled by farmers for less than 40 years.

The first known inhabitants were Beaver Indians who occupied the watershed of the Athabasca and Peace rivers. To hold this territory the Beavers were incessantly at war with the neighboring Crees. About 200 years ago they won a decisive victory over the Crees along the banks of the presently known Notikewin river. This river and the two rivers to the north, the Hotchkiss and Meikle rivers, are locally referred to as the 1st, 2nd and 3rd Battle rivers, respectively, and the country adjacent to them is known as the Battle River country commemorating this battle.

The first white man to arrive in this area was Alexander Mackenzie in 1792, an explorer and fur trader for the North West Company of Montreal. He was the forerunner of the white traders who built many trading posts along the length of the Peace river. However, only one of the many trading posts built along the Peace river by the North West Company, Horse Shoe House located at the southeast corner of 94-21-W5, was in this area. This trading post was built before 1802 and abandoned before 1806.

In December 1821 the North West Company united with the Hudson's Bay Company and George Simpson was selected as governor. Shortly after the union two trading posts were built in this area, one located at Carcajou and the other at the junction of the Notikewin and Peace rivers. Both posts were abandoned by 1912. In 1912 a Hudson's Bay Post was built at Keg River and is still in operation. It is located 9 miles west of the Mackenzie highway in the southeast corner of 28-101-24-W5.

The first white settler, Mr. Frank Jackson, started a cattle ranch in the vicinity of the trading post at Keg River in 1919. He continued ranching until 1931 and then changed to the successful production of grain. Following his example, settlement has progressed in the Keg River, Hotchkiss, and the Hawk Hills areas.

Population

The population of the mapped area is essentially rural. Settlement occurred in this area as early as 1919 but the first major influx of settlers did not take place until 1929. Estimates made from the records compiled by the Dominion Bureau of Statistics show that the population of this area in 1951 was 853. From 1951 to 1961 there has been a gradual increase of settlers in this region. Census data show an increase of 232 in population in 1956 with an added increase of 24 in 1961. However, between 1961 and 1966 there was a marked increase in population in the map area with the result that the total population in 1966 was approximately 1,500.

Towns

There are no towns or villages in this area but there are small trading centres where essential materials can be purchased. These trading centres are located at Hotchkiss, Keg River, Carcajou, and Paddle Prairie. The majority of the settlers in this area travel south to Manning or north to High Level for the bulk of their supplies.

Industries

The major industries of this area are agriculture, lumbering, and trapping.

Agriculture can be considered as the major industry of the area. There are approximately 1,074,000 acres indicated on the soil rating map as arable land in this area. Of this total, approximately 100,000 acres were under cultivation in 1966 and new land is being cleared continually for agricultural purposes. Measured in value terms, the agricultural production in this area in 1966 was estimated at $2,375,000. This estimate was based on the census information compiled by the Dominion Bureau of Statistics supplemented by a market price representing an average of the 1965 and 1966 prices as supplied by the Statistics Branch, Alberta Department of Agriculture.

Lumbering is the second largest industry of this area. The production for the period 1960 to 1965 was 17,300,000 feet board measure providing for an annual average of 3,460,000 board feet. At a cost of lumber at the mill of $66.50 per 1,000 F.B.M., the yearly production measured in value terms was approximately $230,000.

The value of the fur industry to the Province of Alberta in 1966 was $1,688,000. Records are not available for specific areas.

However, this area made a contribution to the total value of the furs produced during the 1966 trapping season.

Figure 12—Harvesting in the Hawk Hills area.

Figure 13—A planer mill at Hotchkiss.

Transportation

The main transportation routes traversing this area are a wide gravelled highway, known as the Mackenzie highway, and the Great Slave Lake railway. In addition, there are main secondary roads linking with the Mackenzie highway that service the settlements at Keg River, Carcajou, Hawk Hills, and Hotchkiss. These all-weather transportation routes are shown on the accompanying soil map.

Until 1930, the river steamer was the only means of transportation and communication for this area. In 1930 a telegraph line was constructed from Peace River via Keg River to Fort Vermilion. Its right-of-way served as a supply road to the area until 1935. In

1935 construction was started on a wagon road which serviced the area until the 1939-45 war years when it was improved to a truck road by the army. In 1948 a gravelled highway was built north from Manning, through this area, to the shores of Great Slave lake. Further improvements to this highway have resulted in the present wide gravelled highway known as the Mackenzie highway. The Mackenzie highway was the only major ground transportation link for this area until the completion of the Great Slave Lake railway in 1964.

In addition to these main and secondary transportation routes, the older settlements of the area are well supplied with good graded

Figure 14—The Mackenzie highway. Until 1964 this highway was the major transportation link to this area.

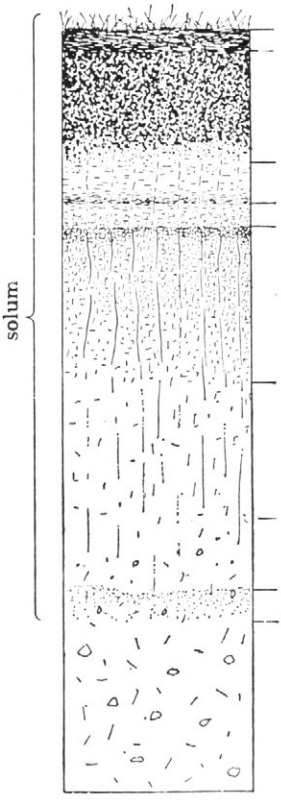
Figure 15—The Great Slave Lake railway completed in 1964 provides a second major transportation link to this area.

earthen roads. However, the new and sparsely settled areas presently have very few roads and in some instances are accessible only by tractor trails.

SOIL DEVELOPMENT AND CLASSIFICATION

SOIL DEVELOPMENT

Soils are developed through the combined effects of climate. vegetation, relief, and drainage acting on the surficial deposits. The characteristics of these soil forming factors are described in previous sections. A record of the combined effects is revealed in a vertical cut exposing the soil profile. The horizons which make up a soil profile differ from one to another in one or more of the following features: color, texture, structure, consistence, and chemical and biological composition. The differentiation of the various soil horizons is shown in diagrammatical form in Figure 16. In this region the solum seldom exceeds a thickness of 36 inches. This is



L, F and H—Organic horizon 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), the presence of calcium and magnesium carbonates (Ck), the presence of soluble salts (Cs), or the accumulation of carbonates (Cca), and salts (Csa).

Figure 16—Diagram of a soil profile showing various horizons.

the depth to which the parent material or surficial deposit has undergone the greatest alteration through the action of the soil forming factors.

The features revealed by a study of the soil profile make it possible to classify soils in accordance with the processes involved in their formation. Such a classification permits a grouping of the soils into natural units which are indicated in the sixth report of the National Soil Survey Committee of Canada, 1965.

SOIL CLASSIFICATION

The basic unit in the classification system is the *soil series.* A soil series consists of soils that have horizons similar in their differentiating characteristics and arrangement in the soil profile. In addition, soil series may be subdivided on the basis of external features that are significant to their use and management such as topography, stoniness, etc., and such subdivisions are referred to as *soil phases.* In this region, soils formed on some parent materials exhibit a variety of profiles which are so intimately intermixed that it is impractical, because of the scale used, to separate them. Such map units are referred to as *soil complexes.*

In addition to the basic units used in field classification, the soils are grouped into broader categories according to similarities as defined in the Canadian Soil Classification System. They involve a consideration of the *subgroup, great group,* and *order* categories. Following is an indication of the characteristics of the categories used in this area:

Chernozemic Soils

Chernozemic soils consist of the well to imperfectly drained soils developed under grassland or transition grassland-forest and are characterized by a prominent dark colored surface horizon. Recognition of the differences in color provides a basis for the separation of the soils in this order into *Black* and *Dark Gray* great groups. Further separations are made on the basis of the characteristics of the horizons permitting a grouping at the subgroup level of categorization. Thus, the *Solodic Dark Gray* subgroup would be composed of those Dark Gray soils that have some of the features of Solod soils, whereas the *Gleyed Dark Gray* subgroup would consist of Dark Gray soils that have some evidence of gleying in some of the horizons. Otherwise, profiles exhibiting the normal or standard characteristics of the great group are indicated in the subgroup as *Orthic.*

Solonetzic Soils

Soils of this order are moderately well to imperfectly drained soils developed under variable vegetative cover from saline parent materials. Chemical standards provide a guide in the classification

of these soils, but the separations made at the great group level are based on the morphological differences evident in the profiles. While there is usually an abrupt break between the A and B horizons of these soils, the development of a distinct AB horizon serves to separate the *Solod* from the *Solonetz* great group. Consideration of the significant difference of color in the A horizon provides a guide to the separation in the subgroup category.

In this region, Solonetz soils are of very limited occurrence but Solod soils occur in a significant portion of the mapped area. However, there is a marked variation in the chemical characteristics of these soils and further studies will be required to recognize those closely associated soils that do not meet the chemical requirements of the Solod great group.

Podzolic Soils

Podzolic soils consist of well to imperfectly drained soils developed under forest vegetation and characterized by a pronounced, light colored, eluvial (Ae) horizon usually underlain by a horizon that is enriched with clay, or organic matter, or sesquioxides, or a combination of these. In this region, most of the Podzolic soils have a high base saturation, are characterized by a B horizon that is enriched with clay (Bt), and meet the requirements for the *Dark Gray Wooded* and *Gray Wooded* great groups. While other Podzolic soils were recognized as part of an intimately mixed complex in a map unit their separation was not feasible on the scale of mapping used in this survey.

Gleysolic Soils

Soils of the Gleysolic order consist of those developed under wet conditions and are characterized frequently by a peaty surface accumulation that does not exceed 12 inches in thickness and by a dull, often bluish colored subsoil that may have yellowish or reddish colored mottles. According to the characteristics of the A horizon, three great groups are recognized. Soils of the *Humic Gleysol, Gleysol,* and *Eluviated Gleysol* great groups are of common occurrence in this region.

Organic Soils

Wet soils characterized by an accumulation of peat exceeding a compressed thickness of 12 inches comprise this order of soils. The type of peat accumulation is closely associated with vegetative cover which consists of coarse grasses, sedges, or mosses. The classification of these soils is still under investigation and pending further study the organic soils in this area have been separated into *Sedge Peat* and *Moss Peat.*

The classification of the soils of this area is presented in Appendix 1 and in the soil map legend.

DESCRIPTION OF SOILS

The soils of this area are described by grouping them on the basis of similarity of parent materials and according to their drainage characteristics. The parent materials of the well to imperfectly drained soils have a marked influence on profile characteristics and are used as a basis for grouping these soils. However, soils developed under poorly drained conditions have profile characteristics that are similar over a wide range of parent materials and are grouped on a textural basis.

A summary of the grouping is shown in the soil map legend and in Appendix I of this report.

Information is presented on parent materials, profile characteristics, topography, vegetation, extent and occurrence, association, and present use for each soil series mapped in this area.

WELL TO IMPERFECTLY DRAINED SOILS

Soils in which the moisture content in excess of field capacity is not normally exceeded during a significant part of the year.

SOILS DEVELOPED ON TILL

1. Grayish brown to very dark grayish brown, weakly calcareous and weakly saline, somewhat stony, generally fine textured material derived mainly from the Kaskapau and Dunvegan Formations of Late Cretaceous age.

This material occurs on the higher land in the southwestern portion of the mapped area.

The topography is generally undulating with the exception of a few moderately sloping ridges.

A predominance of aspen poplar with white spruce, birch, and various shrubs and grasses make up the present natural vegetation.

This till forms the parent material of the Alcan series.

Alcan Series—Solodic Gray Wooded

Alcan soils occupy 89,800 acres in the southwestern portion of the mapped area.

These soils have a thin organic surface layer of decomposing leaf material underlain by a relatively thick, grayish, silt loam horizon. The subsurface horizon is dark grayish brown in color, very firm, fine textured with weak columnar, blocky structure. The thickness of the solum varies from 30 to 50 inches. Following is a description of a representative Alcan soil profile of this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Very dark brown (10YR 2/2)* decomposing leaf litter. pH 6.4.
Ae	4	10.0	Light grayish brown (10YR 6/2) silt loam, platy, firm. pH 5.4.

* Moist Munsell color designations.

Horizon	Thickness in.	Thickness cm.	Description
AB	3	7.5	Brown (10YR 5/3) clay loam, subangular blocky, firm. Structural aggregates coated with materials from horizon above. pH 4.8.
Btnj	9	22.5	Very dark grayish brown (10YR 4/2) clay, weak columnar, strong blocky with faint dark colored staining, very firm. pH 4.7.
BC	12	30.0	Very dark grayish brown (10YR 3/2) clay, subangular blocky, firm. pH 5.1.
Csk	at 30 below surface	at 75.0	Very dark grayish brown (10YR 3/2) clay loam to clay with variable amounts of pebbles and stones. Weakly saline and weakly calcareous. pH 6.9.

The thickness of the horizons within the profile will vary, especially the Btnj and BC horizons. Btnj horizons with a thickness of 25 inches have been observed in these soils. The surface organic horizons are generally quite uniform in thickness, usually about 2 inches, but the eluviated (Ae) horizons vary considerably in thickness with the average being 4 inches. The parent material is generally fine textured but varies in lime and salt content. Lime generally occurs in small pockets but the salts are usually disseminated throughout.

Alcan soils are found in association with Boundary, Hazelmere, Snipe, Goose, Prestville, Eaglesham, and Kenzie soils.

These soils are used exclusively for forest production in this area. Elsewhere they have been utilized for grain and pasture production.

2. Yellowish brown to grayish brown, weakly calcareous, medium to fine textured material derived mainly from both the Smoky and Wapiti Formations of Late Cretaceous age.

This till occurs in the southeastern portion of the area on gently sloping to undulating topography.

The native vegetation consists predominantly of aspen poplar with white spruce, varying mixtures of pine, birch, and various shrubs.

Braeburn Series—Orthic Gray Wooded

Braeburn soils are found in the southeastern portion of the mapped area mainly in association with Hazelmere soils which are of dominant occurrence in this portion of the area. As a result no estimate is made of the extent of Braeburn soils in this region.

Braeburn soils have a dark grayish brown L-H horizon; a moderately thick, light yellowish brown Ae horizon that is acid in reaction; and a moderately well developed, blocky structured, dark yellowish brown Bt horizon. The solum of these soils is usually 36 to 48 inches thick. A description of a representative Braeburn soil profile of this area follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	1	2.5	Dark grayish brown (10YR 4/2) leaf mat. pH 6.8.
Ahe	1	2.5	Grayish brown (10YR 5/2) loam, weak fine granular. Usually thin, often absent. pH 6.6.
Ae	4	10.0	Light yellowish brown (10YR 6/4) very fine sandy loam, fine to medium platy, friable. pH 5.5.
AB	3	7.5	Yellowish brown (10YR 5/4) silt loam, fine subangular blocky, firm, somewhat porous. pH 5.2.
Bt	10	25.0	Dark yellowish brown (10YR 4/4) clay, medium to coarse blocky, firm. pH 5.0.
BC	16	40.0	Dark yellowish brown (10YR 4/4) clay loam, fine to medium subangular blocky, firm. pH 5.5.
Cca	at 35 below surface	at 87.5	Grayish brown (10YR 5/2) clay loam with occasional bands of dark gray (10YR 4/1) clay. Lime occurs in pockets or in thin beds. pH 7.5.
Ck			Grayish brown (10YR 5/2) clay loam, with occasional pockets of sandy loam and silt loam. pH 7.0.

Braeburn soils are of limited occurrence in this region and are confined to small areas intimately associated with other soils. They are of dominant occurrence in many regions south of this mapped area. Generally, Braeburn soils have a browner and coarser textured solum than that common to Alcan soils, and are characterized by parent material that is calcareous. However, while the sola of Braeburn and Dixonville soils are very similar, more acidic reactions are typical of Dixonville soils and their parent material is generally less calcareous.

3. Brown to grayish brown, noncalcareous to weakly calcareous, somewhat stony, medium to fine textured material derived mainly from the Dunvegan Formation of Late Cretaceous age.

This till occurs on the highlands of the west-central portion of the area and is characterized by a topography varying from very gently sloping to hilly.

The present natural vegetation is predominantly aspen poplar with white spruce, varying mixtures of pine, birch, and various shrubs and grasses.

This till forms the parent material of the Dixonville series.

Dixonville Series—Orthic Gray Wooded

Dixonville soils are found mainly in the west-central portion of this area. Approximately 235,000 acres of Dixonville soils were mapped in the area.

Dixonville soils have surface horizons of dark grayish brown leaf litter, usually 2 inches in thickness, underlain by about 4 inches of bleached, fine sandy loam to silt loam. The subsurface horizon is brown with a firm, blocky structure. The depth of development in these soils is from 25 to 35 inches. Both the solum and the C horizon are usually characterized by acidic reactions. A description of a typical Dixonville soil profile follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Very dark grayish brown (10YR 3/2) leaf mat. pH 6.1.
Ae	3	7.0	Gray (10YR 6/1) silt loam, medium to coarse platy, firm. pH 5.4.
AB	4	10.0	Brown (10YR 4/3) silty clay, subangular blocky, firm, porous. pH 4.6.
Bt	8	20.0	Dark yellowish brown (10YR 4/4) clay, blocky, very firm. pH 4.6.
BC	9	22.5	Grayish brown (10YR 5/2) clay, subangular blocky, firm. pH 4.6.
C	at 26 below surface	at 65.0	Grayish brown (10YR 5/2) clay loam, somewhat stony, occasional pockets of sandy loam to silt loam. pH 5.3.

The degree of development of the Dixonville soils in this area is relatively similar. Slight variations can be found in the thickness of the horizons, especially the L-H and Ae horizons. The parent material is fairly uniform but contains a higher percentage of sandstones on the steeper slopes. The lime content of this material varies quite considerably throughout the area, but is usually very low.

Dixonville soils are found in association with Teepee, Boundary, Culp, Codesa, Hazelmere, Keg, Goose, Prestville, Eaglesham, and Kenzie soils.

Dixonville soils are used exclusively for forest production. On very gently sloping and gently sloping topography they have fairly good agricultural potential.

SOILS DEVELOPED ON LACUSTRO-TILL MATERIALS

1. Dark gray to very dark grayish brown, weakly calcareous and weakly saline, variable fine textured materials which have alternating strata of sandy loam or loam that may be gravelly or stony.

This material is generally found on the lower slopes throughout the mapped area.

The topography is mostly gently undulating but a few areas are rolling.

The vegetation is aspen poplar with varying mixtures of balsam poplar, white spruce, birch, willow, and various native shrubs.

Hazelmere Series—Solodic Gray Wooded

The Hazelmere soils occur on the lower slopes between elevations of about 1,800 to 2,000 feet throughout the area. There are approximately 92,000 acres in which these soils predominate.

Hazelmere soils usually have a 2 inch layer of decomposing leaf material underlain by a 3 inch grayish, leached, silt loam horizon. The subsurface horizon is dark brown, fine textured, and has weak columnar structure. These soils have developed to depths of 24 to 36 inches. A description of a representative Hazelmere soil profile of this area follows:

Horizon	*in.*	*cm.*	*Description*
	Thickness		
L-H	2	5.0	Very dark brown (10YR 2/2) leaf litter. pH 6.6.
Ae	3	7.5	Light brownish gray (10YR 6/2) silt loam, fine platy, firm. pH 6.2.
AB	3	7.5	Grayish brown (10YR 5/2) silty clay, subangular blocky, very firm. Aggregates coated with material from horizon above. pH 5.3.
Btnj	12	30.0	Dark brown (10YR 3/3) clay, weak columnar with faint dark colored staining, very firm. pH 5.0.
BCk	10	25.0	Very dark grayish brown (10YR 3/2) silty clay loam, subangular blocky, firm. pH 7.2.
Cks	at 30 below surface	at 75.0	Very dark grayish brown (10YR 3/2) clay loam with variable thickness of gravelly sandy clay loam strata. Weakly calcareous and weakly saline. pH 7.4.

There is a fairly wide range of profile characteristics within the Hazelmere soils. The Ae and AB horizons will vary in thickness from 1 to 4 inches and the Btnj horizons will vary in structural development from very firm, strong blocky to weak columnar with faint to pronounced dark staining. Chemical characteristics of the Bt horizon are quite variable and may approach the requirements of a Solod soil. The parent materials range in texture from clay loam to clay, in the amount of pebbles and stones, and in the degree of stratification.

The Hazelmere soils are found in association with Braeburn, Dixonville, Alcan, Boundary, Albright, Codesa, Donnelly, Esher, Snipe, Goose, Prestville, Eaglesham, and Kenzie soils

Only a small portion of the Hazelmere soils of this area are used for agricultural purposes. Most of them are forested.

Albright Series—Solodic Dark Gray

Albright soils occur in close association with the Hazelmere soils. They predominate in approximately 1,000 acres in this area.

The Albright soils are very similar to the Hazelmere soils in profile characteristics except for the presence of a prominent organic-mineral horizon (Ah) immediately underlying the surface organic leaf mat. The organic-mineral horizon is about 3 inches thick, dark grayish brown in color, and contains about 4 percent organic matter. The following is a description of a representative Albright soil profile of this area.

Horizon	*Thickness* *in.*	*cm.*	*Description*
L-H	2	5.0	Very dark brown (10YR 2/2) leaf litter. pH 6.6.
Ahe	3	7.5	Dark grayish brown (10YR 4/2) silty clay loam, granular, friable. pH 6.4.
Ae	2	5.0	Light brownish gray (10YR 6/2) silt loam, fine platy, firm. pH 6.2.
AB	2	5.0	Grayish brown (10YR 5/2) silty clay loam, subangular blocky, very firm. Aggregates coated with material from horizon above. pH 5.3.
Btnj	10	25.0	Dark brown (10YR 3/3) clay, weak columnar with faint dark colored staining, very firm. pH 5.1.

Horizon	Thickness in.	Thickness cm.	Description
BCk	8	20.0	Very dark grayish brown (10YR 3/2) clay loam, subangular blocky, firm. pH 7.2.
Cks	at 27 below surface	at 67.5	Very dark grayish brown (10YR 3/2) clay loam with variable thickness of gravelly sandy clay loam strata. Weakly calcareous and weakly saline. pH 7.4.

Surface horizons of the Albright soils are relatively similar but considerable variation occurs in the subsurface horizons. The consistence and structure of the Btnj horizons vary from very firm, strong blocky to firm, subangular blocky with faint to pronounced dark staining. The parent materials are also quite variable in the quantity of pebbles and stones, degree of stratification, and texture. The texture will range from clay loam to clay.

Albright soils are found in association with Hazelmere, Snipe, Goose, Prestville, Eaglesham, and Kenzie soils.

Albright soils are used mainly for agriculture in this area.

2. Dark gray to very dark grayish brown, weakly calcareous and saline, fine textured materials which may have alternating light colored, thin strata of sandy to silty materials. Pebbles are common.

This material is found on the lower slopes throughout this area at a lower level than the more variable material of similar origin described above.

The topography associated with this material in this area is generally gently undulating.

Vegetation is composed of a sparse to dense woodland consisting predominantly of aspen poplar with varying mixtures of balsam poplar, white spruce, birch, willow, and various shrubs and grasses.

Soils formed on this material have characteristically darker colored sola with fewer stones than the soils formed on the more variable lacustro-till material.

Donnelly Series—Gray Solod

The Donnelly soils of this area are found generally at elevations between 1,600 and 1,800 feet. They occupy approximately 20,200 acres.

Donnelly soils have a thin organic leaf mat overlying a grayish leached horizon that is usually about 3 inches thick. The subsurface horizon is dark grayish brown, fine textured with very firm, weak columnar structure. The depth of development in these soils is from 20 to 30 inches. A description of a representative Donnelly soil profile of this area follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Very dark brown (10YR 2/2) leaf litter. pH 6.5.
Ae	3	7.5	Pale brown (10YR 6/3) silt loam, strong platy, firm. pH 5.9.
AB	3	7.5	Grayish brown (10YR 5/2) silty clay, strong subangular blocky, very firm. Aggregates coated with material from horizon above. pH 5.2.

Horizon	Thickness in.	Thickness cm.	Description
Btn	10	25.0	Very dark grayish brown (10YR 3/2) clay, weak columnar with pronounced dark staining, very firm. pH 4.9.
BCk	7	17.5	Very dark grayish brown (10YR 3/2) clay, subangular blocky, firm, pH 7.5.
Cks	at 25 below surface	at 62.5	Very dark grayish brown (10YR 3/2) clay with thin brownish strata of silt loam. Pebbles common. Weakly calcareous and saline. pH 7.7.

Donnelly soils are somewhat variable. The prominent Ae and AB horizons range in thickness from 2 to 4 inches and the fine textured, very firm Btn horizons vary in structure from weak to strong columnar. The parent materials have a range in texture from clay loam to clay and vary considerably in degree of salinity.

Donnelly soils in this area are found in association with Esher, Hazelmere, Snipe, Goose, Prestville, Eaglesham, and Kenzie soils.

These soils are used mainly for agricultural purposes in this area.

Esher Series—Black Solod

The Esher soils occur in locations similar to the Donnelly soils. They are predominant in approximately 14,100 acres.

Esher soils have thin, organic surface layers underlain by a prominent dark grayish brown Ah horizon and distinct Ae and AB horizons. The subsurface horizon is fine textured, dark grayish brown in color and has columnar structure. The depth of development in these soils is from 20 to 30 inches. Following is a description of a representative Esher soil profile of this area:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Very dark brown (10YR 2/2) leaf litter. pH 6.5.
Ahe	3	7.5	Dark grayish brown (10YR 4/2) silty clay loam, granular, friable. pH 6.2.
Ae	1	2.5	Pale brown (10YR 6/3) silt loam, weak platy, firm. pH 5.9.
AB	2	5.0	Grayish brown (10YR 5/2) silty clay, strong subangular blocky, very firm. Aggregates have a coating of material from horizon above. pH 5.2.
Btn	8	20.0	Very dark grayish brown (10YR 3/2) clay, weak columnar with pronounced dark staining, strong subangular blocky, very firm. pH 4.9.
BCk	5	12.5	Very dark grayish brown (10YR 3/2) clay, subangular blocky, firm. pH 7.5.
Cks	at 21 below surface	at 52.5	Very dark grayish brown (10YR 3/2) clay, with thin brownish strata of silt loam. Pebbles common. Weakly calcareous and saline. pH 7.7.

Like the Donnelly soils, the degree of development in these soils is quite variable. The surface organic and organic-mineral horizons are fairly uniform as to thickness and organic matter content. The Ae horizons, however, are quite variable in thickness and range

from one-half to 3 inches. The fine textured, very firm horizons vary from weak to strong columnar. The parent materials range in texture from clay loam to clay and vary considerably in degree of salinity.

Esher soils are found in association with Donnelly, Albright, Snipe, Goose, Prestville, Eaglesham, and Kenzie soils.

Esher soils are used mainly for agricultural purposes in this area.

SOILS DEVELOPED ON LACUSTRINE MATERIALS

1. Very dark grayish brown to very dark gray, weakly calcareous and saline, fine textured and usually stone-free material that may have sandy loam and silt loam strata.

This material is found on the lowlands of this area at elevations up to 1,600 feet.

The topography associated with this material is level to gently undulating.

Vegetation is composed of a sparse to dense woodland consisting of predominantly aspen poplar with varying mixtures of balsam poplar, white spruce, birch, willow, and various shrubs and grasses.

Nampa Series—Gray Solod

Nampa soils occur on the lowlands in the central portion of this area. They predominate in approximately 36,000 acres.

Nampa soils have a thin leaf mat underlain by a grayish leached horizon that is usually about 2 inches thick. The subsurface horizon is very dark grayish brown in color and fine textured with a very firm, weak columnar structure. The depth of development in these soils varies between 20 and 30 inches. A description of a representative Nampa soil profile of this area follows:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	1	2.5	Very dark brown (10YR 2/2) leaf mat. pH 6.1.
Ae	2	5.0	Very pale brown (10YR 7/3) silt loam, strong platy, firm. Iron staining common in lower portion of horizon. pH 6.3.
AB	3	7.5	Brown (10YR 5/3) silty clay, strong subangular blocky, firm. pH 5.4.
Btn	11	27.5	Very dark grayish brown (10YR 3/2) clay, weak columnar with faint dark staining, strong subangular blocky, very firm. pH 5.0.
BC	9	22.5	Very dark gray (10YR 3/1) clay, strong subangular blocky, firm. pH 6.2.
Ck	13	32.5	Very dark gray (10YR 3/1) clay, weakly calcareous. pH 7.5.
Cks	at 39 below surface	at 97.5	Very dark gray (10YR 3/1) clay, weakly calcareous and saline. pH 7.6.

Surface horizons of these soils are quite similar throughout the area. The most noticeable variations in profile characteristics are in thickness and firmness of the Btn and BC horizons and in the

depths to lime and salts. The depths to lime and salts range from 15 to 40 inches with the salts usually 10 inches below the lime. The parent materials are quite uniform as to texture and color.

Figure 17—Barley crop in a Falher soil area near Hotchkiss.

Nampa soils are found in association with Falher, Notikewin, Cadotte, Peace River, Keg, Goose, Prestville, Eaglesham, and Kenzie soils.

The Nampa soils are being used for both agriculture and forestry purposes.

Falher Series—Black Solod

Falher soils are found mainly in the central and south-central portions of the lowlands. There are approximately 42,000 acres in which these soils are predominant.

Falher soils have a thin leaf mat resting on a fairly thick, dark grayish brown organic-mineral horizon underlain by a 2 inch, grayish, leached horizon. The subsurface horizon is very dark grayish brown in color, very firm, fine textured with weak columnar structure. Development processes have reached to depths of 20 to 30 inches in these soils. Following is a description of a representative Falher soil profile of this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	1	2.5	Very dark brown (10YR 2/2) leaf mat. pH 6.0.
Ahe	3	7.5	Dark grayish brown (10YR 4/2) silty clay loam, granular, friable. pH 6.2.
Ae	2	5.0	Light brownish gray (10YR 6/2) silt loam, weak platy, firm. pH 6.3.
AB	3	7.5	Dark grayish brown (10YR 4/2) silty clay loam, strong subangular blocky, firm. pH 5.4.

Horizon	Thickness in.	Thickness cm.	Description
Btn	10	25.0	Dark brown (10YR 3/3) clay, weak columnar with faint dark staining, strong subangular blocky, very firm. pH 6.3.
BCk	11	27.5	Very dark grayish brown (10YR 3/2) clay, strong subangular blocky, firm. pH 7.5.
Cks	at 30 below surface	at 75.0	Very dark grayish brown (10YR 3/2) clay. Weakly calcareous and saline. pH 7.6.

The surface L-H and Ahe horizons of these soils possess quite similar characteristics in this region. The remaining horizons of the profile of these soils show considerable variation in their thickness, color, and structure. The Ae horizons vary in thickness from a trace to about 3 inches; the Btn horizons vary from dark brown to very dark grayish brown, from firm to very firm, and from weak to strong columnar. The parent materials are quite uniform as to texture but vary in the quantities of lime and salts.

Falher soils are found in association with Nampa, Notikewin, Peace River, Keg, Goose, Prestville, Eaglesham, and Kenzie soils.

Falher soils are used almost exclusively for agricultural purposes in this area.

Notikewin Series—Black Solonetz

Notikewin soils occur mainly in the southern portion of the lowlands in this area. They occur mainly in association with other soils in this area and predominate in only about 1,000 acres.

Notikewin soils have a 2 inch layer of leaf litter underlain by a 2 inch, very dark brown organic-mineral horizon, and a thin, grayish brown, leached horizon. The dark brown to dark grayish brown fine textured subsurface horizon has a white-capped round-topped columnar structure. The solum is from 20 to 30 inches thick. Following is a description of a representative Notikewin soil profile of this area:

Horizon	Thickness in.	Thickness cm.	Description
LH	2	5.0	Very dark brown (10YR 2/2) leaf mat. pH 6.0.
Ahe	2	5.0	Very dark grayish brown (10YR 3/2) silty clay loam, granular, friable. pH 5.5.
Ae	1	2.5	Gray (10YR 6/1) silty clay loam, coarse platy, firm. pH 5.4.
Btn1	3	7.5	Very dark grayish brown (10YR 3/2) clay, white-capped round-topped columnar with pronounced dark staining, strong subangular blocky, very firm. pH 5.9.
Btn2	4	10.0	Very dark brown (10YR 2/2) clay, strong columnar with pronounced dark staining, blocky, very firm. pH 7.0.
BCk	9	22.5	Very dark grayish brown (10YR 3/2) clay, fine blocky, firm. pH 7.4.
Csk	at 21 below surface	at 52.5	Very dark grayish brown (10YR 3/2) clay, stratified. Weakly calcareous and saline. pH 7.6.

Notikewin soils vary considerably in the thickness of their horizons and depth of profile development. The Ah horizons range from 2 to 4 inches in thickness and from very dark brown to very dark grayish brown in color. The Ae horizons range in texture from silt loam to silty clay loam and in structure from coarse platy to fine subangular blocky. The Btn horizons are generally clay with round-topped columnar structure but the thickness of these horizons is quite variable. The depths to salts and the quantity of salts present in the parent materials of these soils are also quite variable.

Notikewin soils in this area occur only in association with Falher, Nampa, and Keg soils.

These soils are used exclusively for agricultural purposes in this area.

2. Mixture of dark grayish brown and very dark grayish brown, moderately calcareous and weakly saline, stone-free, fine textured, stratified material.

This material is found adjacent to the Peace river on gently undulating to gently rolling topography.

Vegetation is predominantly aspen poplar on the humps with willow and grasses in the low areas between the humps.

Cadotte Series—Solodic Gray Wooded

Cadotte soils occur on the portion of the lowlands bordering the Peace river. They are predominant in approximately 293,000 acres.

Cadotte soils have a relatively thick surface of leaf mat resting on a grayish, medium textured, leached horizon that is usually about 4 inches thick. The dark grayish brown to very dark grayish brown, very firm, fine textured, subsurface horizon has a weak columnar, subangular blocky structure with pronounced dark staining on the structural surfaces. The solum in these soils is from 18 to 36 inches thick. A description of a representative Cadotte soil profile of this area follows:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Very dark brown (10YR 2/2) leaf mat. pH 6.3.
Ae	5	12.5	Light gray (10YR 7/2) loam, coarse platy, firm. pH 5.4.
AB	4	10.0	Grayish brown (10YR 5/2) silty clay, subangular blocky, firm. pH 4.8.
Btnj	9	22.5	Dark brown (10YR 4/3) clay, very weak columnar with pronounced dark staining, subangular blocky, very firm. pH 5.3.
BCk	7	17.5	Dark grayish brown (10YR 4/2) clay, subangular blocky, firm, weakly calcareous. pH 7.2.
Cks	at 27 below surface	at 67.5	Mixture of dark grayish brown (2.5Y 4/2) and very dark grayish brown (2.5Y 3/3) silty clay loam, stone-free. Moderately calcareous and weakly saline. pH 7.8.

Cadotte soils vary considerably in thickness of horizons within the sola and depth to lime and salts. The Ae horizons range in

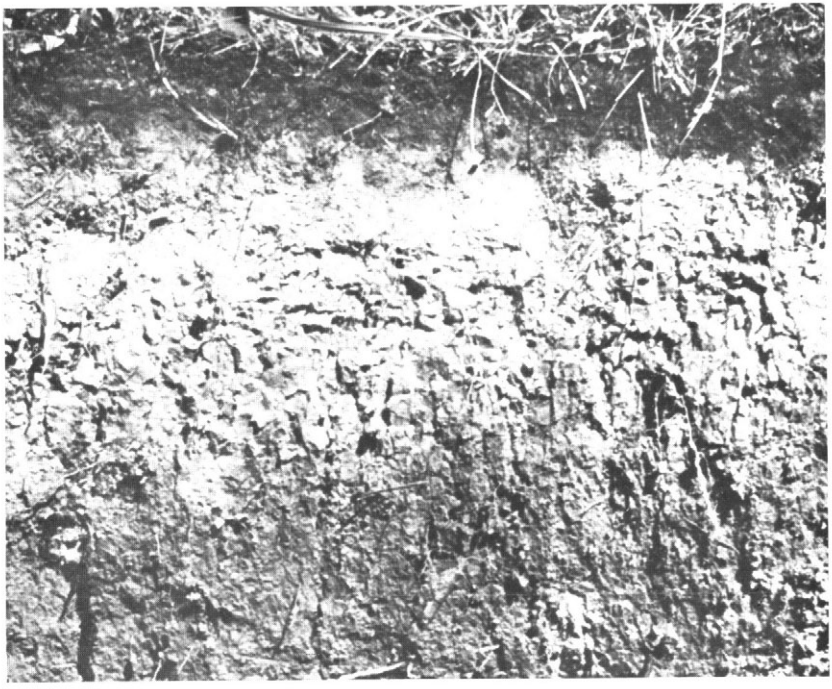


Figure 18—Soil profile of the Peace River series near Hotchkiss.

thickness from about 2 to 6 inches, in color from a light gray to a grayish brown, and in texture from loam to silt loam. The Btnj horizons range in thickness from 5 to 10 inches, and in color from yellowish brown to very dark grayish brown. Lime is encountered in these soils at depths between 8 and 20 inches. Visible salts are present at depths generally below 36 inches.

Cadotte soils of this area are found in association with Peace River, Nampa, Snipe, Keg, Goose, Prestville, Eaglesham, and Kenzie soils.

These soils are being used in this area for agricultural and forestry purposes.

Peace River Series—Solodic Dark Gray Wooded

Peace River soils occur in the same geographical position as the Cadotte soils in this area. They predominate in approximately 95,600 acres.

A thin leaf mat overlies a dark grayish brown organic-mineral horizon that has an average thickness of 3 inches and a 4 inch, grayish, leached horizon. Their subsurface horizons are yellowish brown to dark grayish brown in color, fine textured with very

Figure 19—Wheat crop in a Peace River soil area near Hawk Hills.

firm, weak columnar, blocky structure. These soils have a solum ranging from 15 to 25 inches in thickness. Following is a description of a Peace River soil profile common to this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Very dark brown (10YR 2/2) leaf mat. pH 6.7.
Ahe	3	7.5	Very dark grayish brown (10YR 3/2) silty clay loam, granular, friable. pH 6.2.
Ae	4	10.0	Pale brown (10YR 6/2) silt loam, fine platy, firm. pH 5.9.
AB	2	5.0	Grayish brown (10YR 5/2) silty clay, subangular blocky, firm. pH 5.2.
Btnj	5	12.5	Dark brown (10YR 4/3) clay, very weak columnar with pronounced dark staining, subangular blocky, very firm. pH 5.2.
BCk	6	15.0	Dark grayish brown (10YR 4/2) clay, subangular blocky, firm. Weakly calcareous. pH 7.2.
Cks	at 22 below surface	at 55.0	Mixed dark grayish brown (2.5Y 4/2) and very dark grayish brown (2.5Y 3/2) silty clay, stone-free. Moderately calcareous and weakly saline. pH 8.0.

The variations in the profile characteristics of these soils are similar to those described for the Cadotte soils except for the surface horizons. The Ahe horizons of these soils are similar in thickness but vary considerably in degree of leaching, thus they will range in color from brown to very dark grayish brown. The Ae horizons of these soils also vary with the degree of leaching. They have a range in color from pale brown to light gray and a thickness which ranges from 3 to 5 inches.

Peace River soils are found in association with Cadotte, Falher, Codesa, Belloy, Nampa, Snipe, Keg, Goose, Prestville, Eaglesham, and Kenzie soils.

These soils are used for agricultural and forestry purposes.

3. Dark brown, moderately calcareous, fine textured material that may have strata consisting of brown to grayish brown silty clay loam to clay, and yellowish brown silt loam.

This material occurs in the northern portion of the mapped area and is characterized by a level to undulating topography.

The vegetation is predominantly aspen poplar with willows and grasses in the low areas between the knolls.

Kathleen Series—Orthic Gray Wooded

Kathleen soils are found on the lowlands in the northern portion of the mapped area. They are predominant in approximately 29,300 acres.

The Kathleen soils have a thin leaf mat overlying a thick grayish leached horizon. The subsurface horizon is fine textured with a blocky structure and a characteristically brown color. The depth of development is between 20 and 30 inches. A description of a representative Kathleen soil profile of this area follows:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Very dark grayish brown (10YR 3/2) leaf litter. pH 6.6.
Ae	3	7.5	Pale brown (10YR 6/3) silt loam, fine platy, firm. pH 6.3.
AB	3	7.5	Brown (10YR 5/3) silty clay loam, subangular blocky, firm. pH 5.2.
Bt	8	20.0	Brown (10YR 4/3) clay, blocky, very firm. pH 5.0.
BC	5	12.5	Dark brown (10YR 3/3) silty clay, subangular blocky, firm. pH 6.6.
Ck	at 21 below surface	at 52.5	Dark brown (10YR 3/3) silty clay that may have yellowish brown (10YR 5/6) silt laminae. Moderately calcareous. pH 7.8.

Kathleen soils in this area are quite uniform as to depth of profile development but they show variations in the structural development of their Bt horizons. The consistence and structure of these horizons range from firm blocky to very firm subangular blocky. The parent materials of these soils range in texture from silty clay loam to silty clay, in color from dark brown to very dark grayish brown, and in degree of stratification from numerous laminae to none.

Kathleen soils are found in association with Cadotte, Judah, Leith, Prestville, and Eaglesham soils.

These soils are presently used for forest production in this area.

Judah Series—Orthic Dark Gray Wooded

Judah soils occur on the lowlands in the northern portion of the mapped area. These soils were not mapped as a predominant series, therefore no estimate was made of their acreage.

Judah soils have characteristic brown colored, granular, friable surface horizons. The subsurface horizons are fine textured with

weak blocky structure and are characteristically brown in color. The depth of development is from 20 to 30 inches. A description of a representative Judah soil profile in this area follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Dark brown (10YR 3/3) leaf mat. pH 6.6.
Ahe	3	7.5	Brown (10YR 4/3) silty clay loam, weak granular, friable. pH 6.5.
Ae	2	5.0	Pale brown (10YR 6/3) silt loam, fine platy, firm. pH 6.3.
AB	3	7.5	Brown (10YR 5/3) silty clay loam, weak subangular blocky, firm. pH 5.5.
Bt	8	20.0	Brown (10YR 4/3) silty clay, weak blocky, firm. pH 5.8.
BCk	4	10.0	Dark brown (10YR 3/3) silty clay, subangular blocky, firm. pH 7.0.
Ck	at 22 below surface	at 55.0	Dark brown (10YR 3/3) silty clay loam that may have yellowish brown (10YR 5/6) silt laminae. Moderately calcareous. pH 7.8.

The surface horizons of these soils are fairly uniform in development except for the Ae horizons which may be absent. Usually they have a prominent AB horizon. The Bt horizons and parent materials show the same variations as described for the Kathleen soils.

Judah soils are found in association with Kathleen, Leith, Prestville, and Eaglesham soils.

They are presently being used in this area for forestry purposes. Elsewhere they are used successfully for agricultural purposes.

SOILS DEVELOPED ON ALLUVIAL AND AEOLIAN MATERIALS

1. Brown to yellowish brown, moderately calcareous, medium textured materials that are commonly stratified, with the strata consisting of alternating beds of sand, silt, and clay.

The topography associated with this material, in this area, is usually level to undulating.

Vegetation consists of sparse second growth aspen poplar with native shrubs and grasses.

Davis Series—Orthic Gray Wooded

Davis soils occur in this area adjacent to the Peace river. They are predominant in approximately 52,000 acres of the mapped area.

Davis soils have surface horizons consisting of a thin leaf mat resting on a very pale brown, leached horizon. The subsurface horizon is brown, fine textured, with weak to strong subangular blocky structure. The depth of development is between 15 and 30 inches. The following is a description of a representative Davis soil profile of this area:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Dark brown (10YR 3/3) leaf mat. pH 6.3.
Ae	4	10.0	Very pale brown (10YR 7/4) very fine sandy loam, weakly platy, firm. pH 6.2.
AB	4	10.0	Light yellowish brown (10YR 6/4) silty clay loam, weak subangular blocky, firm. pH 6.0.
Bt	8	20.0	Yellowish brown (10YR 5/4) silty clay, strong, subangular blocky, firm. pH 5.6.
BCk	4	10.0	Dark yellowish brown (10YR 4/4) silty clay loam, subangular blocky, firm. pH 7.6.
Ck	at 22 below surface	at 55.0	Dark yellowish brown (10YR 4/4) silty clay loam often with light yellowish brown (10YR 6/4) very fine sandy loam to silt laminae. Moderately calcareous. pH 8.0.

Davis soils have prominent Ae and AB horizons that vary only slightly in thickness. The significant variations found in these soils are in the thickness of their Bt horizons and in the texture and degree of stratification in their parent materials. The parent materials range in texture from silt loam to silty clay loam and in degree of stratification from many laminae to none.

Davis soils are found in association with Tangent, Codesa, Wanham, Codner, Bison, and Eaglesham soils in this area.

Davis soils are presently under forest.

Tangent Series—Orthic Dark Gray Wooded

The Tangent soils occur adjacent to the Peace river in this area. There are approximately 9,200 acres in which these soils are predominant.

The surface horizons of the Tangent soils consist of a thin leaf mat resting on a dark grayish brown, friable, organic-mineral horizon underlain by a very pale brown, leached horizon. The subsurface horizon is brown, fine textured, and has a strong subangular blocky structure. The depth of development is between 15 and 30 inches. A description of a representative Tangent soil profile in this area follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Dark brown (10YR 3/3) leaf litter. pH 6.4.
Ahe	3	7.5	Dark grayish brown (10YR 4/2) silt loam, weak granular, friable. pH 6.3.
Ae	2	5.0	Very pale brown (10YR 7/4) very fine sandy loam, weak fine platy, firm. pH 6.0.
AB	2	5.0	Light yellowish brown (10YR 6/4) silty clay loam, weak subangular blocky, firm. pH 5.8.
Bt	6	15.0	Yellowish brown (10YR 5/4) silty clay, strong subangular blocky, firm. pH 5.6.
BCk	4	10.0	Dark yellowish brown (10YR 4/4) silty clay loam, weak fine subangular blocky, firm. pH 7.5.
Ck	at 19 below surface.	at 47.5	Dark yellowish brown (10YR 4/4) silty clay loam often with light yellowish brown (10YR 6/4) very fine sandy loam to silt loam laminae. Moderately calcareous. pH 8.0.

Tangent soils vary only slightly in the thickness of their L-H and Ahe horizons but show greater variations in the thickness of their Ae, AB, and Bt horizons. Tangent soils with a relatively high lime content often have strong brown horizons immediately above the lime contact horizon. The same degree of variations are found in the parent materials of these soils as those described for the Davis soils.

Tangent soils are found in association with Davis, Cadotte, Keg, Wanham, Codner, Bison, and Eaglesham soils.

Tangent soils of this area are used mainly for forest production. Only a very small acreage of these soils have been cleared for agricultural purposes.

2. Brown to grayish brown, weakly calcareous, variable, coarse textured materials that commonly have sandy strata of variable thickness.

The topography associated with this material, in this area, ranges from level to gently rolling.

Vegetation generally consists of sparse second growth aspen poplar with native shrubs and grasses.

Culp Series—Orthic Gray Wooded

Culp soils occur in this area mainly adjacent to the Peace river. There are approximately 78,700 acres in which these soils predominate.

Culp soils have a thin layer of leaf litter resting on a relatively thick, grayish, leached horizon. The subsurface horizon is yellowish brown in color, has a sandy texture and may be characterized by clay bands of variable thickness. The depth of profile development is from 20 to 30 inches. A description of a representative Culp soil profile for this area follows:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Dark brown (10YR 3/3) leaf litter. pH 6.2.
Ae	5	12.5	Light yellowish brown (10YR 6/4) loamy sand, weak platy, friable. pH 6.0.
AB	4	10.0	Yellowish brown (10YR 5/4) sandy loam, weak subangular blocky, firm. pH 6.0.
Bt	8	20.0	Yellowish brown (10YR 5/4) sandy clay loam, subangular blocky, firm. pH 5.8.
BC	8	20.0	Brown (10YR 5/3) sandy loam often with sandy clay loam laminae, weak granular, firm. pH 6.5.
Ck	at 27 below surface	at 67.5	Grayish brown (10YR 5/2) sandy loam with strata of loamy sand and often laminae of sandy clay loam. Weakly calcareous. pH 7.6.

Culp soils in this area have relatively thick Ae horizons that often show some additional development within these Ae horizons. However, this development has presently not advanced to the stage where the soils could be classified in the Bisequa subgroup. The Bt horizons of these soils may show varying degrees of banding.

Recent studies* of this banding showed it to be both pedogenic and depositional.

Culp soils are found in association with Leith, Wanham, Bison, and Eaglesham soils.

They are being used exclusively for forest production in this area.

Leith Series—Orthic Dark Gray Wooded

Leith soils of this area occur mainly adjacent to the Peace river. They are predominant soils in approximately 20,000 acres of this mapped area.

The surface horizons of the Leith soils consist of a leaf mat overlying a 4 inch, dark grayish brown, friable, organic-mineral horizon and a 3 inch, grayish, leached, loamy sand horizon. The subsurface horizon is brownish in color, sandy clay loam in texture, and may have some sandy clay loam banding. Development has proceeded to a depth of 20 to 30 inches in these soils. Following is a description of a representative Leith soil profile of this area:

Horizon	*Thickness* *in.*	*cm.*	*Description*
L-H	2	5.0	Dark brown (10YR 3/3) leaf mat. pH 6.0.
Ahe	4	10.0	Dark grayish brown (10YR 4/2) sandy loam, weak granular, friable. pH 5.7.
Ae	3	7.5	Pale brown (10YR 6/3) loamy sand, very weak platy, friable. pH 5.6.
AB	3	7.5	Brown (10YR 5/3) sandy loam, very weak subangular blocky, firm. pH 5.9.
Bt	8	20.0	Yellowish brown (10YR 5/4) sandy clay loam, subangular blocky, firm. pH 5.6.
BC	6	15.0	Brown (10YR 5/3) sandy loam often with sandy clay loam laminae, weak granular, friable. pH 6.4.
Ck	at 26 below surface	at 65.0	Grayish brown (10YR 5/2) sandy loam with strata of loamy sand and often laminae of sandy clay loam. Weakly calcareous. pH 7.6.

Surface horizons of the Leith soils are quite similar throughout this area. Their Bt horizons show the same general variability as described for the Culp soils.

Leith soils are found in association with Culp, Wanham, Bison, and Eaglesham soils.

These soils are presently under forest.

3. Brown to light yellowish brown, weakly calcareous, sand materials that are stratified and cross-bedded.

This material occurs in this area in the east-central portion adjacent to the Peace river and the lower areas of the Naylor hills complex.

The topography associated with this material is usually gently rolling to rolling and frequently composed of dunes.

* Coen, G. M., and Pawluk, S. 1966. The origin of bands in sandy soils of the Stony Plain area. Can. J. Soil Sci. 46, 245-254.

Vegetation found on this material generally consists of pine, aspen poplar, and grasses with black spruce and tamarack in the depressions between the dunes.

The soils developed on this material show a wide variety of profile characteristics not readily separable on the scale of mapping used.

Heart Complex—Undifferentiated Podzolic and Brunisolic

Heart soils occur in the east-central portion and in the Naylor hills of the west-central portion of the mapped area. They are predominant in approximately 74,500 acres.

Heart soils exhibit a variety of profile characteristics. Their surface horizons consist of a thin mat of leaf and grass litter underlain by a leached horizon that varies in color from brown to light gray. The subsurface horizon is loamy sand in texture, with a color ranging from strong brown to yellowish brown. The depth of profile development is from 16 to 30 inches. The following description is for a Heart soil profile in this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Very dark grayish brown (10YR 3/2) leaf mat. pH 6.0.
Ae	3	7.5	Light gray (10YR 7/1) sand, strong platy, very friable. pH 5.4.
Btfj	4	10.0	Brownish yellow (10YR 6/6) loamy sand, granular, friable. pH 6.1.
BC	8	20.0	Light yellowish brown (10YR 6/4) sand, weak granular, friable. pH 6.3.
C	at 18 below surface	at 45.0	Light yellowish brown (10YR 6/4) sand with darker colored strata and a few pebbles. Weakly calcareous. pH 6.5.

A variety of profiles have been developed on this material. Although these profile characteristics have been recognized, because of their complexity no attempts have been made to differentiate them on a series basis. All soils formed on sand materials in this area have been placed in the Heart complex.

Heart soils of this area are found in association with Teepee, Bison, Eaglesham, and Kenzie soils.

They are used for forest production in this area and they have a fairly good pasture potential for wildlife.

4. Brown to dark grayish brown, weakly calcareous, sandy loam to silty clay, comparatively recent water deposited materials of stream or river flood plains and terraces.

This material occurs along the major streams and rivers of the area.

The topography associated with this material is usually level to gently undulating except for the terraces which have very steeply sloping topography between the lower and upper levels.

Native vegetation consists of grasses with bluffs of aspen poplar, balsam poplar, and willows.

A wide variety of soils have developed on these materials. It was impracticable to show all the separations involved on the scale of mapping used for this area, but some of the soils have been separated and mapped as the Spirit River series and High Prairie complex.

Spirit River Series—Orthic Black

The Spirit River soils occur only at Paddle Prairie adjacent to the Boyer river in the northern portion of the mapped area. There are approximately 3,100 acres in which they predominate.

Spirit River soils usually have a 6 inch organic-mineral horizon that is very dark gray. The subsurface horizon is dark brown silty clay. The depth of development in these soils is between 25 and 35 inches. The following is a description of a representative Spirit River soil profile of this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
Ah	6	15.0	Very dark gray (10YR 3/1) loam, weak subangular blocky, friable. pH 6.6.
Btj	17	42.5	Dark brown (10YR 3/3) silty clay, subangular blocky, firm. pH 5.6.
Bm	9	22.5	Dark grayish brown (10YR 4/2) silty clay, subangular blocky, firm. pH 5.7.
Ck	at 32 below surface	at 80.0	Dark brown (10YR 4/3) silty clay, weakly calcareous. pH 7.6.

Profile characteristics of the Spirit River soils in this area vary only in the thickness of their Ah horizons which range from 4 to 12 inches.

They are found in association with Codner soils in this area.

These soils occur within the boundaries of the Metis Colony in this area and are being used for agricultural purposes.

High Prairie Complex—Gleyed Dark Gray and Black

The High Prairie soils of this area are found mainly on the flood plains adjacent to the Keg, Chinchaga, and Peace rivers. There are approximately 14,500 acres in which these soils predominate.

High Prairie soils are characterized by surface horizons consisting of a thin mat of leaf litter and a fairly thick organic-mineral horizon that is very dark grayish brown to dark grayish brown in color with a silty clay loam texture and granular structure. The subsurface horizon is brown in color with dark gray staining. It has a silty clay loam texture with firm subangular blocky structure. The degree of development in these soils is quite variable. A description of a representative High Prairie soil profile for this area follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Dark brown (10YR 3/3) leaf and grass litter. pH 6.3.
Ahe	5	12.5	Very dark grayish brown (10YR 3/2) with streaks and splotches of dark gray (10YR 4/1) silty clay loam, weak granular, friable. pH 5.7.
Btjg	8	20.0	Brown (10YR 5/3) silty clay, subangular blocky, firm. Splotched with dark gray (10YR 4/1). pH 5.5.
BCg	6	15.0	Dark brown (10YR 4/3) silty clay loam, subangular blocky, firm with brown (10YR 5/3) colorations. pH 6.1.
Ckg	at 21 below surface	at 52.5	Dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) very fine sandy and silty clay loam strata. Little uniformity in thickness of strata. Brown (10YR 5/3) colorations common. Weakly calcareous. pH 7.2.

The profile characteristics and degree of development in the High Praire soils are variable. The Ah-Ahe horizons range in color from black to dark grayish brown and in thickness from 4 to 8 inches. The Btjg horizons show weak to strong development and vary in thickness from 6 to 16 inches. Mottling is common in the Btjg horizons.

High Prairie soils are found in association with Codner, Goose, and Enilda soils.

These soils are being used for agricultural purposes where they are accessible in economical units. Otherwise, they are used for forest production.

Alluvium—Undifferentiated

Alluvium is found on river flats and terraces occurring adjacent to the major rivers which are often dissected by stream channels and oxbows. These areas are variable in size, in many instances too small to outline on this scale of mapping, and they are variable in texture ranging from gravel to silt loam. Thus, no attempt was made to differentiate the soils formed on these materials. There are approximately 42,500 acres of alluvium mapped in this area.

The predominant soils formed on these materials have a surface horizon consisting of about 3 inches of black silt loam. The underlying material is generally brown in color with variable strata of sand, silt, silty clay, and often gravel. A description of a Rego Black profile developed on alluvium in the vicinity of Carcajou follows:

Horizon	Thickness in.	Thickness cm.	Description
Ah	3	7.5	Black (10YR 2/1) silt loam, weak granular, friable. pH 6.8.
C	at 3 below surface	at 7.5	Variable strata of brown (10YR 5/3) silt loam, yellowish brown (10YR 5/6) fine sand, and grayish brown (10YR 5/2) silty clay. pH 5.7.

The profile characteristics of the soils developed on alluvium in this area are variable. There may or may not be an Ah horizon and, if present, it has been recorded as up to 10 inches in thickness. Weakly developed B horizons have been described in these soils, especially on upper terraces where flooding does not occur yearly. This parent material ranges in texture from gravels and sands on the flats to silt loams and silty clay loams on the higher terraces.

Alluvium is found in association with High Prairie, Belloy, Codesa, Enilda, Codner, and Eaglesham soils in this area.

Alluvium is being used for agricultural purposes on some of the flats of the Notikewin river and at Carcajou Point adjacent to the Peace river. The remainder of the alluvium areas are in forest production.

5. Brown to yellowish brown, weakly calcareous, medium to coarse textured materials that occur as a mantle, not less than 8 inches and usually not exceeding 18 inches in thickness, overlying finer textured materials of a different deposition.

This material has a wide distribution in this area but its major occurrence is in the central and southeastern portions of the mapped area.

Topography associated with this material ranges from level to gently rolling.

Vegetation is composed of a sparse woodland consisting of aspen poplar, pine, and willow with native shrubs and grasses.

Soils developed on this material usually have weakly developed eluviated and illuviated horizons, and there is often a thin gravelly layer at the contact between the two different materials. Series separations were not made on the basis of differences in underlying materials but the associated series provide a clue to the characteristics of this material.

Codesa Series—Orthic Gray Wooded

Codesa soils occur in the Naylor hills complex, in the central portion, and in the southeastern portion of the mapped area. They are the predominant soils in approximately 91,600 acres.

The surface horizons of Codesa soils consist of a thin mat of leaf litter underlain by grayish, medium to coarse textured, leached horizon. The subsurface horizon is generally brown in color, medium to coarse textured with weak structural development. Following is a description of a Codesa soil profile formed on relatively uniform sandy material that is underlain by lacustrine material:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Dark brown (10YR 3/3) leaf litter. pH 6.0.
Ae	4	10.0	Light brownish gray (10YR 6/2) loamy fine sand, weak platy, friable. pH 5.4.

Horizon	Thickness in.	Thickness cm.	Description
AB	4	10.0	Brown (10YR 5/3) loamy sand, weak subangular blocky, friable. pH 5.2.
Btj	6	15.0	Yellowish brown (10YR 5/4) sandy loam, weak subangular blocky, firm. Lenses of gravel common at contact with underlying horizon. pH 5.0.
II BC	at 16 below surface	at 40.0	Very dark grayish brown (10YR 3/2) clay, strong blocky, firm. Coarse material from the horizon above commonly forms a coating on the structural aggregates. pH 6.7.
II Cks	at 18 below surface	at 45.0	Very dark grayish brown (10YR 3/2) clay. Weakly calcareous and saline. pH 7.6.

The characteristics of the profiles of these soils vary in the thickness of the Ae and AB horizons and in the degree of development of the Btj horizons. The depth of this overlying material varies from 8 to 18 inches in this area. The classification of these soils is tentative and subject to change following further study.

Codesa soils are found in association with Belloy, Hazelmere, Falher, Peace River, Dixonville, Wanham, Snipe, Goose, Prestville, Eaglesham, and Kenzie soils.

The Codesa soils of this area are being used for forest production.

Belloy Series—Orthic Dark Gray Wooded

Belloy soils occur mainly in the east-central portion of the mapped area. These soils predominate in approximately 3,700 acres.

Belloy soils are distinguished from the Codesa soils by a prominent organic-mineral horizon immediately underlying the leaf mat. A description of a sandy Belloy soil profile follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Dark brown (10YR 3/3) leaf litter. pH 6.0.
Ahe	3	7.5	Dark grayish brown (10YR 4/2) sandy loam, weak granular, firm. pH 6.0.
Ae	2	5.0	Light brownish gray (10YR 6/2) loamy fine sand, weak platy, friable. pH 5.5.
AB	2	5.0	Brown (10YR 5/3) loamy sand, weak subangular blocky, firm. pH 5.7.
Btj	4	10.0	Yellowish brown (10YR 5/4) sandy loam, weak subangular blocky, firm. Often a gravel lens occurs at the contact with underlying horizon. pH 5.9.
II BC	at 13 below surface	at 32.5	Very dark grayish brown (10YR 3/2) clay, strong blocky, firm. Coarse materials from horizons above commonly form a coating on the structural aggregates. pH 6.8.
II Cks	at 15 below surface	at 37.5	Very dark grayish brown (10YR 3/2) clay. Weakly calcareous and saline. pH 7.6.

Profile characteristics of the Belloy soils vary with the texture of their materials. The surface L-H and Ahe horizons of these soils remain fairly constant as to thickness throughout the area.

Belloy soils are found in association with Codesa, Peace River, and Prestville soils.

The Belloy soils are being used for forest production in this area.

SOILS DEVELOPED ON GRAVELLY ALLUVIAL AND OUTWASH MATERIALS

1. Brown, weakly calcareous, coarse textured materials with alternating layers of coarse sand and gravel or gravel with cobbles.

This material occurs in shoreline remnants, old river channels, outwash, and terraces.

Topography associated with this material is quite variable consisting of low ridges, low knolls, and gently sloping single slopes.

Vegetation consists of aspen poplar and pine with native shrubs and grasses.

Figure 20—Gravel pit in a Clouston soil area near Carcajou.

Clouston Series—Orthic Gray Wooded

Clouston soils occur mainly on the terraces of the Peace river. These soils predominate in approximately 400 acres of the mapped area.

Clouston soils have surface horizons composed of a thin leaf mat underlain by a prominent, grayish, gravelly loamy sand, leached horizon. The subsurface horizon has a yellowish brown color and a gravelly loamy sand texture with a detectable firmness. The following is a description of a representative Clouston soil profile of this area:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Dark brown (10YR 3/3) leaf litter. pH 6.2.
Ae	5	12.5	Light gray (10YR 7/2) gravelly loamy sand, weak platy, friable. pH 5.6.
AB	4	10.0	Grayish brown (10YR 5/2) gravelly loamy sand, weak subangular blocky, friable. pH 5.4
Btj	12	30.0	Yellowish brown (10YR 5/4) gravelly sandy loam, weak subangular blocky, firm. pH 5.2.
BC	10	25.0	Brown (10YR 5/3) gravelly loamy sand, single grained, loose. pH 6.5.
Ck	at 33 below surface	at 82.5	Brown (10YR 5/3) gravelly and cobbly loamy sand. Lime present as an accumulation on the underside of the coarse fragments. pH 7.0.

The degree of profile development varies greatly in the Clouston soils from locality to locality. Although all of these soils have the same number and kind of horizons, there will be variations in their thicknesses of up to 6 inches.

Clouston soils are found in association with Codesa, Belloy, and Grouard soils.

The Clouston soils are used for commercial gravel and for forest production.

Grouard Series—Orthic Dark Gray Wooded

Grouard soils in this area are found mainly on terraces of the Peace river in association with other soils.

Grouard soils are distinguished from the Clouston soils by the presence of a prominent organic-mineral horizon immediately underlying the surface leaf litter. The subsurface horizon exhibits the same characteristics as those described for the Clouston soils. A description of a representative Grouard soil profile of this area follows:

Horizon	Thickness in.	Thickness cm.	Description
L-H	2	5.0	Dark brown (10YR 3/3) leaf litter. pH 6.2.
Ahe	3	7.5	Dark grayish brown (10YR 4/2) gravelly sandy loam, weak granular, friable. pH 6.0.
Ae	2	5.0	Light brownish gray (10YR 6/2) gravelly loamy sand, weak platy, friable. pH 5.6.
AB	3	7.5	Grayish brown (10YR 5/2) gravelly loamy sand, weak subangular blocky, friable. pH 5.4.
Btj	10	25.0	Yellowish brown (10YR 5/4) gravelly sandy loam, weak subangular blocky, firm. pH 5.3.
BC	8	20.0	Brown (10YR 5/3) gravelly loamy sand, single grained, loose. pH 6.6.
Ck	at 28 below surface	at 70.0	Brown (10YR 5/3) gravelly and cobbly loamy sand. Lime present as accumulations on underside of pebbles and cobbles. pH 7.0.

Grouard soils show a wide variation in the degree of profile development at different locations in the area. The classification of both the Clouston and Grouard series is tentative and subject to change with further study.

Grouard soils are found in association with Clouston, Codesa, and Belloy soils in this area.

Grouard soils are being used as a source of commercial gravel and for forest production.

SOILS DEVELOPED ON RESIDUAL AND MODIFIED RESIDUAL MATERIALS

1. Brown to light olive brown, acidic, coarse to medium textured materials that have a high proportion of weathered sandstone.

This material is found at the higher elevations in the Naylor and Hawk hills. It occurs as small areas many of which are too small to indicate on the scale of map used for this survey.

The topography associated with this material will range from very gently sloping to hilly.

Vegetation consists mainly of aspen poplar with native shrubs.

The soils formed from this material have a variety of profiles. Depending on location, they may have profiles that show little evidence of eluviation and illuviation or profiles showing strongly developed eluvial and illuvial horizons.

Teepee Complex—Undifferentiated Podzolic and Brunisolic

Teepee soils occur in the west-central portion of the mapped area at the higher elevations in the Naylor and Hawk hills. They are the predominant soils in approximately 9,000 acres. Where they are not the dominant soils but occur in association with other soils, no estimate is made of their extent.

Teepee soils usually have surface horizons consisting of a thin mat of leaf litter lying on a thin brownish organic-mineral horizon that is underlain by a pale brown to light brownish gray, leached, loamy sand horizon. The subsurface horizon is strong brown to yellowish brown in color and sandy loam in texture with weak blocky structure. The depth of development is from 10 to 20 inches. A description of the most commonly found Teepee soil profile in this area follows:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Dark brown (10YR 3/3) leaf mat. pH 5.5.
Ahe	2	5.0	Brown (10YR 5/3) sandy loam, weak granular, friable. pH 5.5.
Ae	3	7.5	Light brownish gray (10YR 6/2) loamy sand, weak platy, firm. pH 5.1.
Bfj	3	7.5	Yellowish brown (10YR 5/4) sandy loam, weak subangular blocky, firm. pH 5.3.
Btj	6	15.0	Brown (10YR 5/3) sandy loam, weak subangular blocky, firm. pH 5.2.
BC	4	10.0	Light olive brown (2.5Y 5/4) loamy sand, single grained, loose. pH 5.6.
C	at 20 below surface	at 50.0	Light olive brown (2.5Y 5/4) loamy sand, with sandstone fragments and layers. pH 5.6.

Teepee soil horizons vary in color and thickness to the extent that a single series classification would not satisfy all the profile characteristics exhibited by these soils.

They are found in association with Dixonville, Boundary, and Heart soils in this area.

Teepee soils are being used for tree production.

2. Olive gray to very dark gray, acidic, fine textured materials occurring in close association with gray shales that have veinlets of yellowish colored material along bedding planes.

This material is found in the Naylor and Hawk hills and the small hill west and north of Keg River Post. It occurs in small areas generally part way down the steeper slopes.

The topography associated with this material is gently sloping to hilly.

Vegetation consists usually of stunted aspen poplar with alder and various native shrubs.

Soils formed from this material have a fairly wide range of profile characteristics which show moderately strong to strong podzolic features.

Boundary Complex—Undifferentiated Podzolic

Boundary soils occur in the west-central portion of the mapped area at intermediate elevations in the Naylor and Hawk hills and on the small hill northwest of Keg River. They are the predominant soils in approximately 10,500 acres. Where they occur as a secondary soil in the map unit, no estimate is made of their extent.

Boundary soils have surface horizons composed of a thin leaf mat underlain by a grayish to whitish, leached horizon. The subsurface horizon is yellowish brown to strong brown in color with a silty clay texture and weak blocky structure. The depth of development is from 10 to 25 inches. The following is a description of a representative Boundary soil profile for this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	2	5.0	Dark brown (10YR 3/3) leaf mat. pH 4.6.
Ae	3	7.5	Grayish brown (10YR 5/2) silty clay loam, weak platy, firm. pH 4.6.
Btfj	4	10.0	Strong brown (7.5YR 5/5) clay, subangular blocky, firm. pH 4.2.
BC	3	7.5	Light olive brown (2.5Y 5/3) silty clay, weak subangular blocky, firm. pH 4.1.
C1	at 12	at 30.0	Light olive brown (2.5Y 5/4) silty clay, with shale fragments. Bedding planes of weathering shale often discernible. pH 3.9.
C2	at 18 below surface	at 45.0	Very dark gray (10YR 3/1) soft shale with silty clay texture that has yellow (5Y 7/6) streaks usually along bedding planes. pH 3.9.

The Boundary soil profiles in this area differ considerably in type of development. They exhibit a marked difference in clay

accumulation and in the amounts of accumulated iron and aluminum in their Btfj horizons. The degree of base saturation in these soils is also variable. It generally ranges between 15 and 50 percent.

These soils are found in association with Alcan, Dixonville, Teepee, and Hazelmere soils.

They are being used mainly for forest production.

POORLY DRAINED TO VERY POORLY DRAINED SOILS

Soils in which moisture in excess of field capacity remains in all horizons for a large part of the year or where free water remains at or within 12 inches of the surface most of the year.

SOILS DEVELOPED ON MODERATELY FINE TO VERY FINE TEXTURED MATERIALS

1. Brown to gray, weakly calcareous and weakly saline, gleyed, moderately fine to very fine textured materials.

The topography associated with these materials is level to depressional.

Vegetation consists of balsam poplar, willow, alder, dwarf birch, and coarse grasses.

Soils developed on these materials, under wet conditions, have characteristic dull colors and brownish to reddish colored mottles particularly in their upper horizons. They may have organic surface layers of 12 inches or less.

Snipe Series—Low Humic Eluviated Gleysol

Snipe soils are of common occurrence in the southern portion of the mapped area. They are found in the low, poorly drained locations of till, lacustro-till, and lacustrine areas. In this region, Snipe soils are mapped mainly as associates with the better drained soils and predominate in only about 4,000 acres.

Snipe soils have surface horizons consisting of a fairly thick organic mat over a thin organic-mineral horizon which is underlain by a grayish, mottled, leached horizon. The subsurface horizon is dull grayish colored clay with a firm subangular structure and a waxy appearance. The depth of development is from 25 to 35 inches. A description of a representative Snipe soil profile of this area follows:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	6	15.0	Dark brown (10YR 4/3) partially decomposed leaf and grass litter. pH 5.5.
Ahe	2	5.0	Dark grayish brown (10YR 4/2) silt loam, granular, friable. pH 5.5.
Aeg	4	10.0	Light gray (10YR 7/2) silt loam, platy, firm with yellowish brown (10YR 5/4) mottles. pH 5.2.
ABg	3	7.5	Grayish brown (10YR 5/2) silty clay loam, subangular blocky, firm, yellowish brown (10YR 5/4) mottles common. pH 4.9.

Horizon	Thickness in.	Thickness cm.	Description
Btg	10	25.0	Gray (10YR 5/1) clay, strong blocky, very firm. Aggregates have waxy appearance. pH 5.3.
BCg	6	15.0	Dark gray (10YR 4/1) clay, subangular blocky, firm. pH 6.9.
Cksg	at 31 below surface	at 77.5	Dark grayish brown (10YR 4/2) clay. Weakly calcareous and weakly saline. pH 7.5.

Snipe soils in this area show varying degrees of leaching depending upon the fineness of texture of their parent materials and the length of time exposed to conditions of a high water table. The L-H horizons range in thickness from 3 to 6 inches but are often absent in burned-over areas. The Aeg horizons are also variable as to thickness and the degree of mottling. The depth of gleying within the profile varies considerably and is difficult to detect in the parent materials.

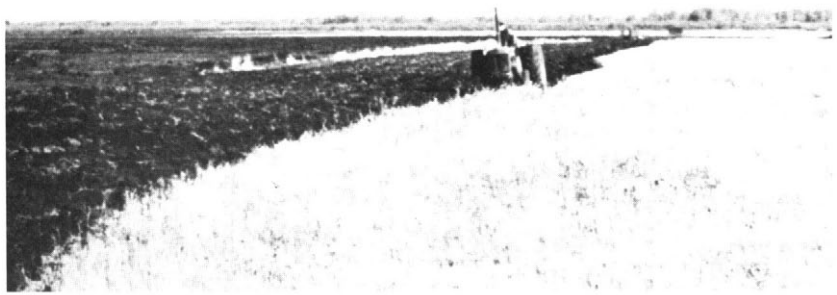


Figure 21—Cultivation in a Keg soil area near Keg River.

Snipe soils are associated with the Alcan, Dixonville, Hazelmere, Albright, Nampa, Falher, Notikewin, Cadotte, and Peace River soils.

Snipe soils are being used for forest production and for agricultural production when they appear as small areas along with the better drained soils that are presently being cultivated.

Keg Series—Orthic Gleysol

Keg soils are of common occurrence in the central and northern portions of the mapped area. They are found in the low, poorly drained areas within the larger areas of better drained soils developed on till, lacustro-till, and lacustrine materials. They are the predominant soils in approximately 57,300 acres. No estimate

of their extent is made in areas where they are of secondary importance.

Keg soils have a surface layer of leaf and grass litter that is generally about 2 inches in thickness. Frequently they have a thin Ah or AB horizon that rarely exceeds a thickness of 2 inches. The B horizon is a very dark gray clay and has a strong subangular structure. The depth of development is from 10 to 20 inches. The following is a description of a representative Keg soil profile for this area:

Horizon	*Thickness* *in.*	*cm.*	*Description*
L-H	2	5.0	Very dark grayish brown (10YR 3/2) leaf and grass litter. pH 7.2.
Bg	8	20.0	Very dark gray (2.5Y 3/0) clay, strong subangular blocky, very firm. Aggregates have dark coatings. pH 7.0.
Cg	at 10 below surface	at 25.0	Very dark brown (10YR 2/2) clay.

The profile characteristics of the Keg soils are quite similar but vary somewhat in color and texture between parent materials. Their L-H horizons are generally uniform in composition and thickness throughout the whole of the area. The most noticeable variations are in the color and thickness of the Bg horizons of these soils. These soils differ from Goose soils by their relatively thin or absent Ah horizon.

Keg soils are found in association with the Dixonville, Nampa, Falher, Notikewin, Cadotte, Peace River, Goose, Prestville, Eaglesham, and Kenzie soils of this area.

Keg soils are being used mostly for forest production. However, areas of these soils are being broken for agricultural purposes in the vicinity of Keg River and are used successfully when drainage is improved.

Goose Series—Orthic Humic Gleysol

Goose soils are of common occurrence throughout the mapped area. They are found in depressional areas and in seepage areas developed on till, lacustro-till, and lacustrine materials. They are the dominant soils in approximately 43,100 acres.

Goose soils usually have surface horizons composed of a 2 inch mat of grass and leaf litter overlying a 6 inch organic-mineral horizon that is very dark grayish brown in color. The subsurface horizon is dark gray clay with a massive structure. The solum is between 15 and 25 inches thick. A description of a representative Goose soil profile of this area follows:

Horizon	*Thickness* *in.*	*cm.*	*Description*
L-H	2	5.0	Dark brown (10YR 3/3) grass and leaf mat. pH 7.4.
Ah	6	15.0	Very dark grayish brown (10YR 3/2) clay loam, granular, friable. pH 7.4.

Horizon	Thickness in.	Thickness cm.	Description
Bg	12	30.0	Dark gray (10YR 4/1) clay, massive, plastic when wet and very hard when dry. pH 6.7.
Cg	at 20 below surface	at 50.0	Dark gray (5Y 4/1) clay. pH 6.8.

Figure 22—Soil profile of the Goose series near Keg River.

The profile characteristics of the Goose soils are similar on like materials. Their organic and organic-mineral horizons are relatively constant throughout the area but their Bg horizons show considerable differences in thickness and degree of development. Some of these soils exhibit well developed ABg horizons with Bg horizons that possess strong blocky structure. Mottling is present in these soils when it is not masked by dark colors.

Goose soils are found in association with the Dixonville, Hazelmere, Albright, Nampa, Falher, Notikewin, Cadotte, Peace River, Keg, Prestville, Eaglesham, and Kenzie soils.

They are being used in some portions of the area for pasture and grain crop production.

Prestville Series—Orthic Humic Gleysol

Prestville soils occur commonly throughout this area. They are found generally in the depressions of till, lacustro-till, and lacustrine areas. These soils are predominant in approximately 101,500 acres.

Prestville soils have surface horizons characterized by the accumulation of about 10 inches of peat overlying a thin, very dark brown organic-mineral horizon. The subsurface horizon is a dark gray, massive, clay. The solum is from 20 to 30 inches thick. Following is a description of a representative Prestville soil profile of this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-F	10	25.0	Brown (10YR 4/3) grading to dark brown (10YR 3/3) with depth, raw and semidecomposed peat. pH 7.0.
Ah	2	5.0	Very dark brown (10YR 2/2) silty clay loam, granular, friable. pH 7.2.
Bg	12	30.0	Dark gray (10YR 4/1) clay, massive, plastic when wet and very hard when dry. pH 6.7.
Cg	at 24 below surface	at 60.0	Dark gray (10YR 4/1) clay. pH 6.8.

The surface organic horizons of the Prestville soils exhibit a range in thickness from 6 to 12 inches, varying degrees of decomposition, and a composition that varies from sphagnum mosses to sedges and grasses. This feature serves to distinguish these soils from Goose and Keg soils. A number of these soils, depending upon the composition of their parent materials, will show well developed ABg horizons and Bg horizons that have strongly developed blocky structure.

Prestville soils are found in association with the Dixonville, Hazelmere, Albright, Nampa, Falher, Notikewin, Snipe, Keg, Goose, Eaglesham, and Kenzie soils.

Prestville soils are being used for pasture and hay production.

SOILS DEVELOPED ON COARSE TO MEDIUM TEXTURED MATERIALS

1. Pale brown to gray, weakly calcareous, gleyed, coarse to medium textured materials.

The topography associated with these materials is level to depressional.

Vegetation consists of balsam poplar, willow, dwarf birch, and coarse grasses.

Soils developed on these materials, under conditions of poor to very poor drainage, show characteristic dull colors often with brownish to reddish mottles. They may have organic surface layers of 12 inches or less in thickness.

Wanham Series—Low Humic Eluviated Gleysol

Wanham soils are common in the east-central portion of the mapped area in association with the better drained soils developed on alluvial and aeolian materials. They are the predominant soils in approximately 2,000 acres.

Wanham soils usually have surface horizons consisting of a 4 inch mat of leaf and grass litter resting on a thin, very dark brown, organic-mineral horizon that is underlain by a light gray, iron stained, leached, very fine sandy loam horizon. The subsurface horizon is dark grayish brown silty clay with yellowish brown mottles. The solum is from 20 to 30 inches thick. Following is a description of a representative Wanham soil profile of this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-H	4	10.0	Dark brown (10YR 4/3) leaf and grass litter. pH 6.0.
Ah	2	5.0	Very dark brown (10YR 2/2) silt loam, granular, friable. pH 6.0.
Aeg	4	10.0	Light gray (10YR 7/2) very fine sandy loam, platy, firm. Yellowish brown (10YR 5/4) mottling. pH 5.2.
ABg	3	7.5	Grayish brown (10YR 5/2) silty clay loam, subangular blocky, firm. Yellowish brown (10YR 5/4) mottling. pH 5.1.
Btg	6	15.0	Dark grayish brown (10YR 4/2) silty clay, coarse subangular blocky, firm. Yellowish brown (10YR 5/6) mottling. pH 5.6.
BCg	4	10.0	Gray (5Y 5/1) silty clay loam, subangular blocky, firm. Yellowish brown (10YR 5/6) mottling. pH 6.8.
Ckg	at 23 below surface	at 57.5	Gray (5Y 5/1) silt loam with yellowish brown (10YR 5/6) mottles and streaks. Occasional laminae of very fine sandy loam. Weakly calcareous. pH 7.6.

Profile characteristics of the Wanham soils are relatively similar throughout the area with the exception of texture which will range from silt loam to sandy loam.

Wanham soils are associated with the Culp, Leith, Davis, Tangent, Codner, and Bison soils.

They are presently being used for forest production.

Enilda Series—Orthic Humic Gleysol

Enilda soils occur in the northwest portion of the mapped area in the vicinity of Keg River. They are found in association with better drained soils on relatively recent flood plains and predominate in about 3,300 acres.

These soils have surface horizons consisting of 2 inches of leaf and grass litter underlain by an organic-mineral horizon generally about 4 inches in thickness. The subsurface horizon is brown in color with dark gray splotches and silty clay in texture. Usually,

profile development is weak and the identification of the B horizon is often doubtful. The C horizon consists of variable, stratified material in which evidence of buried horizons is common. A description of a representative Enilda soil profile for this area follows:

Horizon	*Thickness* *in.*	*cm.*	*Description*
L-H	2	5.0	Dark brown (10YR 3/3) leaf and grass mat. pH 7.2.
Ah	4	10.0	Very dark grayish brown (10YR 3/2) silty clay loam, granular, friable. pH 7.0.
Bg	10	25.0	Grayish brown (10YR 5/2) with splotches of dark gray (10YR 4/1) silty clay, subangular blocky, firm. pH 6.8.
Ckg	at 16 below surface	at 40.0	Dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) very fine sandy and silty clay loam strata with yellowish brown (10YR 5/4) mottling. pH 7.0.

These soils show only very slight variation in their profile characteristics. The most noteworthy variation is in the thickness of their Ah horizons which range between 3 and 5 inches.

Enilda soils are found in association with the High Prairie and Belloy soils.

They are being used mainly for agricultural purposes.

Codner Series—Orthic Humic Gleysol

Codner soils occur adjacent to the Peace river in association with the better drained soils developed on alluvial and aeolian materials. They are the predominant soils in approximately 2,900 acres.

Codner soils usually have a layer of plant remains overlying a very dark gray organic-mineral horizon. The subsurface horizon is dark grayish brown silty clay loam with yellowish brown mottling. The solum is from 15 to 25 inches thick. A description of a representative Codner soil profile of this area follows:

Horizon	*Thickness* *in.*	*cm.*	*Description*
L-H	6	15.0	Very dark brown (10YR 2/2) semidecomposed plant remains. pH 5.8.
Ah	3	7.5	Very dark gray (10YR 3/1) loam, granular, friable. pH 5.7.
ABg	3	7.5	Dark gray (10YR 4/1) silt loam, weak subangular blocky, firm. Yellowish brown (10YR 4/2) mottling. pH 5.8.
Btjg	6	15.0	Dark grayish brown (10YR 4/2) silty clay loam, weak subangular blocky, firm. Strong brown (7.5YR 5/6) mottling. pH 5.8.
Ckg	at 18 below surface	at 45.0	Gray (10YR 4/1) silt loam with laminae of silty clay and sandy loam. Reddish brown (5YR 5/4) mottling. Weakly calcareous. pH 7.2.

The surface horizons of the Codner soils vary quite considerably in thickness throughout the area. The remaining horizons

in the profile are relatively similar in their characteristics except for the variation in texture that is common in soils developed on these materials.

Codner soils are found in association with the Culp, Leith, Davis, Tangent, Wanham, and Bison soils in this area.

They are presently being used for forest and pasture purposes.

Bison Series—Orthic Humic Gleysol

Bison soils are found in depressional and seepage areas developed on alluvial and aeolian materials. They are the predominant soils in approximately 1,700 acres.

Bison soils have surface layers comprised of a relatively thick accumulation of moss or sedge peat lying over a very dark brown organic-mineral horizon. The subsurface horizon is a gray silt loam with strong brown mottles. The solum is from 20 to 30 inches thick. The following is a description of a representative Bison soil profile of this area:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L-F	10	25.0	Brown (10YR 4/3) grading to dark brown (10YR 3/3) with depth, raw and semidecomposed peat. pH 5.8.
Ah	2	5.0	Very dark brown (10YR 2/2) silt loam, granular, friable. pH 5.8.
Bg	14	35.0	Gray (10YR 5/1) silt loam, often with strong brown (7.5YR 5/6) mottles. Sticky when wet and very firm when dry. pH 5.8.
Cg	at 26 below surface	at 65.0	Gray (10YR 5/1) silt loam with laminae of silty clay and sandy loam. pH 6.8.

The surface L-F horizons of these soils range in thickness from 6 to 12 inches and are composed of sphagnum mosses, or sedges and grasses. The degree of decomposition of the materials of these horizons, especially the lower portions, vary quite considerably from area to area. The underlying horizons of these soils are relatively similar throughout and resemble those of Codner soils.

Bison soils are found in association with the Culp, Leith, Davis, Tangent, Wanham, and Codner soils of this area.

They are presently being used for forest production and to some extent for pasture purposes.

SOILS DEVELOPED ON ORGANIC MATERIALS

Soils containing more than 30 percent organic matter with a thickness of more than 12 inches of consolidated or 18 inches of unconsolidated, coarse to fine, peaty material. The reaction of these materials ranges from strongly acid to alkaline.

For this survey, these soils were separated into two complexes on the basis of the dominant characteristics of the accumulated peat.

Eaglesham Complex—Sedge Peat

Eaglesham soils are composed of dark brown to black fibrous peaty materials derived from the remains of sedges and grasses. They have a wide distribution in this area and are the predominant soils in approximately 60,700 acres. In addition, there are numerous small areas that are too small to indicate on the accompanying soil map.

The profile of Eaglesham soils is made up of layers of peat that are distinguishable from one another by composition, color, and degree of decomposition. This peat material rarely exceeds a depth of 30 inches in this area. A description of an Eaglesham soil profile of this area follows:

	Thickness		
Horizon	*in.*	*cm.*	*Description*
L	10	25.0	Dark brown (10YR 3/3) easily discernible sedge and grass remains. pH 5.8.
F	6	15.0	Very dark brown (10YR 2/2) partially decomposed sedge and grass remains. May be wet. pH 6.8.
H	4	10.0	Black (10YR 2/1) well decomposed peat. Plant remains not recognizable. Usually wet. pH 7.3.
II Ckg	at 20 below surface	at 50.0	Gray (5Y 6/1) clay, massive, plastic. Numerous rusty stains and streaks. Weakly calcareous. pH 7.2.

The Eaglesham soils of this area are noticeably shallower than comparable soils farther south. The thickness and frequency of the different layers, as well as their position within the profile of these soils, are extremely variable from one bog area to another.

Eaglesham soils are found in association with all soil series and complexes. They develop in the very poorly drained areas irrespective of the kind of underlying mineral materials.

Eaglesham soils in their native state are being used for pasture purposes and cutting of grasses for hay. They also play an important role in the storage and conservation of groundwater.

Kenzie Complex—Moss Peat

Kenzie soils are composed of brown to dark brown, coarse peaty materials consisting predominantly of sphagnum moss. They have a wide distribution in this area and are the predominant soils in approximately 145,000 acres in areas large enough to outline on the accompanying soil map.

The profile of Kenzie soils is made up of layers of peat differing in color, composition, and degree of decomposition with usually the darkest, more highly decomposed layers at depth. The thickness of the peat materials is quite variable and in this area generally does not exceed a depth of 48 inches. A description of a Kenzie soil profile for this area follows:

Horizon	Thickness in.	Thickness cm.	Description
L	12	30.0	Dark brown (10YR 4/3) undecomposed moss, leaf and root remains. pH 4.7.
F	8	20.0	Brown (10YR 5/3) partially decomposed peat containing recognizable remains of mosses and roots with occasional thin layers of fine peat. pH 4.3.
H-F	6	15.0	Dark brown (10YR 3/3) fairly well decomposed peat with some recognizable plant remains. pH 4.6.
H	4	10.0	Dark brown (10YR 3/3) well decomposed peat. Plant remains not recognizable. pH 4.8.
II Ckg	at 30 below surface	at 75.0	Gray (10YR 6/1) clay, rusty stains and streaks common. Weakly calcareous. pH 7.0.

The Kenzie soils are generally wet to within a few inches of the surface and in many of the tree covered portions of these bogs ice may be encountered at depths within 24 inches of the surface during the summer months. The thickness and frequency of the various layers common to these soils are extremely variable from one bog to another. The depth of peat is also variable and in general may not be as thick as in similar bogs south of this area. The peat materials forming these bogs are generally acid in reaction.

Kenzie soils of this area are associated with all soil series and complexes. They develop in the very poorly drained areas irrespective of the kind of underlying mineral materials.

Kenzie soils play an important role in the storage and conservation of groundwater.

LAND USE

Soil properties exert a strong influence on the way in which man uses land. Soils are an irreplaceable resource, and the mounting pressures being placed upon land by man are making this resource more and more valuable. A need exists, therefore, to investigate not only how land and soils are presently used but how they can best be used and managed. This requires the interpretation of soil survey data for land use planning. Proper interpretation of soil survey data will permit preliminary assessment of:

(a) soil-plant relationships for agricultural and non-agricultural uses;

(b) the properties of soils affecting the development and selection of desirable areas for residential, commercial, industrial, agricultural, and recreational uses;

(c) the suitability and limitations of soils for engineering applications, such as sewage disposal facilities, drainage systems, water storage reservoirs, highways, railroads, airports, pipelines, and other transportation facilities; and

(d) the location of potential sources of sand, gravel, and other mineral resources.

Agricultural and other uses, productivity rating, and some of the physical characteristics significant to engineering use of the soils in the Hotchkiss and Keg River area are indicated in the following:

Figure 23—New breaking in the Hotchkiss area.

AGRICULTURE

History

The first attempt at agriculture in this area was made on the river flat near the junction of the Wolverine and Peace rivers. Macoun[1] reported in 1903 that some Metis had a few acres under cultivation at this location.

In 1919 Mr. Frank Jackson[2] settled in the Keg River area as a cattle rancher but he made no attempt at crop production until 1931. Farming on a small scale has been carried out at Carcajou, on the river flats, since 1925.

The first major attempt at agriculture in this area was made in 1929, in the Hotchkiss area. Settlement progressed rather slowly beyond this area and did not reach the Keg River area until 1935 with the extension of the highway north of Hotchkiss.

During the period 1939-1946, the Alberta Department of Welfare reserved 18 townships for a Metis colony in the vicinity of Paddle Prairie. At present, the 50 families (358 persons) comprising this colony have 3,500 acres broken for agricultural purposes with 2,200 acres under crop and have 200 head of cattle.

The second major attempt at agriculture in this area occurred in 1955-1956 mainly in the Hawk Hills and Keg River area, and since then there has been a gradual but steady increase in settlement in this area as indicated by census data in Table 5.

1. Report on the Peace River Region, Geological Survey of Canada, Annual Report 1903, Vol. 15, part E, 1904.
2. Private communication.

TABLE 5—Population and Occupied Farms, 1951-1966

Year	Population	Occupied Farms
1951	853	—
1956	1,085	266
1961	1,109	262
1966	1,500	350

Development

The three major factors to be considered in the development of agriculture in this area are: (1) removal of tree cover, (2) water supply, and (3) climate.

Tree cover removal is a major obstruction to agricultural development in this area. However, through the use of power equipment tree cover can be removed rapidly and efficiently. The costs of clearing, piling, and breaking vary with the size and density of the tree cover, the equipment used, and the efficiency of the operator. Present custom charges average between $20.00 and $30.00 per acre for clearing and piling, and $10.00 per acre for breaking. Areas of light tree cover can be cleared at the rate of 4 acres per hour, whereas in areas of heavy tree cover the rate of clearing may not exceed 1 acre per hour. The distribution of tree cover in this area is indicated in Figure 24.

The domestic supply of water for this area comes from stored surface water and from streams. In most cases, the settlers have to resort to reserves of water stored in dug-outs or small earthern dams across drainage courses. Dug-outs and dams appear to be satisfactory sources of water supply provided they are properly constructed, well maintained, and suitably situated. Plans for the construction of suitable dug-outs can be obtained from District Agriculturists.

The climatic conditions of this area are considered marginal for the growing of wheat. A summary of the data published by the Meteorological Branch shows the major portion of this area has a growing season of less than 1,800 degree-days above 42F°[1], and less than 75 frost-free days. The short growing season and the occasional occurrence of summer frosts place severe restrictions on agriculture in this area. However, day length has not been taken into consideration in this summary and the rapid growth of plants in this area during the long days has often been stressed. What weight should be given to day length has not yet been established even for grasses. In addition to somewhat severe temperature conditions, the area is at times subject to a moisture deficiency. The meteorological summary shows the annual precipitation to be between 14 and 16 inches with an annual water deficiency of between 4 and 6 inches. These moisture conditions are considered adequate for the growing of wheat, oats, and barley but the distribution of

1. Degree-days above 42°F is a combination of the length of growing period and mean daily temperature to give an index which is used as a cumulative measure of the growing period. The degree-days above 42°F for Alberta range from 2,750 in the south to less than 1,750 in the north.

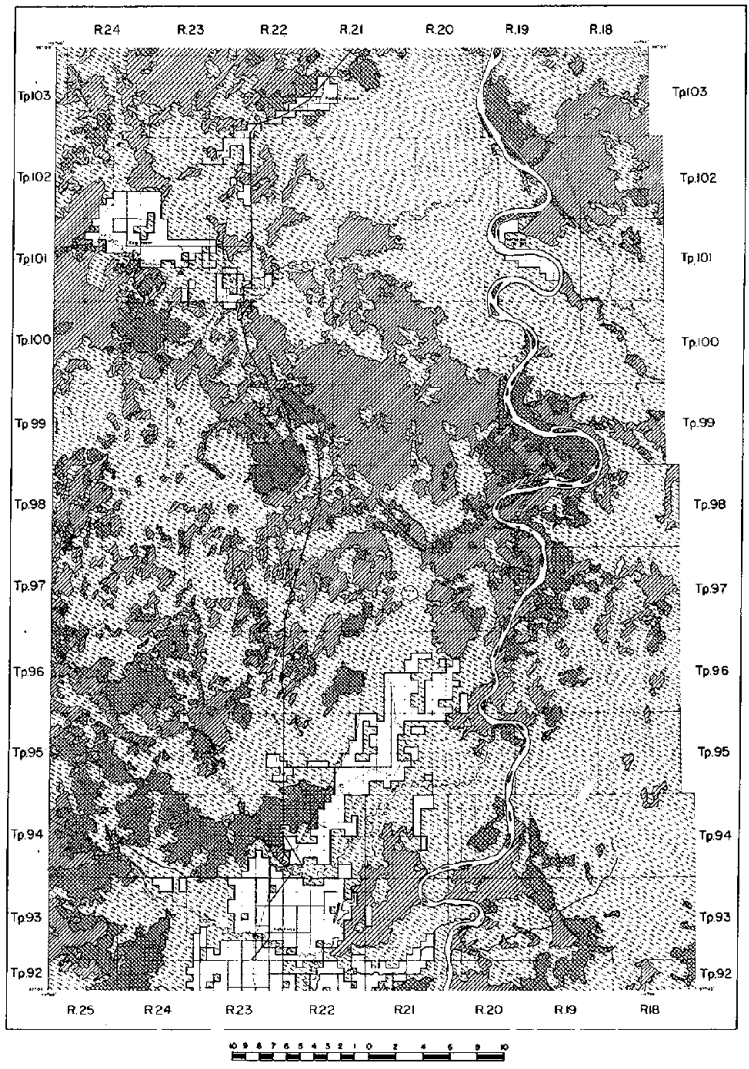


Figure 24—Map showing the relative distribution of tree cover in the mapped area at the time of survey.

Figure 25—Tree cover of this size and density poses a problem in the improvement of areas considered suitable for development.

Figure 26—Areas with this type of tree cover are being developed for agricultural use.

this moisture during the growing season is extremely irregular. Usually, only once in about 5 years does the precipitation fall during the period essential for good crop yields. Thus, the combination of temperature and precipitation distribution is a major factor for consideration in the development of this area for agriculture.

Present Agriculture

Grain farming is presently the dominant type of farming in this area. Census data (Table 7) show wheat, oats, barley, flax, and

hay to be the major crops grown with the acreage sown to wheat far in excess of other crops. However, there is some doubt as to the feasibility of wheat production in many portions of this area due to the frost hazard. The acreage sown to hay crops has been increasing, providing a trend considered desirable for this area.

TABLE 6—Acreages of Principal Crops, 1956-1966

Year	Wheat	Barley	Oats	Flax Seed	Mixed Grains	Tame Hay
1956	14,850	7,802	7,468	7,586	265	4,379
1961	15,500	8,247	6,028	3,115	331	8,790
1966	25,350	12,540	3,995	5,425	530	9,730

For the period 1963 to 1966, the average crop yields for Census Division 15, of which this area is a part, as determined by the Farm Economics Branch, Province of Alberta are shown in Table 7.

TABLE 7—Average Yields of Crops for Census Division 15

Crop	Yields			
	1963	1964	1965	1966
Wheat	10.4 bu./ac.	22.8 bu./ac.	18.1 bu./ac.	21.9 bu./ac.
Barley	15.1 "	30.5 "	24.1 "	31.8 "
Oats	26.4 "	46.4 "	30.3 "	39.8 "
Flax	6.5 "	10.8 "	8.6 "	9.9 "
Rape	9.5 "	13.7 "	9.1 "	14.0 "
Hay	1.05 tons/ac.	1.72 tons/ac.	1.46 tons/ac.	1.35 tons/ac.

Since 1956 agriculture has made fairly rapid progress in this area as evidenced by the census data (Table 8) for occupied and improved acreages. The data show a marked increase each year in both occupied and improved acreages.

TABLE 8—Acres Occupied and Acres Improved, 1956-1966

Year	Acres Occupied	Average Acres per Farm	Acres Improved	Percentage of Land Improved
1956	114,790	430	64,169	55
1961	128,990	492	74,750	58
1966	152,200	435	90,570	59

The cultivation map (Figure 27) shows the distribution of cultivation at the time of the survey. The largest portion of the cultivated acreage is in the southern portion of the area. Smaller acreages are located in the vicinity of Keg River, Paddle Prairie, and Carcajou.

The livestock population for this area is comparatively small as shown by the census data in Table 9.

TABLE 9—Livestock Population, 1956-1966

Year	Horses	Cattle	Sheep	Swine	Poultry
1956	296	2,298	181	2,083	16,411
1961	203	3,262	441	2,893	14,098
1966	160	3,270	260	1,230	12,400

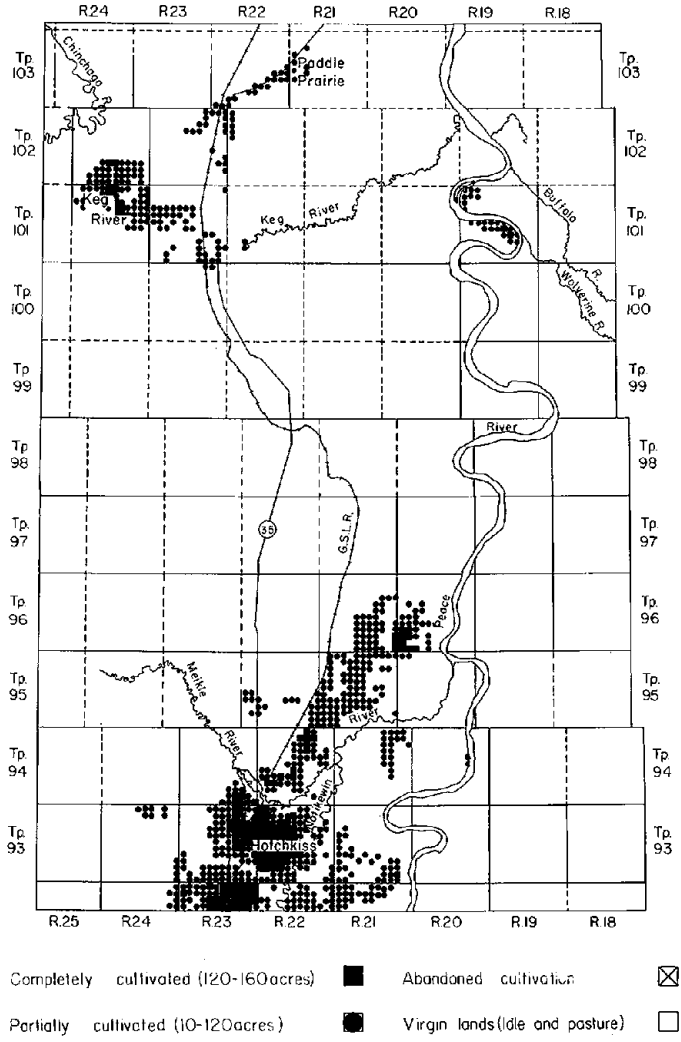


Figure 27—Map showing the cultivated and virgin lands in the mapped area at the time of survey.

Soil Management

Soil management studies are being conducted by the Beaverlodge Research Station, Canada Department of Agriculture, and by the Alberta Department of Agriculture to provide guidance in the management of the soils in this region for agricultural production. From such studies, supplemented by those of the Department of Soil Science, The University of Alberta, and of the members of the Western Canada Fertilizer Association, the Alberta Soils Advisory Committee has published a "Guide to Fertilizer Use in Central and Northern Alberta" (Alberta Department of Agriculture—Publication 541-2). This Guide deals with fertilizer application recommendations which should be considered in a management programme for this area.

Generally it is recommended that the successful management of the soils in this region should involve consideration of crop rotations supplemented by applications of recommended fertilizers. This is particularly true of most of the Gray Wooded soils common to this region. Further studies by the Beaverlodge Research Station show that in the case of some soils (e.g. Boundary) which are characterized by pronounced acid reactions, liming is not recommended. Instead, satisfactory production can be achieved by a suitable fertilizer programme and by the choice of tolerant crops. These studies show that in such soils, applications of 40 to 60 lbs. of nitrogen per acre are required for cereal crops seeded on stubble or about 20 to 30 lbs. of nitrogen per acre for crops seeded on summerfallow. In addition, about 25 lbs. of phosphate per acre should be included to meet the requirements of cereal crop production.

In addition, a further guide to fertilizer use can be obtained by taking representative soil samples and forwarding them to the Alberta Soil and Feed Testing Laboratory, The University of Alberta. In accordance with the instructions provided, soil tests can provide valuable guidance in making sound soil management decisions.

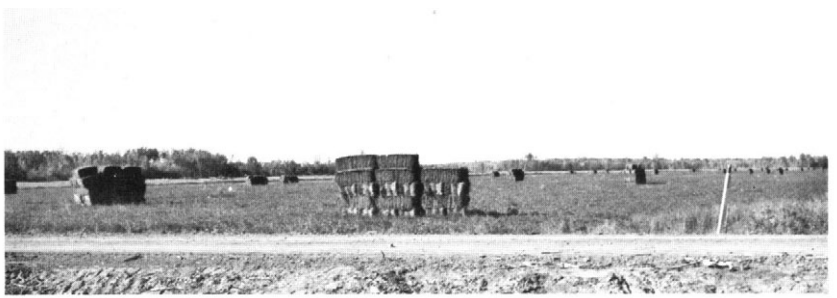


Figure 28—Grass production for fodder has shown a substantial increase in the past decade, a trend considered advisable for this area.

Productivity Rating

Soils may be grouped into productivity groups for the purpose of distinguishing the better land from the poorer land providing a guide to agricultural development.

A productivity rating is essentially an interpretation of the morphology of the soil and the physical characteristics of the area as they affect plant growth and land use. Such factors as type of soil profile, soil texture, degree of stoniness, topography, and elevation are all taken into consideration. But, factors such as hail incidence, frost hazard, and distance from markets are not considered. Past performance of somewhat similar soils under the prevailing grain cropping system of management is used as a guide.

It should be noted, however, that for this area it is assumed that climatic limitations preclude consideration of soils occurring at elevations exceeding about 2,000 feet in the southern portion, grading to those occurring at elevations exceeding about 1,600 feet in the northern portion for the production of grain crops.

Based on these considerations, the soils of this area have been grouped into 5 productivity groups: 1 nonarable and 4 arable, in accordance with their suitability for grain production. This information is presented in map form and accompanies this report.

The soil rating map should be regarded as presenting average ratings of soil areas because most soil areas consist of more than one soil series and each of these soil series may have a different soil rating. In addition, no attempt is made to subdivide the pasture lands according to carrying capacity since there is a marked variability in the density of the native tree cover. Following is the approximate acreage of each of the productivity groups as outlined on the accompanying soil rating map:

P. & W.	Pasture and woodland—nonarable land	900,000
Group 4.	Poor to fair arable land	145,000
Group 5.	Fair to fairly good arable land	676,000
Group 6.	Fairly good to good arable land	215,000
Group 7.	Good to very good arable land	8,000

It should be recognized that, with the continuing improvements in farm management practices, the introduction of new varieties of farm crops, and increased use of commercial fertilizers, the productivity capacity of these soils will undoubtedly rise and a shift in the present proposed limits for the productivity groups may be necessary.

Soil Capability Classification

The grouping of soils into capability classes for agriculture is one of a number of interpretive groupings that may be made from soil survey data. Such a grouping or classification is not a guide to the most profitable use of land but a guide to better land use. It is used most commonly for planning in specific areas.

The classification is based on the effects of combinations of

climate and soil characteristics, on limitations in use of the soils for agriculture, and their general productive capacity for common field crops. Soils within a capability class are similar with respect to degree but not necessarily to kind of limitations in soil use for agricultural purposes. Factors such as adverse climate, undesirable soil structure or low permeability, erosion, low fertility, inundation by streams or lakes, moisture limitation, salinity, stoniness, consolidated bedrock, adverse soil characteristics, topography, and excess water are considered as important criteria in limiting agricultural use. But, factors such as distance to market, kind of roads, location, size of farms, characteristics of land ownership and cultural patterns, and the skill or resources of individual operators are not considered as criteria for capability groupings.

In the classification of soils for agricultural capabilities, the mineral soils are grouped into seven classes according to their potentialities and limitations for agricultural use. The first three classes are considered capable of sustained production of common cultivated crops, the fourth is marginal for sustained agriculture, the fifth is capable of use only for permanent pasture and hay, the sixth is capable of use only for wild pasture, and the seventh class is for soils and land forms considered incapable of use for agriculture or permanent pasture.

The capability classification of the soils of this area for agricultural purposes will be published in colored map form and may be purchased from the Queen's Printer, Ottawa, when it becomes available.

FORESTRY

The demand for forest products up to about 1940 was largely confined to meet the settlers' needs for housing and heating. Following the construction of the Mackenzie highway there was a marked increase in lumbering activity in this region.

The removal of commercial timber, in Alberta, is controlled by a quota system which allocates a percentage of allowable cut in each management unit. Selective cutting and natural reforestation is maintained to ensure a future supply of commercial timber. White spruce and pine are the principal tree crops harvested in this region.

During the period 1960 to 1965 the average annual production and the projected production for the period 1965 to 1970 for the two management units from which this area draws its lumber supply are shown in Table 10.

TABLE 10—Lumber Production in and Adjacent to the Hotchkiss and Keg River Area

Management Unit	Average Production F.B.M.* 1960-1965	Projected Production F.B.M. 1965-1970
P6	11,500,000	14,500,000
P10	5,800,000	6,000,000
Total	17,300,000	20,500,000

*Feet board measure

Studies are underway to relate soil characteristics to tree growth. It is anticipated that such studies will permit a grouping of soils based on productivity for forest crops.

WILDLIFE

Animals native to this region are numerous both in terms of species and number of individuals. Moose is the most abundant big-game animal in the region while woodland caribou frequent some of the more secluded areas. Both mule and white-tailed deer frequent the area but these species undergo periodic devastation due to winter cold and deep snow. The influx of settlement in this region has generally reduced the ranges of the indigenous ungulates but has enabled the white-tailed deer to gain a foothold. Black bear, beaver, snow-shoe hare, muskrat, marten, fisher, weasel, mink, wolverine, and others are found throughout the area and sustain the trapping economy in varying degrees. Beaver and muskrat provide the highest number of pelts and predominate the list of animals trapped in this region. Upland game birds frequenting this region are the spruce and ruffed grouse and the willow-ptarmigan. Pike and walleye are the most common game fish in the lakes and rivers of this area.

Management of the wildlife resource is maintained through population surveys, hunter questionnaires, and annual kill summaries obtained from check stations. During the 1966-67 trapping season 53 registered trappers worked in 45 areas within the Hotchkiss-Keg River region. Besides, numerous private land-owners trapped on their property. Despite these activities, management surveys indicate that the wildlife resource in this region is underutilized or harvested. This area, being sparsely settled and difficultly accessible to hunters, could provide a higher percentage of trapping income to the livelihood of this region than it does at present.

As part of the Canada Land Inventory, studies are underway to provide a wildlife capability classification. This classification is based on a consideration of the soils, landscape, vegetation, climate, and other features significant to the production of wildlife.

ENGINEERING

Soil survey reports contain information that can be used to provide a preliminary assessment of the suitability and limitations of soils for engineering purposes. In addition, a cooperative project was initiated in 1963 with the Highways Research Division, Research Council of Alberta, to provide an indication of some of the physical characteristics of the soils in areas under study as a further aid to engineering use.

The results of this cooperative study of representative soils in the Hotchkiss and Keg River area are given in Table 11. The soil

TABLE 11—Physical Analyses of Some Representative Soils as Related to Engineering Applications

Soil Series and Location	Horizons	Particle Size: Sand (S) Percent (2.0-.05 mm)	Silt (Si) Percent (0.05-0.002 mm)	Clay (C) Percent (<0.002 mm)	Liquid Limit (W_l)	Plastic Limit (W_p)	Plasticity Index (I_p) ($W_l - W_p$)	Activity $A = \frac{I_p}{C-5}$
Lacustrine Materials								
Nampa (NE35-100-23-W5)	Bt	11	24	65	65.9	22.9	43.6	0.7
	C	5	26	69	56.1	25.0	31.1	0.5
Cadotte (SW14-101-23-W5)	Bt	9	30	61	60.3	22.3	38.0	0.7
	C	2	45	53	51.3	21.2	30.1	0.6
Cadotte (NE11-102-23-W5)	Bt	13	21	66	61.3	20.0	41.3	0.7
	C	13	44	43	45.1	19.7	25.4	0.7
Keg (SW15-102-23-W5)	Cg	10	29	61	61.1	21.1	40.0	0.7
Keg (NW19-101-23-W5)	Bg	3	24	73	73.7	28.8	44.9	0.7
	Cg	5	43	52	59.6	20.8	38.8	0.8
Goose (SW29-101-23-W5)	Cg	0	21	79	83.5	35.8	47.7	0.6
Alluvial Materials								
Spirit River (SE24-103-22-W5)	Bm	0	55	45	53.5	26.3	27.2	0.7
	C	0	57	43	52.3	23.8	28.5	0.7
Residual Materials								
Teepee (SW9-100-23-W5)	Btfj	18	38	44	43.8	22.7	21.1	0.5
	C	78	10	12	Tr	Tr	—	—
Boundary (SW16-100-23-W5)	Btfj	1	27	72	60.9	38.0	22.9	0.3
	C	1	45	54	51.3	30.3	21.0	0.4

series are arranged by parent materials and the samples selected for study are composed of those collected during the soil survey with those of the C horizons rarely exceeding a depth of 5 feet.

The methods used in determining the reported results are as follows:

1. Particle Size—Pipette method of Kilmer and Alexander modified by Toogood and Peters, 1953. Can. J. Agr. Sci. 33:159-171.
2. Liquid Limits—ASTM procedures for testing soils, 1958. 1916 Race St., Philadelphia 3, Pa. Designation D423-54T.
3. Plastic Limits—ASTM procedures for testing soils, 1958. 1916 Race St., Philadelphia 3, Pa. Designation D424-54T.
4. Activity—Prediction of swelling potential for compacted soils by H. Boldon Seed, et al, 1962. J. Soil Mech. and Found. Div., Proc. Am. Soc. Civil Eng. 88 No. SM3:53-87.

PHYSICAL AND CHEMICAL ANALYSES OF SOME REPRESENTATIVE SOIL PROFILES

Physical and chemical analyses of soil samples taken from representative soil profiles in the Hotchkiss and Keg River area are given in Table 12. The samples were collected, usually, at virgin sites representative of the dominant soils indicated in this area. The analyical methods used in determining the reported results are as follows:

Mechanical Analysis—Pipette method of Kilmer and Alexander as modified by Toogood and Peters, 1953. Can. J. Agr. Sci. 33: 159-171.

Reaction (pH)—Soil paste method of Doughty, 1941. Soil Sci. 22: 135-138, and utilizing the Coleman glass electrode apparatus.

Nitrogen—Kjeldahl method of Prince, 1945. Soil Sci. 59: 47-52, using mercury as a catalyst.

Organic Carbon—Determined with a Leco induction furnace and a model 577-100 carbon analyzer

Calcium Carbonate Equivalent—A.O.A.C. method, 8th Edition, 1955, Washington, D.C. and modified by absorption of CO_2 with indicarb.

Exchange Capacity—A.O.A.C. magnesium oxide method, 8th Edition, 1955. Washington, D.C.

Exchangeable Cations—A.O.A.C. extraction method, 8th Edition, 1955, Washington, D.C. Beckman DU flame spectrophotometer method for calcium, magnesium, sodium, and potassium by Baker, 1956. Soil and Crop. Sci. Soc. Florida Proc. 16: 272-282, and modifications to the instrument by Mathieu and Burch, 1961. Can. J. Soil Sci. 41: 134-135 and Mathieu and Carson, 1961. Can. J. Soil Sci. 41: 136-137, and utilizing the clearing solution proposed by Choiniere, 1956. Can. J. Agr. Sci. 36: 203-204.

TABLE 12—Physical and Chemical Analyses of Some Representative Soil Profiles

Horizon	Thickness in.	Thickness cm.	Particle Size: Sand %	Silt %	Clay % <2μ	Clay % <0.2μ	Text.	pH	N %	Org. C %	C/N Ratio	$CaCO_3$ Equiv. %	Exchangeable Cations: H	K	Na	Mg	Ca	C.E.C. (m.e./100 gms.)	Base Sat. %	Ca/Na Ratio	Conduct. mmhos/cm 1:5	Diath. Ext. Fe
Dixonville Series - Orthic Gray Wooded - SW5-97-24-W5 (Till)																						
L-H	2	5	-	-	-	-	-	6.1	-	-	-	-	8.4	2.9	0.4	3.6	61.4	76.7	89	-	-	-
Ae	3	7	29	53	18	0	SiL	5.4	0.08	0.8	10	-	3.6	0.9	0.4	1.0	7.9	13.8	74	-	-	-
AB	4	10	9	40	51	19	SiC	4.6	0.09	0.9	10	-	3.7	0.9	0.2	4.7	12.6	22.1	83	-	-	-
Bt	8	20	4	33	63	17	C	4.6	0.07	0.4	6	-	3.3	0.9	0.6	5.1	16.1	26.0	87	27	-	-
BC	9	22	19	37	44	23	C	4.6	-	-	-	0.0	4.8	0.5	0.4	4.3	13.7	23.7	80	34	-	-
C	at 26	64	35	37	28	14	CL	5.3	-	-	-	0.0	1.7	0.3	0.4	2.6	15.6	20.6	92	39	0.0	-
Hazelmere Series - Solodic Gray Wooded - SW5-93-23-W5 (Lacustro-Till)																						
L-H	2	5	-	-	-	-	-	6.6	-	-	-	-	2.4	1.9	0.1	2.6	24.4	31.4	92	-	-	-
Ae	3	7	21	63	16	4	SiL	6.2	0.08	1.3	17	-	1.2	0.2	0.1	1.0	5.4	7.8	85	-	-	-
AB	3	7	14	45	41	18	SiC	5.3	0.08	0.9	11	-	2.9	0.3	0.2	6.5	10.2	20.1	72	-	-	-
Bt	12	30	12	35	53	31	C	5.0	0.07	0.8	13	-	4.4	0.4	0.3	9.6	14.9	29.6	85	50	-	-
BCk	10	25	19	43	38	19	SiCL	7.4	-	-	-	2.3	-	0.3	1.5	9.0	23.8	34.6	100	16	-	-
Cks	at 42	105	27	38	35	15	CL	7.4	-	-	-	2.4	-	-	-	-	-	-	-	-	1.9	-
Esher Series - Black Solod - NW14-93-23-W5 (Lacustro-Till)																						
Ap	6	15	12	38	50	18	SiC	5.9	0.33	5.0	15	-	3.6	1.7	0.0	9.8	12.7	27.8	87	-	-	-
AB	2	5	18	48	34	10	SiCL	5.2	0.14	1.8	12	-	3.8	0.6	0.6	4.6	5.0	14.6	74	-	-	-
Btn1	6	15	8	29	63	34	C	4.9	0.11	1.5	14	-	4.6	0.7	1.7	12.5	8.7	28.3	84	5	-	-
Btn2	4	10	4	18	78	40	C	5.6	0.09	1.2	14	-	0.6	0.6	3.0	18.8	12.0	35.0	98	4	-	-
BC	8	20	4	24	72	36	C	7.5	0.08	1.1	14	0.9	-	-	-	-	-	-	-	-	-	-
Csk	at 26	65	6	25	69	27	SiC	7.7	-	-	-	2.1	-	-	-	-	-	-	-	-	3.0	-
Nampa Series - Gray Solod - NE35-100-23-W5 (Lacustrine)																						
L-H	2	5	-	-	-	-	-	6.1	-	-	-	-	2.5	1.8	0.3	4.7	14.2	23.5	89	-	-	-
Ae	3	7	20	59	21	4	SiL	6.3	0.07	0.8	11	-	1.5	0.8	0.2	1.5	6.5	10.5	86	-	-	-
AB	3	7	19	41	40	21	SiC	5.4	0.07	0.5	8	-	2.2	0.7	1.2	6.8	20.4	31.3	93	-	-	-
Btn	11	27	11	24	65	38	C	5.0	0.05	0.5	11	-	2.9	0.9	1.8	10.2	16.4	32.2	91	9	-	-
BC	9	22	16	19	65	26	C	6.2	-	-	-	0.0	1.0	0.9	1.3	10.0	18.0	31.2	97	14	-	-
Csk	at 40	100	4	22	74	19	C	7.6	-	-	-	5.3	-	-	-	-	-	-	-	-	1.9	-
Falher Series - Black Solod - NE6-100-20-W5 (Lacustrine)																						
L-H	2	5	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ahe	3	7	9	53	38	0	SiCL	5.3	0.35	4.8	14	-	8.8	2.8	0.7	5.4	15.8	33.5	74	-	-	-
AB	2	5	8	57	35	0	SiCL	4.8	0.11	1.2	11	-	4.7	1.0	1.5	6.5	6.0	19.7	76	-	-	-
Btn1	4	10	3	37	60	20	C	4.4	0.09	1.3	15	-	5.8	1.1	3.0	8.3	9.4	27.6	79	3	-	-
Btn2	6	15	2	40	58	24	C	4.2	0.06	0.9	15	-	6.8	1.0	3.9	9.9	9.9	31.5	79	3	0.3	-
BC	12	30	3	35	62	20	C	4.2	-	-	-	0.0	4.8	0.6	5.5	9.3	10.4	30.6	84	2	0.6	-
Cs	at 29	70	4	34	62	13	C	4.8	-	-	-	0.0	-	-	-	-	-	-	-	-	1.6	-
Cadotte Series - Solodic Gray Wooded - NE11-102-22-W5 (Lacustrine)																						
L-H	2	5	-	-	-	-	-	6.3	-	-	-	-	2.8	1.3	0.3	11.3	48.5	64.2	96	-	-	-
Ae	5	12	28	48	24	12	L	5.4	0.07	0.8	11	-	2.8	0.6	0.3	4.0	4.6	12.3	77	-	-	-
AB	4	10	6	44	50	27	SiC	4.8	0.06	0.5	9	-	4.7	0.7	0.6	9.2	5.1	20.3	77	-	-	-
Btn	9	22	13	21	66	40	C	5.3	0.04	0.5	12	-	3.6	0.7	1.3	15.7	8.0	29.3	88	6	-	-
BCk	7	17	8	27	65	31	C	7.2	-	-	-	2.8	-	-	-	-	-	-	-	-	0.4	-
Ccas	at 27	67	9	59	32	17	SiCL	7.8	-	-	-	15.1	-	-	-	-	-	-	-	-	1.4	-

Peace River Series - Solodic Dark Gray Wooded - NE1-93-22-W5 (Lacustrine)

L-H	2	5	-	-	-	-	-	6.7	-	-	-	-	5.8	1.5	0.0	9.1	32.7	49.1	89	-	-	-
Ahe	3	7	7	58	35	11	SiCL	6.2	0.29	4.7	16	-	3.0	1.6	0.1	6.7	19.6	31.0	90	-	-	-
Ae	3	7	6	63	31	6	SiCL	5.9	0.10	1.3	13	-	1.6	0.6	0.1	9.8	8.8	20.8	92	-	-	-
AB	2	5	2	52	46	16	SiC	5.2	0.09	1.1	13	-	2.4	0.4	0.1	11.5	7.7	22.1	91	-	-	-
Bt	5	12	3	46	51	24	SiC	5.2	-	-	-	-	3.8	0.4	0.3	13.5	7.7	25.7	85	26	-	-
BCk	6	15	1	30	69	34	C	7.0	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-
Cca	14	35	0	31	69	26	C	8.0	-	-	-	4.2	-	-	-	-	-	-	-	-	0.3	-
Cks	at 36	90	1	27	72	24	C	7.7	-	-	-	1.4	-	-	-	-	-	-	-	-	2.9	-

Spirit River Series - Orthic Black - SE24-103-22-W5 (Alluvial)

Ah	6	15	-	-	-	-	-	6.6	0.83	7.4	9	-	5.6	0.9	0.7	7.0	35.4	49.6	89	-	-	-
Btj	18	45	1	54	45	24	SiC	5.6	0.12	1.4	11	-	3.0	0.6	0.7	9.1	15.1	28.5	90	25	-	-
Bm	10	25	0	56	44	21	SiC	5.7	0.11	1.2	11	-	2.2	0.6	0.7	8.8	17.0	29.3	91	24	-	-
C	at 34	85	0	57	43	19	SiC	7.6	-	-	-	0.5	-	-	-	-	-	-	-	-	0.0	-

Heart Complex - Podzolic and Brunisolic - SW23-98-25-W5 (Alluvial and Aeolial)

L-H	2	5	-	-	-	-	-	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ae	3	7	89	9	2	2	S	5.4	-	-	-	-	1.4	0.1	0.4	0.2	1.7	3.8	63	-	-	-
Btfj	4	10	84	12	4	2	LS	6.1	-	-	-	-	3.0	0.3	0.1	0.8	2.5	6.7	55	25	-	1.6
BC	8	20	90	8	2	2	S	6.3	-	-	-	-	0.8	0.2	0.2	0.6	3.2	5.0	84	16	-	-
C	at 18	45	92	5	3	2	S	6.2	-	-	-	0.0	0.6	0.2	0.2	0.0	3.0	4.0	85	20	0.0	1.3

Teepee Complex - Podzolic and Brunisolic - NE5-100-22-W5 (Residual)

Ahe	2	5	73	18	9	2	SL	5.5	0.14	2.2	15	-	4.2	1.4	0.7	1.3	6.8	14.4	70	-	-	-
Ae	3	7	85	9	6	0	LS	5.1	0.03	0.2	7	-	1.7	0.5	0.1	0.0	3.0	5.3	68	-	-	-
Bfj	3	7	77	14	9	0	SL	5.3	0.04	0.3	7	-	3.9	0.7	0.2	1.6	2.9	9.3	58	14	-	-
Bt	6	15	63	22	15	4	SL	5.2	0.05	0.7	13	-	5.6	0.5	0.3	0.1	3.9	10.4	46	13	-	-
C	at 15	37	87	4	9	6	LS	5.6	-	-	-	0.0	2.7	0.3	0.1	0.0	4.1	7.2	63	41	0.0	-

Boundary Complex - Undifferentiated Podzolic - SW16-100-23-W5 (Residual)

L-H	2	5	-	-	-	-	-	4.6	0.19	2.6	13	-	19.4	2.0	0.2	0.0	3.6	25.2	23	-	-	-
Ae	3	7	16	34	50	8	C	4.6	0.11	1.2	11	-	15.2	1.0	0.1	0.1	0.6	17.0	11	-	-	-
Btfj	4	10	1	27	72	27	C	4.2	0.10	0.5	5	-	15.5	1.0	0.1	0.4	1.0	18.0	14	10	-	3.4
BC	3	7	3	61	36	10	SiCL	4.1	0.09	0.3	4	-	15.2	0.9	0.2	0.0	0.6	16.9	11	3	-	-
C	at 12	30	1	43	56	12	SiC	3.9	-	-	-	0.0	16.2	0.9	0.2	0.0	0.0	17.3	6	-	0.0	2.8

Keg Series - Orthic Gleysol - NW19-101-23-W5 (Lacustrine)

L-H	2	5	-	-	-	-	-	7.2	0.27	4.5	17	-	0.0	1.0	0.1	4.1	30.1	35.3	100	-	-	-
Bg	10	25	3	24	73	37	C	7.0	0.11	1.5	15	-	0.0	1.3	0.6	10.8	24.8	37.5	100	62	-	2.3
Cg	at 14	35	3	28	69	39	C	7.4	-	-	-	0.0	0.0	0.9	0.6	9.6	26.6	37.7	100	44	0.0	2.0

Goose Series - Orthic Humic Gleysol - SW29-101-23-W5 (Lacustrine)

Ah	7	17	-	-	-	-	-	7.4	0.80	9.2	11	-	0.0	1.2	0.3	8.6	57.0	67.1	100	-	-	-
Bg	12	30	0	20	80	40	C	6.7	0.11	1.9	17	-	0.8	1.2	1.0	12.2	28.4	43.6	98	28	-	3.9
Cg	at 20	50	0	21	79	39	C	6.8	-	-	-	0.0	0.5	1.2	1.3	10.2	29.2	42.4	99	-	0.0	5.3

Conductivity and Soluble Salts—Saturated soil extract methods as proposed by Howard, et al, 1954. U.S. Regional Salinity Laboratory Agr. Handbook 60. U.S. Dept. Agr., Washington, D.C.

Free Iron—Sodium dithionite method of Mitchell and MacKenzie, 1954. Soil Sci 77: 173-184.

Physical Analyses

Particle Size Distribution

The distribution of various size particles found in the soils of this area are given in Table 12. These data show that there is a definite clay accumulation horizon (Bt horizon) in practically all of the well to imperfectly drained soils of this area. Poorly drained soils (Gleysols) do not show this characteristic.

Chemical Analyses

Chemical data considered significant to show the effects of development in the soils of this area are given in Table 12.

Leaching has taken place in all well and imperfectly drained soils as indicated, specifically, by the values for pH, exchangeable hydrogen, and percent base saturation. Poorly drained soils show only minor effects from leaching.

Reaction (pH)

pH is a measure of the degree of acidity or alkalinity. pH 7 is neutral. Values above pH 7 denote alkaline conditions and those below pH 7 denote acid conditions. The pH values within a soil profile are good indicators of the degree of leaching that has taken place.

The pH data for soils of this area show B horizons of Gray Wooded soils to be strongly acid. The remainder of the soils show very slightly acid to neutral reactions in their B horizons. In general, parent materials of soils developed on lacustrine, lacustrotill, till, and alluvial deposits are alkaline in reaction. Only one soil of the area, the Boundary soil, is developed from strongly acid parent material.

Nitrogen and Organic Matter

The surface L-H and Ah horizons have the highest nitrogen and organic matter content. On a total profile basis, Orthic Black, Dark Gray Wooded, and Gleysolic soils have the most nitrogen and organic matter. In all soils of this area the percentage of both nitrogen and organic matter decreases with depth in the soil profile. The C/N ratios in the mineral soils are between 7 and 17 except for the Boundary soil which has a ratio of 4.

Calcium Carbonate Equivalent

In general, with the exception of the soils formed on residual materials, free lime was found in the soils of this area within 48

inches of the surface. The results show that the majority of the parent materials of these soils are weakly calcareous. Exceptions are the soils formed on the brownish lacustrine materials which are shown to be moderately calcareous. Cadotte and Peace River soils are examples of soils developed from this material.

Exchangeable Cations

The capacity of a soil to hold exchangeable cations is termed cation-exchange capacity (C.E.C.) and ranges between 5 and 75 milliequivalents per 100 grams of soil in this area. The C.E.C., in general, increases with increased clay content and organic matter content. Consequently, sandy soils and the eluviated horizons of the finer textured soils have the lowest C.E.C.

Important exchangeable cations of soil are hydrogen, potassium, sodium, magnesium, and calcium. These cations are held by the soil collodial complex and are not readily leached from the soil. The balance between amounts of exchangeable hydrogen and exchangeable bases often reflects in the acidity of soils. This balance is shown by percentage base saturation. Depth and degree of leaching is usually reflected by the presence and amount of exchangeable hydrogen on the cation exchange complex. As indicated in Table 12, all of the soils of this area except some of the Gleysolic soils, have undergone varying degrees of leaching.

Amounts of exchangeable potassium in these soils are relatively low and range between 1 and 3 percent of the cation-exchange capacity.

Exchangeable sodium of the soils of this area ranges from 1 to 12 percent of the cation-exchange capacity. Generally, the B horizons of soils developed on saline parent materials have the higher percentages.

In most of the soils of this region, exchangeable magnesium makes up between 12 and 32 percent of the cation-exchange capacity. Exceptions are the soils developed on the brownish lacustrine materials, Cadotte and Peace River soils, which have magnesium as the dominant cation on the exchange complex.

Exchangeable calcium for the majority of the soils of this area is over 50 percent of the cation-exchange capacity.

Exchangeable calcium to exchangeable sodium ratios are presented to comply with the 1965 proposal of the National Soil Survey Committee of Canada for Solonetzic soils. The B horizons of such soils must have exchangeable calcium to exchangeable sodium ratios of less than 10. The results for the Esher, Nampa, Falher, and Cadotte soils show ratios of less than 10 but this ratio is usually quite variable. Frequently, B horizons of these and similar soils developed on fine textured, somewhat saline parent materials have a ratio of exchangeable calcium to exchangeable sodium greater than 10.

Soluble Salts

Appreciable amounts of soluble salts are found mainly in the parent materials of lacustrine origin in this area. Leaching has removed soluble salts to lower portions of the soil profile, thus the A and B horizons of these soils are relatively salt free.

Soluble salts present in a sample of a C horizon of a Cadotte profile at a depth of 40 inches provide an indication of the kinds and amounts common to some of these parent materials:

Cations meq./l.			Anions meq./l.		
Na	Mg	Ca	Cl	HCO_3	SO_4
0.3	6.0	13.0	0	0.3	17.5

In general, calcium ranges between 60 and 70 percent, magnesium between 20 and 30 percent, and sodium between 5 and 15 percent of the total soluble cations.

Sulphate is the dominant anion in these soils; it makes up over 90 percent of the total anions. Bicarbonate anions make up the remainder of the total. There are relatively no chlorides in these soils.

APPENDIX I

CLASSIFICATION OF THE SOILS OF THE HOTCHKISS AND KEG RIVER AREA

Order	Great Group	Subgroup	Series — Parent Materials: Till	Lacustro-Till	Lacustrine	Alluvial and Aeolian	Gravelly Alluvial and Outwash	Residual and Modified Residual	Organic
Well to Imperfectly Drained									
Chernozemic	Black	Orthic Black				Spirit River			
	Dark Gray	Solodic Dark Gray		Albright					
		Gleyed Dark Gray				High Prairie			
Solonetzic	Solonetz	Black			Notikewin				
	Solod	Black		Esher	Falher				
		Gray		Donnelly	Nampa				
Podzolic	Dark Gray Wooded	Orthic Dark Gray Wooded			Judah	Tangent Leith Belloy	Grouard Belloy*		
		Solodic Dark Gray Wooded			Peace River				
	Gray Wooded	Orthic Gray Wooded	Braeburn Dixonville		Kathleen	Davis Gulp Codesa	Clouston Codesa*		
		Solodic Gray Wooded	Alcan	Hazelmere	Cadotte				
	Undifferentiated					Heart		Teepee Boundary	
Poorly Drained to Very Poorly Drained									
Gleysolic	Humic Gleysol	Orthic Humic Gleysol	Goose Prestville	Goose Prestville	Goose Enilda Prestville	Codner Enilda Bison	Codner Bison		
	Gleysol	Orthic Gleysol	Keg	Keg	Keg				
	Eluviated Gleysol	Low Humic Eluviated Gleysol	Snipe	Snipe	Snipe	Wanham	Wanham		
Organic**	Sedge Peat								Eaglesham
	Moss Peat								Kenzie

*Gravelly Phase **Preliminary Classification

APPENDIX II

DEFINITIONS OF SOME DESCRIPTIVE TERMS

Frequent use is made of descriptive terms, throughout the report, in describing features of significance within the mapped area. Following are definitions of some of these descriptive terms:

SOIL TEXTURE

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

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

(b) Proportion of Soil Separates in Various Soil Textural Classes

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

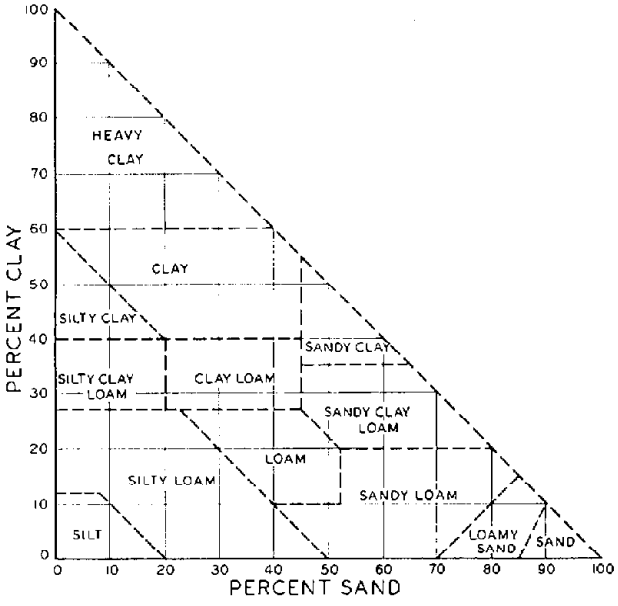


Figure 29—Chart showing proportions of soil separates.

(c) Textural Groupings

The following textural groupings have been indicated by the National Soil Survey Committee for use in soil survey nomenclature:

Coarse textured—sands, loamy sands.
Moderately coarse textured—sandy loam, fine sandy loam.

Medium textured—very fine sandy loam, loam, silt loam, silt.
Moderately fine textured—sandy clay loam, clay loam, silty clay loam.
Fine textured—sandy clay, silty clay, clay (40-60%).
Very fine textured—>60% clay.

SOIL STRUCTURE AND CONSISTENCE

Soil structure refers to the aggregation of the primary soil particles into compound particles, or clusters of primary particles, which are separated from adjoining aggregates by surfaces of weakness. The aggregates differ in grade of development (degree of distinctness) as follows: *weak, moderate,* and *strong.* They vary in class (size) as follows: *very fine, fine, medium, coarse,* and *very coarse.* They also vary in kinds (character of the faces and edges of the aggregates). The kinds mentioned in this report are: *single grain, blocky, subangular blocky, granular, columnar,* and *platy.*

Soil consistence comprises the attributes of soil materials that are expressed by the degree and kind of cohesion and adhesion or by the resistance to deformation and rupture. It deals with the strength and nature of the forces of attraction within a soil mass. The terms used in describing soils in this report are: *loose, friable, firm,* and *very firm.*

SOIL MOISTURE CLASSES

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

Rapidy drained—soil moisture content seldom exceeds field capacity in any horizon except immediately after water additions.

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.

Moderately well drained—soil moisture in excess of field capacity remains for a short but significant period of the year.

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

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

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

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

TOPOGRAPHIC CLASSES

Topographic classes provide for the recognition of important variations in the land surface. They determine the comparative roughness of the land surface by defining the gradient of the slopes and the shape and frequency of the various slopes. The classes of topography are defined as follows:

Simple Topography		Complex Topography		
	Single Slopes (Regular surface)		Multiple Slopes (irregular surface)	Slopes Percent
A	Depressional to level	a	Depressional to 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	5 +- 9
E	Strongly sloping	e	Rolling	9 +-15
F	Steeply sloping	f	Hilly	15 +-30
G	Very steeply sloping	g		30 +-60
H	Extremely sloping	h		over 60

The topographic classes are indicated on the soil map by hatching and symbols. Rough land that borders and forms the banks of drainage courses is indicated on the soil map by color and with the symbol R.B. (Rough and Broken).

CLASSES OF STONY LAND

Stone-free.
Occasional stones no serious handicap to cultivation.
Moderately stony—requiring removal, occasional stone piles in the field.
Very stony—serious handicap to cultivation, frequent stone piles in the fields.
Excessively stony—too stony to permit cultivation.

CLASSES OF TREE COVER

Open land—trees no handicap to cultivation.
Light tree cover—can be cleared by heavy, crawler type, clearing machinery at a rate of about 4 acres per hour.
Medium tree cover—can be cleared by heavy, crawler type, clearing machinery at a rate of about 2 acres per hour.
Heavy tree cover—can be cleared at a rate of about 1 acre per hour.
Excessively heavy tree cover—preferably left for timber.
Further designations, relating to the prevailing types of trees, are often included in this field classification.

CALCAREOUS GRADES

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

Reaction	pH		pH
Extremely acid	$<$4.5	*Neutral*	6.6-7.3
Very strongly acid	4.6-5.0	*Mildly alkaline*	7.4-7.8
Strongly acid	5.1-5.5	*Moderately alkaline*	7.9-8.4
Medium acid	5.6-6.0	*Strongly alkaline*	8.5-9.0
Slightly acid	6.1-6.5	*Very strongly alkaline*	$>$9.0

Salinity Grades	Electrical Conductivity
Weakly saline	2 to 6 mmhos./cm.
Saline	6 to 12 mmhos./cm.
Strongly saline	$>$12 mmhos./cm.

GLOSSARY*

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

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

Calcareous material—Material containing more than 2 percent calcium carbonate equivalent. Will effervesce visibly when treated with hydrochloric acid.

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

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

Concretions—Local concretions 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.

Drift—Material of any sort deposited in one place after having been moved from another. Glacial drift includes all glacial deposits whether unstratified or stratified.

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

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

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

Humus—The well decomposed, 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.

Mature soil—A soil with well developed soil horizons produced by the natural process of soil formation and in equilibrium with its environment.

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

Mottling—Spots of color irregularly marking soil horizons. Common causes are: (1) imperfect to impeded drainage, and (2) uneven weathering of rocks.

Nutrients (plant)—The elements taken in by the plant, essential to 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 unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil is developed by soil forming processes.

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

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

Podzolization—A general term referring to that process by which soils are depleted of bases, become acid, and develop leached A horizons. Specifically, the term refers to the process by which Podzol soils are formed and in which iron and aluminum are removed from the upper part of the profile more rapidly than is the silica. This results in the development of a light-colored surface horizon and an accumulation of iron, aluminum, and organic matter in the B horizon.

Relief—The elevation or inequalities of a land surface when considered collectively. Minor surface configurations, such as slight knolls, ridges, or shallow depressions are referred to as micro-relief.

Saline material—Material whose water extract has an electrical conductivity greater than 4 mmhos./cm.[1]

Solodization—A soil forming process that is somewhat similar to podzolization in that the soil becomes acid in the surface horizons and develops an Ae horizon. Through improved drainage and an accompanying decrease in the salt content, Solonetz soils develop a leached A horizon accompanied by a general breakdown of the hard B horizon that ultimately results in the development of a Solod soil. The process of change of Solonetz to Solod is called "solidization".

Solum—The upper part of the soil profile, which is above the parent material and in which the processes of soil formation operate. It comprises the A and B horizons.

Stratified—Composed of or arranged in strata or layers. The term is applied to parent materials. Those layers that are produced in soils by the processes of soil formation are called soil horizons, while those inherited from the parent material are called strata. Layers that are less than one centimeter in thickness are referred to as *laminae*, while layers that are one or more centimeters in thickness are referred to as *beds*. When thickness is implied, reference to cross-stratification will involve consideration of cross-bedding or cross-lamination.

Terrace—A flat or undulating plain bordering a river or a lake. Many streams are bordered by a series of terraces at different levels indicating flood plains at successive periods. Although many older terraces have become more or less hilly through dissection by streams or wind action, they are still regarded as terraces.

Till—A heterogeneous mixture of stones, sand, silt, and clay transported by glaciers and deposited during the melting of the ice and subsequent recession of the ice front.

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

Varves—Distinctly marked annual deposits of sediments regardless of their origin.

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

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

1 U.S. Regional Salinity Laboratory Agr. Handbook 60. U.S. Dept. Agr. Washington, D.C.