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Soils of the Williams Lake - Alexis Creek area, British Columbia

Report No. 53 British Columbia Soil Survey 1988

Canada

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Report No. 53 of the
British Columbia Soil Survey

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Land Resource Research Centre
Contribution No. 85-54

(Map sheets 93B/SW and 93B/SE)

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Cover photo: Massey Sawyer steam tractor (about 1900) at Chezacut (photo credit Alex Green)

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PREFACE

This report and the accompanying soil maps (sheets 93 B/SW and 93 B/SE in the National Topographic System) cover 759 225 ha of land taking in the city of Williams Lake and extending west of the Fraser River to the community of Redstone.

The report describes the characteristics of the soils and map units and specifies their location and extent. It gives a short account of the history and natural features of the map area. The maps show the distribution of the soils. The survey was undertaken to provide an inventory of land resources through the Canada Land Inventory (CLI) program. Land capability maps were published during the 1970s (see References). Soil capability for agriculture maps were produced by J.I. Sneddon. Manuscript soil-and-terrain maps at a scale of 1:50 000 covering this and surrounding map areas are available from the B.C. Ministry of Environment.

This publication is one of a series covering the Cariboo-Chilcotin region, which provides information on the soils of the region and presents maps at scales of 1:100 000 or 1:125 000. Others in the series are soils of the Lac la Hache-Clinton area 1980; Soils of the Quesnel area 1982; Soils of the Horsefly area 1984; Soils of the Barkerville area 1985 and reports in preparation for the Taseko Lakes area, the Canim Lake-Bonaparte River area, and the Nazko area.

GENERAL DESCRIPTION OF THE AREA

Location and extent

The surveyed area (Fig. 1) is in the Interior Plateau of central British Columbia. It extends from latitude 52°00' to 52°15' north and from longitude 122°00' to 124°00' west, comprising an area of about 760 000 ha. The city of Williams Lake and the community of McLeese Lake lie in the eastern part of the map area. Alexis Creek and Redstone are communities in the southwestern part and are approximately 80 and 105 km west of Williams Lake, respectively.

History and resources

Alexander Mackenzie crossed the continental divide on June 12, 1793. Arriving on the banks of a river the Indians called Tacoutche Tesse (now the Fraser), he became the first white man to arrive in the Cariboo. Williams Lake was named after Shuswap Indian Chief Willyum. The place was bypassed during the gold rush and by the wagon trail. When the railway reached the site in the 1920's, the town began to grow to its present status as a city of 13,124 (1975). Today it is a major commercial centre for the Cariboo.

Alexis Creek, with an area population of about 200, was first settled in the 1880's for ranching. The community was named after Alexis Anahim, or Alexis the Kingly, a coast Indian who moved inland to establish a colony in the heart of the Indian Athapashan nation (B.C. Directory 1975). Agriculture, mainly ranching, remains as the second largest industry in the area today. Consequently, forages and fodder are the primary crops in the region with a variety of vegetables being grown on alluvial soils associated with the Fraser River.

Forestry and related lumbering activities are the major industry. Lumber and planer mills are located in the vicinity of Williams Lake where plywood is also made.

As a consequence of the improved access provided by logging activities, the tourist industry has expanded into the plateau country where fishing, hunting, hiking, camping, and boating are pleasant recreational pursuits.

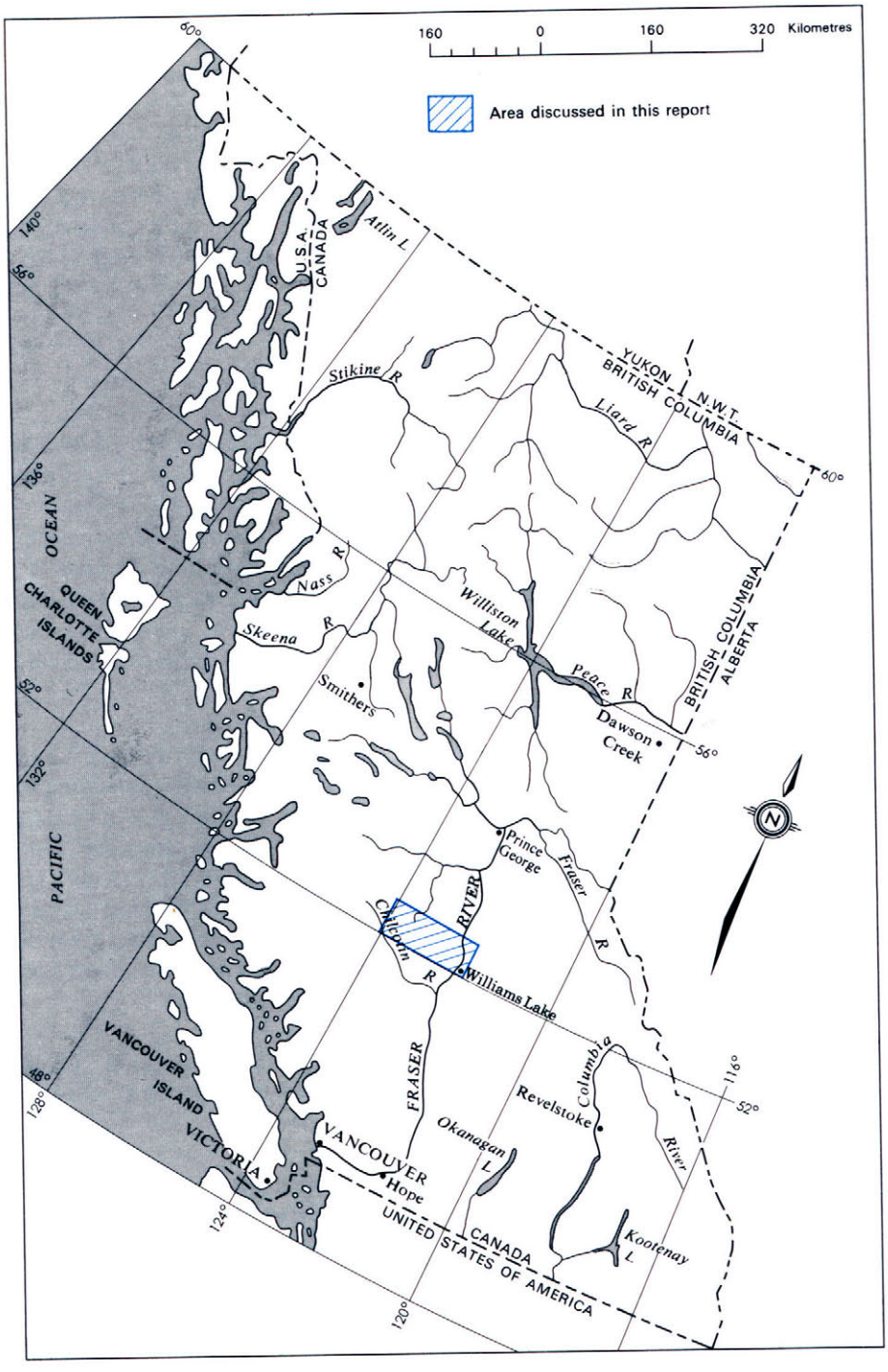
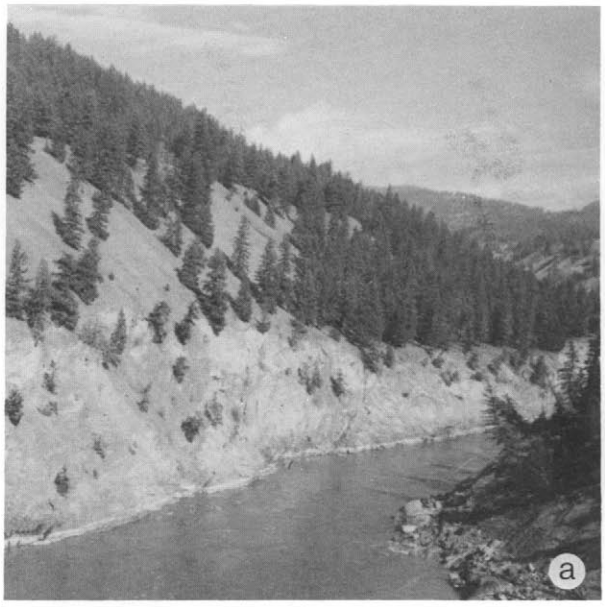


Figure 1. Location of the Williams Lake-Alexis Creek map area in British Columbia.



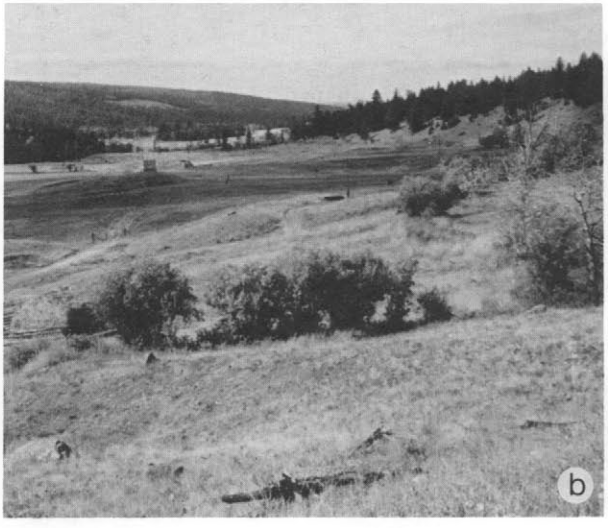


Plate I

(a) Hargreaves and Dog Creek map units along the Fraser River.
(b) Dark Gray Chernozemic soils under grass and shrub vegetation in the Chimney Creek valley.
(c) A recently flooded Organic (Rail) soil.
(d) Scout Island Nature Park, Williams Lake (photo credit Bill Watt).
(e) Snake fence on Organic soils near Mackin Creek.

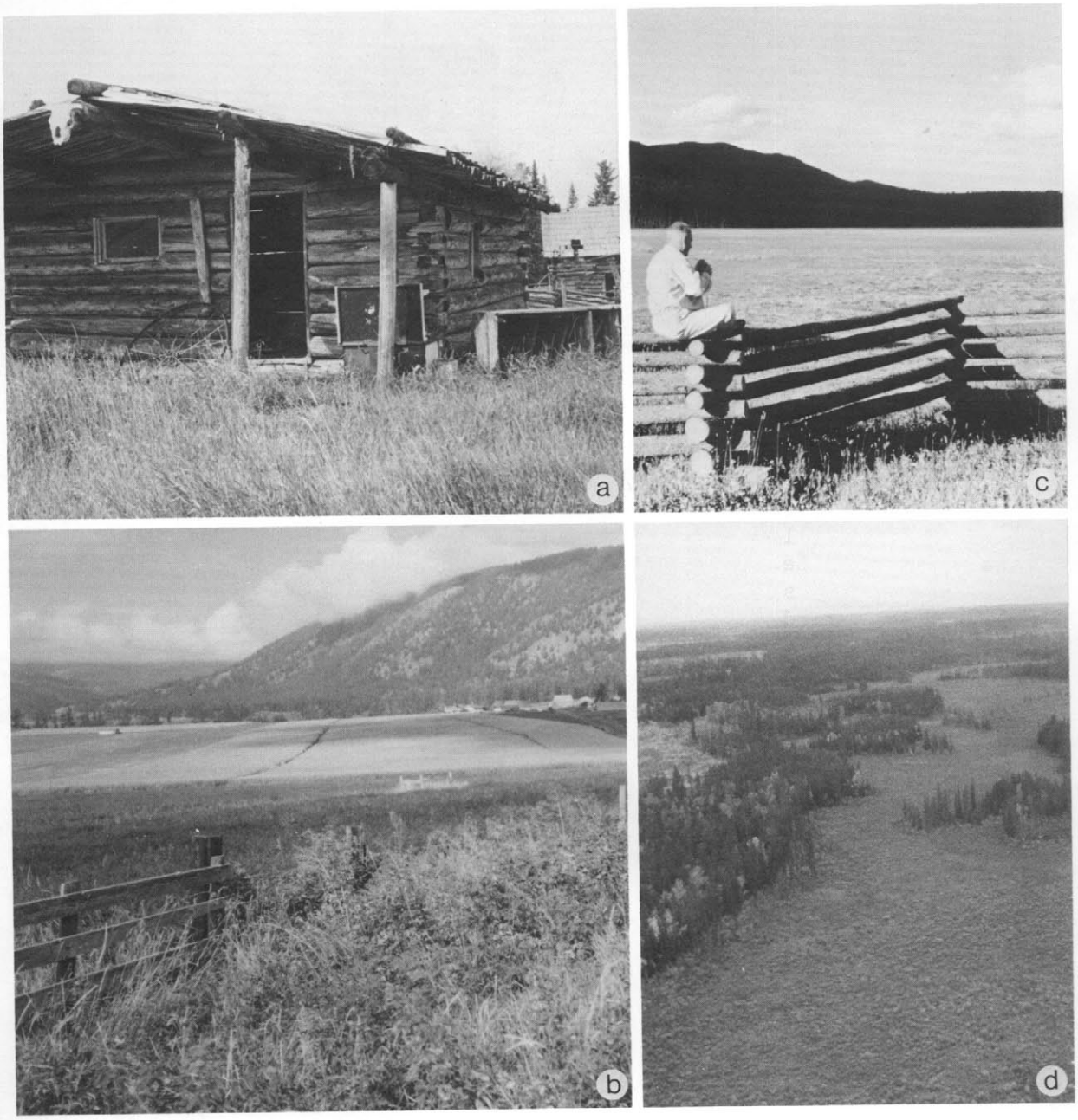


Plate II

(a) Abandoned homestead on Meldrum soils.
(b) A corn crop on Hargreaves soil along the old highway above the Fraser River.
(c) Dark Brown Chernozemic soils on loamy fluvial materials near Redstone (photo credit Alex Green).
(d) Chief soils form large irregularly-shaped map units in the northwestern part of the map area (photo credit Dave Moon).

Physiography and drainage

With the exception of the Fraser Basin, the area is located entirely within the Fraser Plateau subdivision of the Interior Plateau of British Columbia (Fig. 2) (Holland 1976). The most prominant feature is the Fraser River which flows southward through the Fraser Basin near the eastern boundary of the area. The river flows through a valley, deeply incised into the flat lying country bedrock, bordered by a series of well-developed terraces.

The widespread mantle of glacial drift on the plateau has a rolling and ridged surface form due to the presence of numerous drumlin fields and eskers. Bedrock outcrops are rare. Elevations above sea level range from approximately 450 m on the Fraser River through 700 m in the Chilcotin River valley, to 1665 m on Mt. Alex Graham east of Alexis Creek.

The Fraser Basin is an area of low relief lying below the elevation of the plateau. Its boundaries are near the 920 m contour and include postglacial deposits of ice-dammed glacial lakes and sediments laid down by the Fraser River. Early geological investigations (Lay 1940, 1941) indicate that the basin was eroded by an ancestral Fraser River flowing northward into the Peace River drainage system.

Numerous bogs and small lakes dot the nearly level plateau surface. Disruption of drainage systems during the Pleistocene is particularly evident in the area of the drainage divide between Alexis Creek and Nazko River. Drainage is mainly to the southeast by means of the Chilcotin River and its main tributaries, the Chilko and Chilanko rivers. However, portions of the area are drained northward by the Nazko River and also by small creeks flowing into the Fraser. The area east of the Fraser is drained mainly by Williams Lake River and a series of westerly flowing steams such as Chimney, Whiskey, and Soda creeks.

The major lakes are Williams, McLeese and Tyee (east of the Fraser), and Stum (containing White Pelican Provincial Park), Punti, and Puntzi to the west. Numerous small lakes occur in the area of the Nazko River-Alexis Creek divide.

Bedrock geology

Figure 3 shows the bedrock geology as generalized from mapping by the Geological Survey of Canada (1959, 1960). It illustrates the location and extent of the various bedrock types and unconsolidated sediments in the survey area. By far the

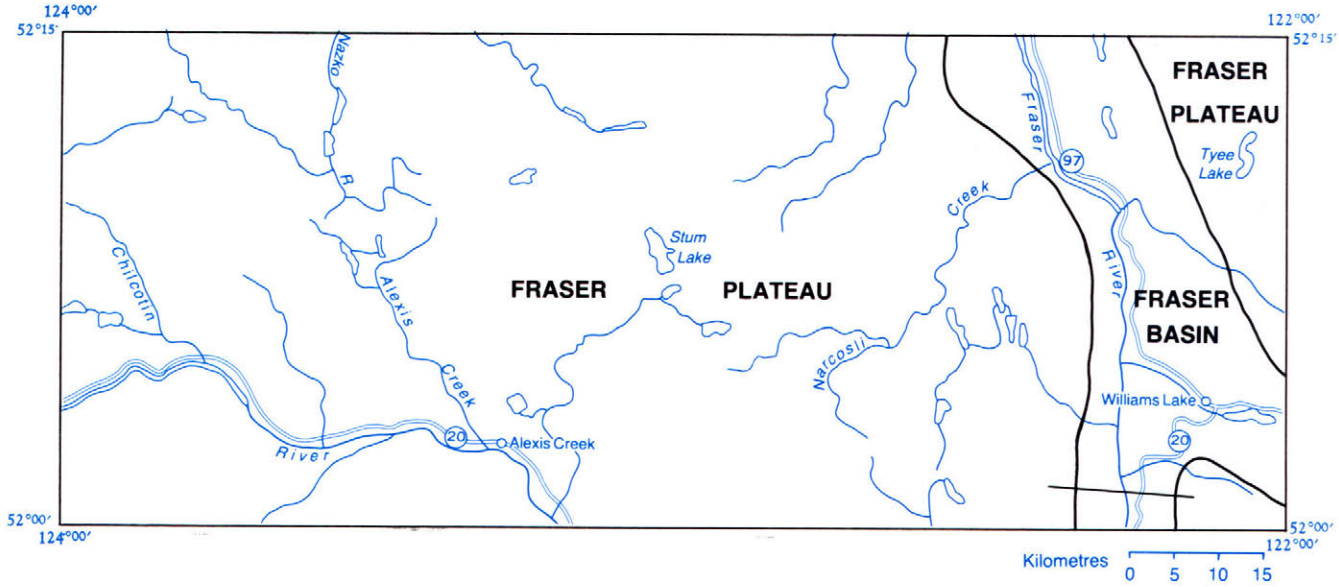
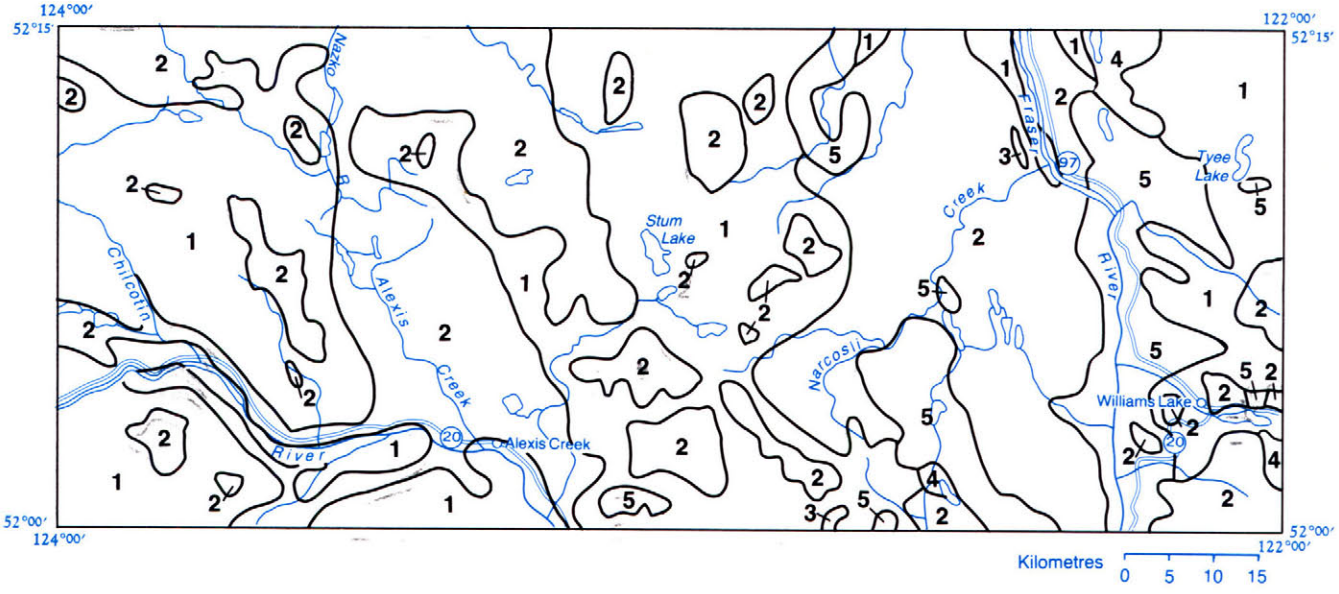


Figure 2. Physiography and drainage.



1 .....Unconsolidated sediments
2 .....Volcanic rocks
3 .....Sedimentary rocks
4 .....Intrusive rocks
5 .....Metasedimentary rocks

Figure 3. Generalized bedrock geology.

most extensive surface materials are unconsolidated sediments. For the most part the Fraser Plateau is underlain by gently dipping olivene basalt flows of Miocene and Pliocene age.

The Fraser Basin is largely an erosional feature. Its surface is characterized by extensive glacial deposits and few bedrock outcrops. Sedimentary rocks occur mainly as outcrops along the Fraser and Chilcotin rivers. Intrusive rocks occur sporadically throughout the area, with the largest unit in the northeast near Cuisson Lake. Metasedimentary rocks occur as a wide belt on the east and west side of the Fraser River south of McLeese Lake and in an area east of Riske Creek, centred on The Dome mountain. The widespread dispersal and mixing of these rock types in the surficial materials by glacial action has tended to minimize their individual influence on soil development. However, some effects can be noted, especially when considering the directions and origins of ice flow (Fig. 4) as described by Tipper (1971).

Surficial geology and soil parent materials

Tipper (1971) has discussed and described the glacial geomorphology and Pleistocene history of central British Columbia in a comprehensive report. The purpose of this section is not to repeat this description but to describe the relationship between these surficial deposits and the parent materials of the soils. Figure 4 provides an overview illustration of the direction of glacial ice movement in central British Columbia (Tipper 1971) and Figure 5 illustrates the general location and extent of surficial geologic deposits, classified according to the Canada Soil Survey Committee 1978. Although there are definite chemical and physical differences within each of the main surficial geological material types, the remainder of this section will describe, in a general fashion, the significant attributes of each group.

Fluvial deposits

Adjacent to present-day river systems, there are extensive terraces and floodplain deposits. These fluvial deposits vary in their extent and mode of formation but are generally found below 600 m and characteristically exhibit level to gently sloping topography. Terraced deposits are usually separated by steep escarpments. As a consequence of their varying mode of deposition, fluvial parent materials can exhibit a considerable range in surface textures. However, for the most part, the textures are loam or loamy sand. Fluvial deposits are parent materials for the Chilcotin, Hargreaves, Elliot, Stellako, Sugarcane, and Taseko soils.

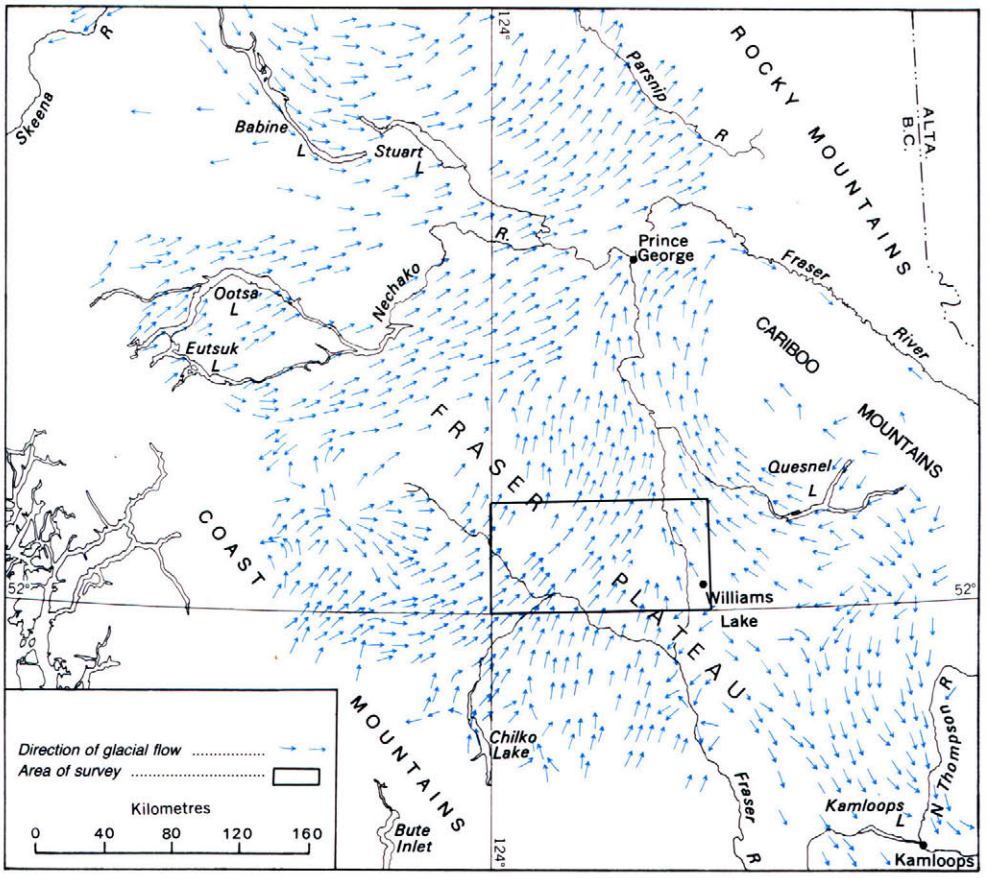


Figure 4. Direction of ice movement in central British Columbia.

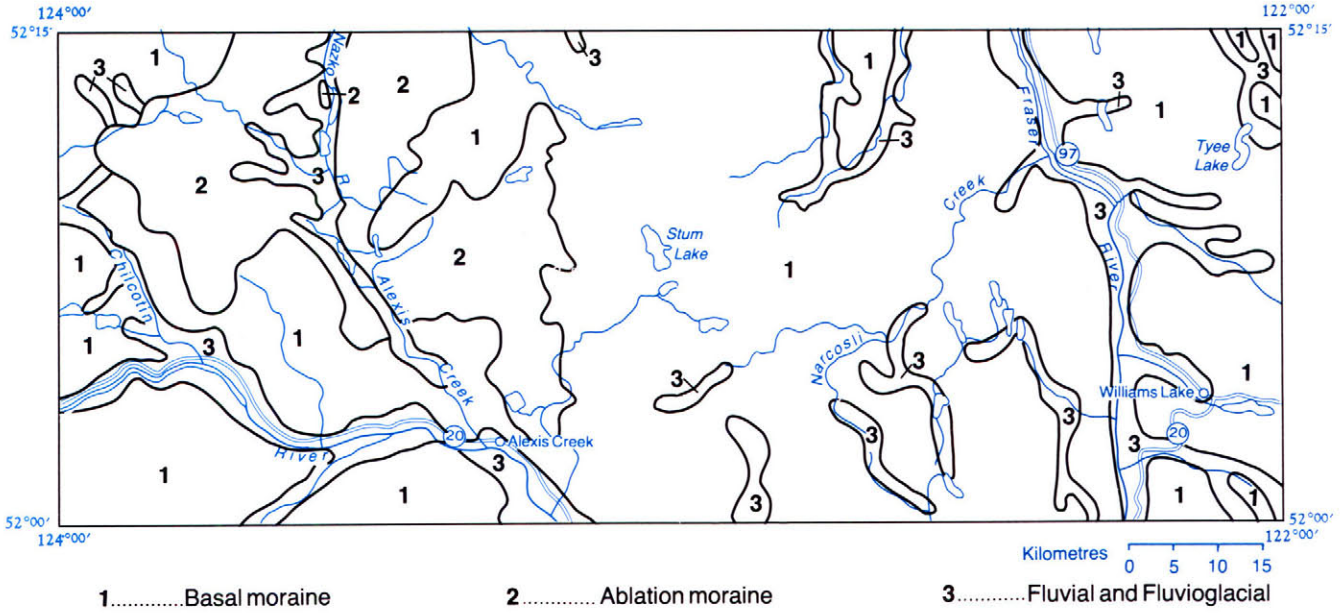
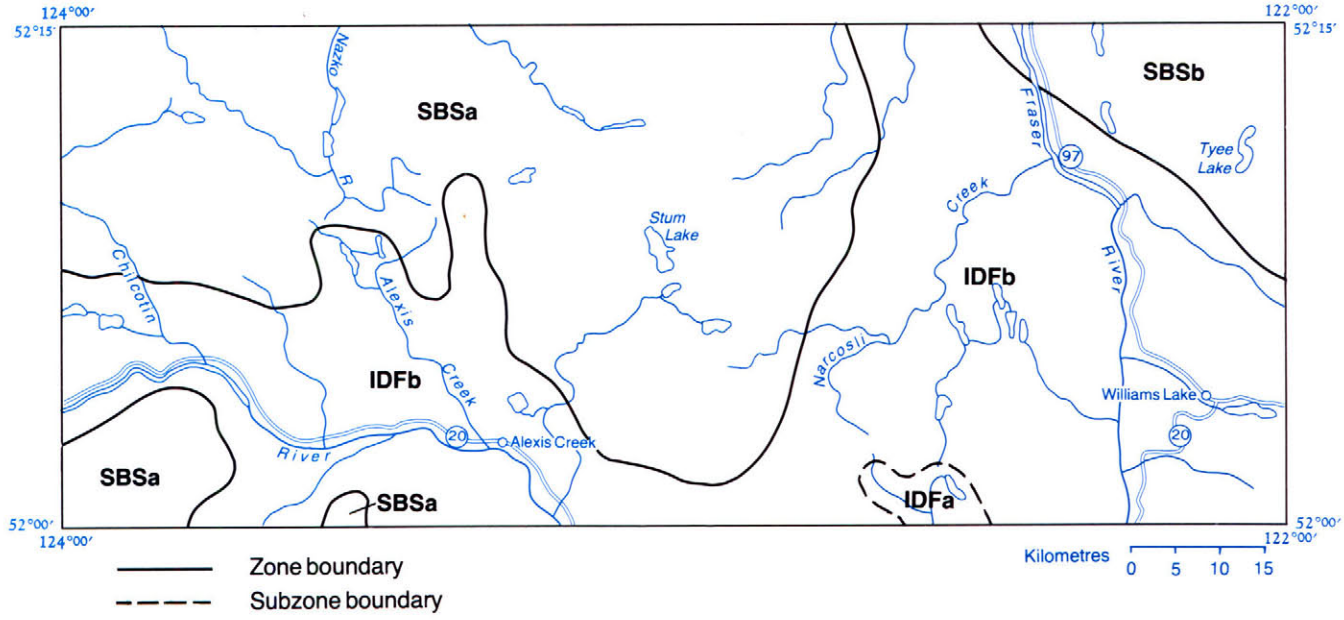


Figure 5. Generalized surficial geology.



Subboreal Spruce Zone

SBSa.....Chilcotin pine subzone

SBSb.....Douglas fir-white spruce subzone

Interior Douglas Fir Zone

IDFa.....grasslands subzone

IDFb.....Douglas fir-pinegrass subzone

Figure 6. Biogeoclimatic zones.

Glaciofluvial deposits occur throughout the map area and are often in close association with morainal (glacial till) deposits at higher elevations (800 m to 1000 m). A variety of landforms occurs associated with recessional glacial ice including esker-kame complexes. Where these deposits are in association with morainal materials, they occur as thin veneers overlying morainal ridges or thicker deposits between drumlins. The texture of the materials generally ranges from gravel to gravelly sand and gravelly loamy sand. Glaciofluvial deposits are parent materials for the Alix, Hawks, Sheridan, and Salt Lake associations.

Lacustrine deposits

In basins centred around Prince George, Fort St. James, and Vanderhoof, ice-dammed lakes formed during late glacial stages and resulted in the deposition of glaciolacustrine sediments extending from upper terraced levels up to approximately 800 m (Tipper, 1971). Because the map area is at the southern extent of these large laking basins, the majority of the glaciolacustrine deposits occurs as isolated pockets of limited extent.

Glaciolacustrine sediments are parent materials for the Berman, Gay Lake, and Zenzako soils. The predominant textures of these sediments are clay loam to heavy clay, although silt loam and very fine sandy loam textures also occur.

Morainal deposits

Morainal (till) deposits, the most extensive surficial materials in the area, occur dominantly above 750 m. At their lower elevational extent, the deposits often occur as islands protruding above the general level of the glaciolacustrine or glaciofluvial sediments. Landforms are commonly well- to poorly-defined drumlins as well as crag-and-tail features where the till is a thin veneer overlying bedrock.

Two types of till are recognized. One, a compact pseudoplaty-structured deposit occurring throughout the area, is described as a basal till (Deserters soil). The second type is a loose, sandy loam to loam textured material displaying evidence of reworking by fluvial action. These deposits are described as ablation (or washed) tills and they characteristically have coarser textures and a higher coarse fragment content (Sheridan and Salt Lake soils occur here as well as on glaciofluvial parent materials).

Other soil associations representing till parent materials are recognized and differentiated on the basis of climatic

characteristics as well as texture and composition resulting from the influence of different bedrock sources. The influence of coarse textured intrusive rocks is reflected in Meldrum and Shemwell soils. Finer textured metavolcanic, metasedimentary, and volcanic rocks occur in the parent materials of the Chimney, Cinema, Tyee, and Williams Lake soils.

Colluvial deposits

Soils developed from colluvial materials are highly influenced by the parent bedrock from which the colluvium was derived. Volcanic and metavolcanic bedrock forms the principal parent material of the Ormond and Whiskey Creek soils. The Chasm and Dog Creek soils tend to be sandy and loamy textured, slightly to moderately calcareous, and are derived from intrusive bedrock.

Eolian or loess deposits

Sandy or silty materials that are transported and deposited by winds form surface veneers on some fluvial, glaciofluvial and, less commonly, till materials. They are of extensive occurrence in the valleys and associated grasslands of the Chilcotin and Fraser River valleys. Chilcotin, Chimney, Dog Creek, and other soils may be capped with a loess mantle 2 to 15 cm thick.

Organic deposits

The rolling, subdued topography of the plateau surface, in combination with the chaotic, often disoriented nature of the drainage pattern has resulted in a multitude of small lakes, ponds, and organic areas. The buildup of organic deposits occurs in wet areas which support vegetation adapted to specific wetland environments. Relatively undecomposed to moderately decomposed, dominantly moss-derived peats predominate in deep meltwater channels and large, open basins with a relatively small fluctuation in the water table. Chief soils are charactistic in these areas. Organic deposits of moderately decomposed sedge materials with an admixture of moss tend to occur in shallower and smaller basins which generally have a sequence of soils grading from organic through peaty phase Gleysols to Gleysols (Elliot soils). The water table generally draws down during the summer growing season. Rail soils are dominant on these primarily sedge-derived peats.

CLIMATE

Given its location in the lee of the Coast Mountains, the map area experiences light annual precipitation (320-450 mm), a high frequency of clear skies and therefore a relatively dry climate. Owing to its elevation, the plateau areas also have a short freeze-free period that may be less than 40 days.

The climate of the Cariboo forest region is described in some detail by Annas and Coupé (1979) as well as by data supplied by G. Cheesman (personal communication). Data from selected climatic stations are presented in Table 1. The data indicate that precipitation increases, freeze-free periods shorten, and growing degree-days lower as one proceeds west from the Fraser River. Snowpacks become deeper and more prolonged in duration at higher elevations.

VEGETATION

Krajina (1969) and Annas and Coupé (1979) have described the vegetation and biogeoclimatic zones of the Cariboo Forest Region on a broad scale. Two biogeoclimatic zones occur in the map area (Fig. 6). A biogeoclimatic zone is a geographic area in a broadly homogeneous macroclimate. Zones are geographically subdivided into subzones on the basis that each subzone is characterized by a homogeneous pattern of soil and distribution of vegetation. Two subzones of the subboreal spruce zone and two subzones of the interior Douglas fir zone are represented in the study area. Botanical and common names of plant species used in this report are from Taylor and MacBryde (1977); some other well-known common names are also given.

Subboreal spruce zone

Two of the three subzones of the subboreal spruce zone occupy about one-half of the study area. The cold, dry Chilcotin pine subzone (SBSa) occurs on the higher elevation plateau in the central and northwestern part of the map area. Here, white spruce (*Picea glauca*) and lodgepole pine (*Pinus contorta* var. *latifolia*) are the dominant coniferous trees on better drained soils. Black spruce (*Picea mariana*) occurs mainly in bogs and on poorly drained soils. One of the key features of this subzone is the general absence of Rocky Mountain Douglas fir or interior Douglas fir (*Pseudotsuga menziesii*). Generally, the herb layer is sparse and the cover of pine grass (*Calamagrostis rubescens*) is variable.

The Douglas fir-white spruce subzone (SBSb) occurs only in the extreme northeastern part of the map area, north of Tyee

Table 1. Climatic data from selected weather stations.

Station	Location	Elev. (m)	Mean temperature(°C)			Mean precipitation(mm)		Growing degree-days[1]	Freeze-free period[2] (days)	Average annual snowfall (cm)	Climatic moisture balance[3] (mm)
			Ann	Jan	Jul	Ann	May-Sep				
Wineglass	51°51'N 122°39'W	488	5.9	-10.8	19.0	309	175	1840	131	71	-348
Wm Lk.-Glendale	52°09'N 122°10'W	588	5.4	-10.2	17.3	386	191	1580	102	116	-316
Puntzi Mtn.	52°07'N 124°05'W	910	1.5	-14.3	13.9	318	176	935	25	133	-295
Wm Lk. Airport	52°11'N 122°04'W	941	3.9	-10.4	15.4	413	198	1220	94	199	-146
Riske Creek	52°01'N 122°31'W	1006	2.6	-11.8	14.4	366	195	1035	72	-	-216
McLeese-Granite	52°32'N 122°16'W	1123	3.0	-10.2	14.4	481	250	1010	94	170	-57
Big Creek	51°44'N 123°02'W	1128	2.0	-11.9	13.5	336	181	900	37	138	-226
Alexis-Tautri	52°32'N 123°11'W	1220	0.4	-13.8	11.6	464	243	635	12	195	-265

[1]Growing degree-days: degree days accumulated above 5°C.
[2]Freeze-free period: days above 0°C.
[3]Climatic moisture balance: moisture deficit (-) or surplus (+).

Reference: Personal communication - G.E. Cheesman, B.C. Ministry of Environment.

Lake. Douglas fir, white spruce, lodgepole pine, trembling aspen (Populus tremuloides), and common paper birch (Betula papyrifera) are the most common trees. The well-developed shrub layer includes western thimbleberry (Rubus parviflorus), Oregon boxwood (Paxistima myrsinites), Rocky Mountain maple (Acer glabrum), and blueberries (Vaccinium spp.). Pine grass is sparse, but herbs such as wild sarsaparilla (Aralia nudicaulis), Canadian bunchberry (Cornus canadensis), and asters (Aster spp.) are common.

Interior Douglas fir zone

The interior Douglas fir-pine grass subzone (IDFb) occurs in the eastern one-third of the map area in the vicinity of the Fraser River and along the Chilcotin River and Alexis Creek in the southwest. Although several tree species occur, Douglas fir is diagnostic for this mild, relatively dry subzone. Common shrubs are prickly rose (Rosa acicularis), soopolallie (Shepherdia canadensis), willows (Salix spp.), and common juniper (Juniperus communis). Pine grass commonly provides a fairly dense ground cover with other herbs such as blue-leaved wild strawberry (Fragaria virginiana), northern twinflower (Linnaea borealis), and star-flowered false Solomon's-seal (Smilacina stellata).

To a very limited extent, the grasslands subzone (IDFa) also occurs in the map area along the valleys of Riske Creek and the Fraser River at the extreme southern edge of the map area, generally below 900 m. Bluebunch wheatgrass (Agropyron spicatum) is a diagnostic species for the subzone which is considered to have the warmest and driest climate of the Cariboo Forest Region. Other plants common to the grassland are big sagebrush (Artemisia tridentata), rabbit brush (Chrysothamnus nauseosus) and yellow salsify or oyster plant (Tragopogon salsify).

SOILS

How this survey was conducted

The soil survey of the Williams Lake area was one of several projects conducted under the auspices of the Canada Land Inventory (CLI) program (Canada Land Inventory 1970) to provide information on soil resources. Each of these projects, as does this one, had a common objective and a set of well-defined guidelines (Working Group on Soil Survey Data, 1983). As with previous projects, soil scientists conducted this survey to learn about the soils and soil-like materials in the survey

area, where they are located, and how they can be used. The soil scientists went into the area knowing they would probably locate many soils they already knew something about, and perhaps identify some they had never seen before. They dug many holes and studied the soil profiles and the surrounding landscape. They gathered much data on factors such as the steepness, length and shape of slopes, drainage, parent materials, vegetation, and the chemical and physical characteristics of the individual soil horizons. With this information, and more, in hand, the soil scientists undertook the task of mapping the distribution of the identified soils.

For detailed accounts of the survey methods and mapping procedures used, the reader is referred to the following publications:

A Soil Mapping System for Canada : Revised (Mapping Systems Working Group, 1981)
The Soil Landscape of British Columbia (Valentine, et al. 1978)

For definitions of terms used in soil science, the reader is referred to:

A Glossary of Terms in Soil Science (Canada Soil Survey Committee, 1976).

The scale of the published soil maps is 1:100 000. Soils are classified and defined according to guidelines established by the Canada Soil Survey Committee (1978). A soil association as defined in this report is a group of soils developed on similar parent materials, which differ because of different soil water regimes or because of variations in other characteristics such as depth to bedrock. A soil association occurs when climatic conditions are similar, usually within one physiographic area or vegetation zone. Although a soil association is named after its most common soil, it may contain several other different yet related soils. All the soils described as belonging to one association may not be represented in every part of the landscape where a soil association is identified or mapped. Soil associations occur singly or in combination and are delineated as map units. Each map unit is marked with labels or symbols to indicate the soil association or associations that make it up.

Two types of map units are employed: a single map unit and a compound map unit. A single map unit contains soils from only one association whereas a compound map unit contains soils from two (or three) associations. For example a single map unit may be D (Deserters association). This map unit represents dominantly deep, moderately well drained Luvisolic soils derived

from gravelly loamy till occurring mainly on the Fraser Plateau. A compound map unit may be D-AX (Deserters-Alix associations). This map unit represents dominantly deep, moderately well drained soils derived from gravelly loamy till, with significant inclusions of gravelly, stony, rapidly drained soils derived from glaciofluvial materials (AX).

How to use this soil survey

The following is a brief guide to using the mapped information and report data. It is understood that as a consequence of the diversity of potential users and their individual needs, there will be other means of making use of the information. However, it is hoped that this section will assist the first-time user of the report and maps.

1. Locate your area of interest on the map sheet.
2. Note the Physiographic Region where your area of interest is located.
3. List the mapping unit symbols that are in your area.
4. Turn to report "Contents" and "Soils" and locate the list of the names of each soil association and the page where that mapping unit is described.
5. Consult "Land Use" and "Derived and Interpretive Maps" sections of the report for information on land capability and other potential uses of the mapped soils.
6. For specific data on the chemical and physical characteristics of the soils, refer to the Appendix.

Description of the soil units

ALIX Soil Units (AX)

Alix are sandy-skeletal soils developed on glaciofluvial materials that were deposited in meltwater channels and near lake margins. The soils occur on level to strongly sloping lands of stream valleys and basins below the general level of the plateau, mainly west of the Fraser River. The elevation range is from 850 - 1200 m. The soils are dominant over 2% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 30-74 days and there are 780-1309 growing degree-days above 5°C. Lodgepole pine is a common tree, but other species characteristic of the subboreal spruce zone--white spruce, Douglas fir, trembling aspen, and common paper birch--occur with a ground cover of blueberry, Oregon boxwood, pine grass, and mosses.

The parent material of the Alix soils is sandy-skeletal glaciofluvial material of variable thickness overlying till or bedrock. Although the predominant terrain form is a nearly level terrace, hummocky and kettled landforms occur. The soils are rapidly drained, are rapidly pervious, and have a subhumid to humid soil moisture regime.

The classification of the soils is Dystric Brunisol with the orthic subgroup dominating in some map units and the eluviated subgroup occurring in slightly moister environments. The more leached soils have a thin surface layer of grayish sandy loam. Subsoils are yellowish brown gravelly sandy loam overlying very gravelly material that may occasionally be calcareous. A complete profile description of an Eluviated Dystric Brunisol, from Soils of the Nechako-Francois Lake Area (Cotic et al. 1976), is in the Appendix.

Alix soils have many characteristics associated with other sandy-skeletal and gravelly soils mapped near the area: Roaring soils of the Nazko area were mapped on complex esker-kame terrain; Ramsey soils are Podzolic.

The Alix soil units provide lodgepole pine pulpwood, and have potential for recreation and wildlife.

The Alix soils were first described in the Quesnel area by Mackintosh et el., in 1965 (unpublished manuscript).

Map units

AX Alix (12 396 ha): The AX map unit occurs in fairly large areas near Tyee Lake and in the upper valleys of Twan and Webster creeks. The deep, rapidly drained soils of the unit occur with small pockets of poorly drained mineral and organic soils. Topography is generally smooth and level to gently sloping, but irregular, ridged, and kettled phases occur. Gully erosion may affect up to 20% of the map unit.

AX-CF Alix-Chief (3454 ha): The Organic soil (Chief) occurs in complexes with Alix soils in this map unit where the very poorly drained secondary soils form a significant landform pattern, or where they occupy 30-40% of the unit. Elevation ranges are similar to those in the AX map unit but topography is more subdued.

BERMAN Soil Unit (BN)

Berman are fine-loamy soils developed on glaciolacustrine deposits. The terrain is nearly level and gently sloping with some steep eroded slopes. Elevations range from 600 m in the Fraser valley to about 900 m near McLeese Lake. These soils predominate in less than 1% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 60-119 days and there are 1170-1504 growing degree-days above 5°C. Lodgepole pine is a common tree, but other species characteristic of the interior Douglas fir zone, such as Douglas fir and trembling aspen, are common trees that occur with a ground cover of herbs, pine grass and mosses.

The parent material of Berman soils is a stratified fine-loamy glaciolacustrine deposit that is only weakly calcareous. Stones or gravel may occur where the lacustrine mantle is shallow over till, especially near the higher elevation limits of the glacial lake basins. The soils are moderately well drained, are moderately pervious, and have a subhumid soil moisture regime.

The most common soils are Orthic Gray Luvisols. Berman soils have thick, grayish surface horizons that can usually be divided into upper and lower subhorizons. The brown, strongly structured subsoil horizons overlie distinctly stratified (varved) glaciolacustrine parent material at depths between 50 and 85 cm. A complete description of an Orthic Gray Luvisol of the Berman Association is from a site southwest of Quesnel (Lord and Mackintosh 1982).

A number of soil associations that occupy the extensive glacial lake deposits of the Fraser Basin are dominated by somewhat similar soils. These Gray Luvisols of the Berman, Beaverley, Narcosli, and Pineview associations are separated on the basis of such criteria as soil profile characteristics, the texture of the parent materials, and landform and climatic features. For the purpose of interpretive groupings most of these associations can be amalgamated.

Berman soils occur extensively in the Prince George-McLeod Lake map area north of Quesnel. The map unit area provides wood for timber and pulp and where cleared is used for grain, hay, and pasture.

Berman soils were first described in the Prince George area in Soils of the Prince George Area (Dawson, in preparation).

Map unit

BN Berman (1716 ha): The BN map unit occupies two areas near the Fraser River. As much as 20-40% of the unit may be comprised of soils on till and a further 20% may be other clayey lacustrine soils. Topography ranges from level to rolling.

CHASM Soil Unit (CM)

Chasm are gravelly loamy soils developed on colluvium on steep upper valley slopes of the Chilko and Chilcotin rivers. Slopes range from moderate to very steep at elevations below 1000 m. These soils cover less than 1% of the map sheet.

The mean annual precipitation is 300-400 m. The freeze-free period is 75-89 days and there are 1310-1504 growing degree-days above 5°C. Chasm soils occur mainly in the interior Douglas fir zone. The forest is open with Douglas fir and a ground cover of bluebunch wheatgrass, herbs, and shrubs such as willows, and roses.

Chasm soils are moderately well drained and moderately pervious, with a semiarid moisture regime. They are classified as Eluviated Eutric Brunisols that have a thin litter layer, and a calcareous subsoil and parent material. In some of these soils volcanic ash is present in the upper horizons. A profile from the Clinton area (Valentine and Schori 1980) is described in the Appendix.

These soils have moderate potential as spring range for cattle and provide winter habitat for wildife such as mule deer.

Map unit

CM Chasm (2859 ha): On the upper valley slopes this unit includes rock outcrops and thin soils. Slopes vary from moderate to very steep.

CHIEF Soil Unit (CF)

Chief are Organic soils developed on moss and sedge peat materials associated with fen and bog types of peat landforms.

The soils occupy depressional or very gently sloping areas generally below elevations of 1200 m. The map units are mainly small and are distributed throughout the subboreal spruce zone of the plateau and basin regions. They are dominant on less than 1% of the map area.

The mean annual precipitation is 300-750 mm. The freeze-free period is 30-89 days and there are 780-1309 growing degree-days above 5°C.

The fens are mostly nonforested, with a vegetative cover of sedges, mosses, and grasses. Vegetation on the bogs is black spruce, lodgepole pine, ericaceous shrubs, and mosses. The soils are very poorly drained and have an aquic moisture regime.

The Chief Association includes a wide range of organic materials in various states of decomposition. Most profiles are classified as Mesisols but Fibrisols predominate in some areas. The surface tier of a typical profile is composed of 5-20 cm of fibric moss peat or sedge peat material that overlies more decomposed layers of dark brown, acidic, organic materials.

Organic soils have been recognized and mapped since the first soil surveys in the Interior Plateau (Kelley and Farstad 1946, Farstad and Laird 1954). At that time three kinds of groundwater soils - muskeg, meadow, and shallow muck - were described in the Prince George area. Although some of these soils are still grouped under the name Chief Association in recent reports, this association name is now used mainly to identify organic landforms in which Mesisols and Fibrisols predominate.

Most of the Chief soils are used by wildlife and for livestock grazing. Some map areas produce hay from native sedge vegetation or from seeded grasses.

Map unit

CF Chief (6862 ha): Many small map delineations of this unit occur in the subboreal spruce zone. The map unit includes variable amounts of Humic Mesisol, terric subgroups, and Gleysols.

CHILCOTIN Soil Unit (CI)

Chilcotin soils are formed on a veneer of coarse-loamy eolian fine sand overlying sandy-skeletal glaciofluvial

deposits. Their slopes are level to gently rolling with some moderately rolling areas. They occur at elevations ranging from 400 to 750 m. These soils cover less than 1% of the map area.

The mean annual precipitation is less than 400 mm. The freeze-free period is mainly 75-89 days but may drop to 50-59 days on cool aspects; growing degree-days are 1310-1504 above 5°C. Within the map area Chilcotin soils are in the dry grasslands subzone of the interior Douglas fir zone. They have few or no trees. The main grass species is bluebunch wheatgrass. In areas which have been overgrazed, plants like big sagebrush, rabbit brush, and oyster plant appear.

Chilcotin soils are classified as Orthic Dark Brown Chernozemic soils, with grayish brown surface horizons. They are deep, well drained, moderately pervious soils under a subarid moisture regime. A complete profile description taken near Riske Creek (Valentine et al., in preparation) is in the Appendix.

These soils provide excellent spring and fall range for cattle. They are used for irrigated forage production where water is available and where the surface eolian layer is deep enough to prevent stoniness from being a problem. Chilcotin soils can be susceptible to slumping and wind erosion.

Map unit

Cl Chilcotin (4173 ha): This unit is comprised of terrace remnants, mostly occurring as isolated flats surrounded by gullied Dog Creek soils. Topography is mainly gently undulating.

CHIMNEY Soil Unit (CY)

Chimney are loamy-skeletal soils developed on till in the vicinity of Riske Creek. The terrain is gently to moderately sloping with occasional areas of strongly sloping or nearly level topography. Elevations are generally less than 1000 m. The soils predominate on 2% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 60-89 days and there are 1170-1504 growing degree-days above 5°C. Douglas fir and trembling aspen occur with a ground cover of blueberry, pine grass, and mosses.

The parent materials of the Chimney soils are loamy-skeletal till deposits. Stones and gravel occur in moderate amounts. The soils are well drained, are moderately pervious, and have a subhumid soil moisture regime.

The classification of the soils is Dark Gray Chernozemic with the orthic subgroup dominating in the map units. The surface horizons are dark grayish brown loam. Subsoils are brown and grayish brown gravelly loam overlying calcareous parent material. A complete profile description of an Orthic Dark Gray Chernozemic soil, from Soils of the Taseko Lakes Area (Valentine et al., in preparation), is given in the Appendix.

Although the dominant soils of the Chimney Association were originally classified as Dark Gray Chernozemic, recent investigations reveal a significant proportion of Dark Brown soils in some areas. Such soils may be predominant on lower valley slopes under the influence of a more arid climate, especially in areas mantled by silty eolian veneers.

Chimney soils support a grassland and shrub vegetation that forms an important part of the natural grazing lands of the Cariboo country. The soils were first described in the Williams Lake area.

Map unit

CY-WL Chimney-Williams Lake (13 323 ha): The hummocky, rolling landscape pattern of open grassland among stands of trembling aspen and Douglas fir is typical of this map unit. The wooded areas (Williams Lake soils) comprise 20-60% of the unit.

CINEMA Soil Units (C)

Cinema are gravelly loamy soils developed on till in the northeast part of the map area. The soils occur on sloping lands near McLeese Lake in the Hawks Creek valley, and west of the Fraser River. Elevations are mainly less than 1000 m. The soils predominate in 5% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 60-89 days and there are 1170-1504 growing degree-days above 5°C. Lodgepole pine is a common tree, but other species characteristic of the subboreal spruce zone - white spruce, Douglas fir, trembling aspen, and common paper

birch - occur with a ground cover of blueberry, Oregon boxwood, pine grass, and mosses.

The parent material of the Cinema soils is gravelly loamy till of variable thickness. Reaction of the parent material ranges from neutral to weakly calcareous. Drumlinized or grooved landforms are common. The soils are well drained, are moderately pervious, and have a subhumid soil moisture regime.

The classification of the dominant soil is Orthic Gray Luvisol. The surface soils are brownish gray, sandy loams that overlie a brownish loamy subsoil. Below this horizon is a gravelly, often stony material that may occasionally be calcareous. A complete profile description of an Orthic Gray Luvisol, from a map unit near Marguerite (Lord and Mackintosh 1982), is given in the Appendix.

In the natural state, the ground vegetation and shrubs associated with the Cinema Association provide considerable grazing, but only where the topography is not too severe.

The soils of the Cinema Association were first described by Mackintosh et al. in 1965 (unpublished manuscript) on the dry lower plateau slopes south of Quesnel.

Map units

C Cinema (36 332 ha): The delineations of this map unit generally occupy south-facing slopes that contain some Dark Gray soils. Gravelly soils, and up to 30% Brunisolic Gray Luvisols may occur in the unit.

C-AX Cinema-Alix (5224 ha): This map unit occupies irregular, hummocky terrain. Veneers and pockets of gravel (Alix) are common in the unit and make up about 20-50% of the soils.

DESERTERS Soil Units (D)

Deserters are gravelly-loamy and loamy-skeletal soils developed on till on topography that ranges from moderate to very steep. The elevations are from 750 m to about 1500 m. The Deserters map units are confined to the vicinity of Tyee Lake where they occupy 2% of the map area.

The mean annual precipitation is 300-450 mm. The freeze-free period is 60-74 days and there are 1170-1309 growing degree-days above 5°C. Lodgepole pine is a common tree, but other species characteristic of the subboreal spruce zone--white spruce, Douglas fir, trembling aspen, and common paper birch--occur with a ground cover of blueberry, Oregon boxwood, pine grass, and mosses.

The parent materials of Deserters soils are clay loam and sandy loam, generally gravelly, and greater than 1 m thick over bedrock. Areas of drumlinized landform adjacent to the shoreline zone of the former glacial lake may have 30 cm or more of gravelly, washed materials. Parent materials are mainly neutral and free of lime to depths of about 1 m. The soils are moderately well to well drained, are moderately to slowly pervious, and have a humid to subhumid soil moisture regime.

The dominant soils are Brunisolic Gray Luvisols, but Podzolic Gray Luvisols and gleyed subgroups are common. The soils have brownish surface horizons and grayish brown subsoils. A complete profile description of a Brunisolic Gray Luvisol is from Soils of the Prince George Area (Dawson, in preparation).

Soils of the Cinema Association are Orthic Gray Luvisols that occur on similar parent material to that of Deserters soils but under a slightly drier environment.

The soils are largely under forest that is currently being cut for pulpwood and sawlogs.

The Deserters Association was first identified and characterized in the Prince George area by Dawson (report in preparation).

Map units

D Deserters (5974 ha): Most delineations of this map unit contain drumlinized terrain in which 15-30% of the soils may be sandy and gravelly. Orthic Gray Luvisols occupy drier aspects.

D-C Deserters-Cinema (9552 ha): Delineations of this map unit occur on a rolling morainal landscape in the northeastern area of the map sheet. Cinema soils, Orthic Gray Luvisols, comprise a significant percentage of the unit.

D-DN Deserters-Dragon (1777 ha): This map unit lies on upper slopes of ridges. Some areas carry a significant component of shallow Dragon soils that are developed on colluvium. These Humo-Ferric Podzols occur in the Engelmann spruce-subalpine fir zone. A profile description of a Dragon soil from Soils of the Nechako-Francois Lake Area (Cotic et al. 1976) is given in the Appendix.

DOG CREEK Soil Unit (DC)

Dog Creek are sandy-skeletal soils formed on mixed fluvial, glaciofluvial, and till materials. Topography is usually simple and slopes are from strong to very steep. They occur on the steep valley sidewalls and eroded gullies along the Chilcotin River. The map unit occupies elevations between 700 and 900 m. Dog Creek soils cover less than 1% of the map area.

The annual precipitation is less than 400 mm. The freeze-free period is 75-89 days and there are 1310-1504 growing degree-days above 5°C. Dog Creek soils are in the interior Douglas fir zone. They occupy sparse grasslands dominated by bluebunch wheatgrass and big sagebrush. As with the other grassland soils of this region, big sagebrush increases in dominance in areas which have been overgrazed. Clumps of Douglas fir grow in the bottoms of many gullies.

Dog Creek soils are well drained, loose, and rapidly pervious with a subarid moisture regime. They are classified as Orthic Dark Brown Chernozemic soils. Many have been eroded on the steep slopes and have thin profiles over calcareous parent material. The Appendix includes a typical profile described near the Gang Ranch (Valentine et al., in preparation).

These soils have moderate potential for domestic range production and may be used in the spring and fall. They are extensively used by wildlife, providing valuable escape terrain adjacent to the better grazing areas of Chilcotin soils. Slumping can be a problem.

Map Unit

DC Dog Creek (2191 ha): More than 40% of this map unit contains shallow soils and rock outcrops. Topography is simple and very steep (30 to 100% slopes).

ELLIOT Soil Unit (EL)

Elliot are fine-loamy soils formed on fluvial sediments. Their topography is subdued with 0 to 5% slopes. They range in elevation from 800 to 1200 m. They cover only 2% of the map sheet but are widely distributed west of the Fraser River.

The mean annual precipitation is 300 - 400 mm or more. The freeze-free period is 30-49 days and there are 780-1029 growing degree days above 5°C. Concentrated mainly in the subboreal spruce zone, the vegetation on Elliot soils consists of willows, sedges, and grasses, which reflect local wetness, not regional climate. There are few trees, and shrubs such as willows and bog birch (Betula glandulosa) are restricted to the upper slopes.

The soils are imperfectly or poorly drained, moderately pervious, with a perhumid moisture regime. They are classified as carbonated phase Rego Humic Gleysols with water near the surface for most of the year. They are calcareous to the surface and have a thick, organic-enriched, surface horizon. A profile described in the Lac la Hache area by Valentine and Schori (1980) is given in the Appendix.

Map unit

EL Elliot (13 256 ha); Restricted mainly to narrow valleys and linear hollows, most delineations are small and irregular. However, some large areas, complexed with 20-40% Organic (Rail) soils, are near Temapho and Alexis lakes.

GAY LAKE Soil Unit (GY)

Gay Lake are fine-silty soils developed on a blanket of glaciolacustrine material on terraces adjacent to the Chilcotin River and its tributaries. Topography is complex and slopes are gentle to moderate. The elevations range from 750 to 1000 m. The soils cover less than 1% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 60-89 days and there are 1170-1504 growing degree-days above 5°C. Within the interior Douglas fir zone, Douglas fir and lodgepole pine are the main tree species with an understory of rose, kinnikinnick (Arctostaphylos uva-ursi) and pine grass.

Gay Lake soils are moderately well drained, deep, and moderately pervious with a subhumid moisture regime. They are classified as Orthic Eutric Brunisols, with a surface horizon, with a pH over 5.5, a slightly weathered subsurface horizon, and calcareous parent material. A typical profile description (from Valentine et al., in preparation) is given in the Appendix.

These soils have moderate to high potential as summer range for domestic cattle. Gentler slopes within this map unit are occasionally irrigated for hay and alfalfa.

Map unit

GY Gay Lake (5859 ha): There are three large delineations and a few small areas of this map unit. Their topography is complex and slopes range from 5 to 30%. In some places low gravelly ridges (crevasse fillings) produce a hummocky surface. Dark Brown soils (Zenzako) and Whiskey Creek soils generally comprise 20-40% of the unit.

HARGREAVES Soil Unit (HA)

Hargreaves are loamy soils developed on terraced glaciofluvial deposits adjacent to the Fraser and Chilcotin rivers. Topography is complex and slopes are very gentle to moderate with some areas of strong slopes. Elevations range from 500 to 800 m. The map units cover about 2% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 75-119 days and there are 1310-1504 growing degree-days above 5°C. Hargreaves soils are in the interior Douglas fir zone, characterized by open stands of Douglas fir and a ground cover of bluebunch wheatgrass, sparse shrubs such as willows and rose, and herbs.

In some areas the parent materials are clay loam in texture and probably originated as glaciolacustrine deposits, as a result of small localized ponding.

Hargreaves soils are deep, well drained, friable, and rapidly pervious, with a semiarid moisture regime. They are Orthic Eutric Brunisols with a surface pH above 5.5 and calcareous parent material. A soil profile, described near the junction of the Chilcotin and Fraser rivers (Valentine et al., in preparation), is given in the Appendix.

These soils offer some grazing potential for domestic livestock and, if water can be pumped to them, a few areas can produce hay and alfalfa.

Map units

HA Hargreaves (7802 ha): Soils of this map unit area are similar to the Chilcotin unit, occurring on flatter terrace remnants, but they are coarser textured and treed. Inclusions of Chilcotin soils occur. Topography is complex and the slopes range from 2 to 15% with some areas of strong to very strong slopes.

HA-WC Hargreaves-Whiskey Creek (2317 ha): This map unit predominates in areas along the Fraser River. Whiskey Creek soils comprise 30-40% of the unit and eroded soils are common.

HA-SN Hargreaves-Sheridan (1391 ha): The two map areas near Macalister contain some clayey soils and variable amounts of coarse-skeletal soils (Sheridan).

HAWKS Soil Unit (HS)

Hawks are gravelly, sandy-skeletal soils developed on glaciofluvial deposits. The terrain is undulating and ridged with gentle to moderate slopes. Elevations are mainly between 700 and 800 m in the Hawks Creek and Chilcotin River valleys. The soils are of limited extent and predominate in less than 1% of the map area.

The mean annual precipitation is about 400 mm, the freeze free period is 50-74 days, and there are 1030-1309 growing degree-days above 5°C. The Hawks soils occur in the interior Douglas fir zone where Douglas fir is the dominant tree associated with trembling aspen, pine grass, blueberry, and mosses; and in the subboreal spruce zone where lodgepole pine and white spruce are common trees.

The parent materials are gravelly, sandy, glaciofluvial deposits that are moderately calcareous. Stones and cobbles are common. The soils are rapidly drained, are rapidly pervious, and have a subhumid to semiarid soil moisture regime.

The most common soils are Eluviated Eutric Brunisols but Orthic Eutric Brunisols also occur. They have thin, grayish

surface horizons and brown subsoils overlying yellowish brown parent material. A complete description of a profile, from Soils of the Taseko Lakes Area (Valentine et al., in preparation), is given in the Appendix.

Hawks soils were first described in the Williams Lake area. The soils have some uses as sources for gravel and production of native forage.

Map unit

HS Hawks (14 218 ha): This map unit occurs with Tyee soils in the Hawks Creek valley and with soils on fluvial materials in the Chilcotin valley. Hawks closely resemble Alix soils but are more calcareous throughout the profile.

MELDRUM Soil Units (ME)

Meldrum are gravelly sandy soils developed on till on the Fraser plateau immediately west of the Fraser River. Most of the soil areas are on nearly level and gently sloping terrain over an elevation range from 900-1250 m. The soils predominate in 11% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 60-89 days and there are 1170-1504 growing degree-days above 5°C. The interior Douglas fir zone is dominated by Douglas fir with trembling aspen and a ground cover of blueberry, pine grass, and mosses.

The parent material of these Orthic Gray Luvisols is a sandy loam till that is calcareous at depth. The brownish, fine sandy loam Ae horizon overlies a moderately well-developed clay loam Bt horizon on a sandy loam subsoil. The complete soil description in the Appendix is from a site north of Mackin Creek.

Meldrum soil units are used extensively for cattle grazing and timber production.

Map units

ME 1 Meldrum 1 (48 033 ha): Numerous, large, nearly level map areas contain high concentrations of large volcanic boulders. Gravel is present in pockets and as thin veneers.

ME 4 Meldrum 4 (9028 ha): This unit occupies somewhat higher and more sloping terrain north of Twan Creek. Shallow lithic soils comprise 20-40%.

ME-AX Meldrum-Alix (10 521 ha): Most areas contain 20-40% gravelly Alix soils and about 20% small bogs and fens.

ME-CF Meldrum-Chief (7057 ha): This unit is characterized by many small organic areas (40% or more) and numerous small lakes and potholes.

ME-HS Meldrum-Hawks (11 350 ha): Similar to the ME-AX unit but the inclusions of Eutric Brunisols comprise between 30 and 50%.

RAIL Soil Unit (RL)

Rail are Organic soils developed on accumulations of moderately decomposed sedges and mosses. The terrain is level to depressional. These soils occur throughout the southern Fraser Plateau. They predominate in 2% of the map area.

The mean annual precipitation is greater than 426 mm, the freeze-free period is less than 49 days, and there are less than 1029 growing degree-days above 5°C.

In the map area Rail soils occur within the Chilcotin pine subzone of the subboreal spruce zone. The hydrophytic vegetation is dominated by sedges, reeds, grasses, willows, and herbs.

Parent materials of the Rail soils are moderately decomposed peat materials that have been derived from water-loving plants common to fen landforms; they are neutral to acid in reaction. The soils are very poorly drained, are moderately pervious, and have an aquic soil moisture regime.

The most common soils are Terric Mesisols. They have a mesic middle tier and are less than 160 cm in depth. A complete description of a Terric Mesisol, from the Clinton-Lac la Hache map area (Valentine and Schori 1980), is given in the Appendix. The Rail soils were first described in the Lac la Hache area.

Rail soils provide a source of hay and grazing for the cattle industry and browse for wild ungulates.

Map unit

RL Rail (14 418 ha): This unit may contain up to 20% inclusions of Gleysolic soils and deep (Typic) Organic soils. Rail soils tend to be somewhat more decomposed, and lack the sphagnum moss surface of the Chief Association.

SALT LAKE Soil Units (SY)

Salt Lake are coarse-loamy, gravelly and stony soils develped on loose, water sorted materials that overlie compact till. The landform is hummocky terrain with gentle to moderate slopes. The elevation ranges from about 1000 to 1200 m across large areas near Mackin Creek and north of Alexis Creek. The association is dominant over 16% of the map area.

The mean precipitation is 300-400 mm. The freeze-free period is 30-89 days and there are 780-1309 growing degree-days above 5°C. The soils occur mainly in the subboreal spruce zone where an open forest of lodgepole pine and white spruce has an understory of rose, willows, kinnikinnick and pine grass.

Salt Lake soils are dominantly Orthic Gray Luvisols that are frequently associated with Brunisols. Surface horizons are light gray or brownish fine sandy loam. Subsoils are compact, brownish, gravelly loams or sandy loams. A moderately calcareous horizon is usually present at some depth. The complete soil description in the Appendix is of an Orthic Gray Luvisol from north of Siwash Lake.

Because of the nature of the ablation till materials and their origins, the map delineations of Salt Lake soils contain varying amounts of gravelly soils, mainly of the Alix Association.

Map units

SY Salt Lake (48 358 ha): The large delineations are mainly almost level but some contain irregular hummocky, kettled terrain. Some gravelly soils are included.

SY-AX Salt Lake-Alix (32 466 ha): Alix and some Hawks soils comprise 20-40% of the unit. SY-AX areas adjoining Temapho Lake contain soils with 20-30 cm of fluvial veneer over till.

SY-TE Salt Lake-Tyee (39 616 ha): This unit may contain greater than 40% Tyee soils on gentle smooth slopes that lie somewhat higher than the other Salt Lake units.

SY-CF Salt Lake-Chief (1 359 ha): The irregular hummocky terrain of this unit contains 20-50% Chief soils interspersed with many small lakes and potholes.

SHEMWELL Soil Unit (SH)

Shemwell are loamy-skeletal soils developed on water-washed till. Topography is mainly gently to moderately rolling over elevations ranging from 900 to 1000 m. Shemwell soils cover 2% of the map area.

The mean annual precipitation exceeds 400 mm. The freeze-free period is mainly within 30-49 days and there are generally less than 1029 growing degree-days above 5°C. The vegetation under the subboreal spruce zone consists of an open forest dominated by lodgepole pine, willows, rose, kinnikinnick, and pine grass.

Shemwell soils are well drained, loose to friable, and rapidly pervious, with a subhumid moisture regime. They are classified as Orthic Gray Luvisols and have clay-enriched subsurface horizons, well leached surface horizons, and a very thin litter layer.

These soils have moderate potential as range for domestic cattle and wildlife. They have some potential for forestry, but they are droughty.

Map unit

SH Shemwell (11 204 ha): This map unit covers two areas of rolling till plain in the southwest. Its topography is usually complex. The unit contains other soils such as Hawks and Williams Lake. Shemwell soils have extensive coverage on the plateau south of the survey area.

SHERIDAN Soil Unit (SN)

Sheridan are coarse-loamy , gravelly and stony soils developed on glaciofluvial and till materials that range in

texture from sandy loam to clay loam. The landform is hummocky terrain with gentle to moderate slopes. The elevation ranges from about 1000 to 1200 m across a few map units along the northern boundary of the map area. The association is dominant on less than 1% of the map area.

The mean precipitation is 300-400 mm. The freeze-free period is 30-89 days and there are 780-1309 growing degree-days above 5°C. The soils occur mainly in the subboreal spruce zone where an open forest of lodgepole pine and white spruce has an understory of rose, willows, kinnikinnick and pine grass.

Sheridan soils are classified as Gray Luvisols with the orthic subgroup dominating in some areas and the brunisolic subgroup in others. Surface horizons are light gray or brownish fine sandy loam. Subsoils are brownish gravelly loams or clay loams. A moderately calcareous horizon is usually present at some depth. The complete soil description is of a Brunisolic Gray Luvisol from the Ramsey Creek area (Lord and Mackintosh 1982).

Because of the nature of the materials and their origins, the map delineations of Sheridan soils contain varying amounts of gravelly soils, mainly of the Alix Association.

Map unit

SN-AX Sheridan-Alix (9860 ha): The generally subdued topography of the delineated units may be a reflection of the high percentage of fluvial materials present (30-40% Alix soils).

SUGARCANE Soil Unit (SU)

Sugarcane are loamy soils developed on calcareous fluvial deposits of the San Jose River. The terrain is level and gently undulating. Elevations are less than 900 m. This localized soil predominates in less than 1% of the map area.

The mean annual precipitation is 426 mm. The freeze-free period is 75-89 days and there are 1170-1309 growing degree-days above 5°C.

The Sugarcane Association occurs in the interior Douglas fir zone where the native vegetation is dominated by sedges, rushes, and grasses.

The parent materials of the Sugarcane soils are calcareous silt loam and silty clay loam fluvial deposits that include saline materials. They are generally nonstony except at depth. The soils are imperfectly to poorly drained, are moderately to slowly pervious, and have a humid to subaquic soil moisture regime. The most common soils are Gleyed Regosols, carbonated phase. They are mottled throughout.

Although the Sugarcane soils are not described here in detail, information on their characteristics and management is given in A Soil Resource and Land Use Survey of the Williams Lake Indian Reserve (Leskiw et al. 1973). This report identifies Sugarcane soils in the legend and discusses them under management areas. Most Sugarcane soils are suitable for forage production and grazing. The association was named and described during the soil survey of the Horsefly area (Lord 1984).

Map unit

SU Sugarcane (337 ha): The single area of this map unit in the San Jose valley is near the mouth of the river. The detailed survey of the Williams Lake Indian Reserve (Leskiw et al. 1973) delineates five map units in the floodplain and delta areas. These units separate components of the Sugarcane Association into two areas: Gleyed Regosol (carbonated and saline phases), and Black and Dark Gray Chernozemic soils (orthic subgroup and carbonated phase).

TASEKO Soil Unit (TK)

Taseko are sandy and gravelly soils developed in fluvial sediments on the lowest terraces along river valleys. Their topography is very gently to gently rolling with some areas of stronger slopes. They occur at elevations between 700 and 900 m. The soil unit covers less than 1% of the map area.

The mean annual precipitation is less than 400 mm. The freeze-free period is 30-74 days and there are 1030-1309 growing degree-days above 5°C. Taseko soils are in the interior Douglas fir zone. Their vegetation is typically balsam poplar (cottonwood), aspen, willows and grasses.

Taseko soils are well drained, deep, friable, and rapidly pervious, with a semiarid moisture regime. These soils are classified as Rego Dark Brown Chernozemic. A profile

description (Valentine et al., in preparation) is included in the Appendix.

At their lowest points they may be flooded in the spring. However, the soils have good potential for agriculture and many of them are currently cultivated where stoniness is not too severe. They are good gravel sources. Gravel underlies the finer textured surface at varying depths.

Map unit

TK Taseko (1861 ha): This map unit is found on the lowest terraces of the Chilcotin and Chilco river valleys. Its topography is complex and slopes are 2 to 9%. The soils can have variable textures typical of a recent floodplain deposit. The finer textured surface layer may vary from fine sand to silt loam and from 25 to 100 cm deep overlying gravels.

TYEE Soil Units (TE)

Tyee are gravelly loamy soils developed on till that lie mainly west of the Fraser River. The terrain is mostly undulating and rolling with some moderate to strong slopes. Elevations range from 1000-1500 m. This extensive soil association is dominant over 35% of the map area.

The mean annual precipitation ranges between 426 and 566 mm, the freeze-free period is 30-59 days, and there are less than 1029 growing degree-days above 5°C. The Tyee soils occur most commonly in the subboreal spruce zone where lodgepole pine and white spruce predominate with Douglas fir and a ground cover of pine grass, herbs, and blueberry.

Parent materials of the Tyee soils are gravelly loam and clay loam deposits which are moderately calcareous. Stones and gravel occur frequently. Variable amounts of volcanic ash cover the soils or are incorporated in the upper profile. The soils are moderately well drained, are moderately to slowly pervious, and have a humid to subhumid soil moisture regime.

The most common soils are Orthic Gray Luvisols. They have grayish surface horizons and compact, brown clay loam subsoils underlain by yellowish brown loam parent material. A complete description of a typical soil, from Soils of the Lac la Hache - Clinton Area (Valentine and Schori 1980), is given in the

Appendix. The profile of a Tyee soil has a thicker Ae horizon and a more deeply leached solum than that of a Williams Lake soil.

Soils of the Tyee units provide timber and grazing throughout the Cariboo area.

Tyee soils were first described and mapped in the Williams Lake area.

Map units

TE1 Tyee 1 (87 686 ha): This map unit predominates in the lower portions of the plateau area. The gently undulating landscape is dominated by Orthic Gray Luvisols with minor amounts of imperfectly drained soils.

TE3 Tyee 3 (25 600 ha): On higher portions of the plateau the few areas of this unit contain some shallow or lithic phases of the Tyee soils.

TE4 Tyee 4 (87 209 ha): Soils in this map unit are dominantly of lithic phase and are associated with rock outcrop on steeply sloping high elevation terrain.

TE-HS Tyee-Hawks (6241 ha): Areas of this map unit are present in the Hawks Creek valley. The gravelly sandy Hawks soils occur as thick veneers over till or as gravelly pockets surrounded by Tyee soils.

TE-SY Tyee-Salt Lake (62 363 ha): This unit occupies large areas near Stum Lake and north of the Chilcotin valley. Gravelly sandy Salt Lake soils make up 30-50% of the unit on gently to moderately rolling topography.

WHISKEY CREEK Soil Units (WC)

Whiskey Creek are gravelly, coarse loamy soils developed on till. They occur on strong to very steep valley slopes of the Chilcotin River and its tributaries. Elevations range from 800 to 1200 m. The soil unit covers 5% of the map area.

The mean annual precipitation is generally less than 400 m. The freeze-free period is 60-74 days and there are 1170-1309 growing degree-days above 5°C. Whiskey Creek soils are mainly in the interior Douglas fir zone, between the grasslands of the

lower river valley areas and the forested soils of the plateau. They have an overstory of Douglas fir with a ground cover of pine grass, sparse shrubs, and herbs.

These soils are well drained, deep, and moderately pervious, with a semiarid moisture regime. They are classified as Orthic Eutric Brunisols with slightly weathered subsurface horizons, and a calcareous parent material. A profile description (Valentine et al., in preparation) is given in the Appendix.

Steep terrain, tree cover, and good grass growth provide winter range for wild ungulates, mainly deer. Cattle use this unit that lies between the spring and fall ranges near ranches in valleys, and the summer range of the plateau. Forest growth on these soils is sparse.

Map units

WC Whiskey Creek (32 448 ha): This map unit represents the upper forested slopes of the river valleys between the forested plateau and the lower grassland terraces. Topography is simple with strong to very steep slopes. Between 10 and 30% of the area may consist of shallow soils on rock outcrops. It may also contain some Chernozemic Chimney soils.

WC-ZO Whiskey Creek-Zenzako (3675 ha): Occurs in a few areas near Alexis Creek where it contains 30-40% Zenzako soils.

WILLIAMS LAKE Soil Units (WL)

Williams Lake are gravelly loamy soils developed on till and associated with the Chilcotin River valley and the area south of Williams Lake. The terrain is mainly undulating or rolling, with occasional strong slopes. Elevations range between 950 and 1050 m. This association is dominant over 5% of the map area.

The mean annual precipitation is about 426 mm, the freeze-free period is 60-74 days, and there are 1170-1309 growing degree-days above 5°C. The Williams Lake soils occur in the interior Douglas fir zone where Douglas fir is the dominant tree. The open forest includes shrubs and herbs such as soopolallie, prickly rose, and pine grass.

The soil parent material is gravelly clay loam till, which is slightly to moderately calcareous. Stones occur frequently. The soils are moderately well drained and moderately pervious, with a subhumid to semiarid soil moisture regime.

The most common soils are Orthic Gray Luvisols. They have a grayish surface horizon and a compact, brownish, clay loam subsoil underlain by yellowish brown parent material. A complete description of an Orthic Gray Luvisol, from Soils of the Lac la Hache - Clinton Area (Valentine and Schori 1980), is given in the Appendix. The Williams Lake soil has a thinner Ae horizon and a less deeply leached solum than that of a Tyee soil.

Soils of the association have limited value for timber production but provide an important grazing capacity.

Map units

WL Williams Lake (26 160 ha): Soils of the map unit occur with Chimney soils in the dry environment near Riske Creek and Williams Lake. Lime is encountered at 60-70 cm and Ae horizons are thin (5 cm) compared with those of Tyee soils (18 cm).

WL-GY Williams Lake - Gay Lake (5907 ha): Areas of this map unit near Alexis Creek contain 20-40% lacustrine deposits, the parent material of Gay Lake and Zenzako soils.

WL-HS Williams Lake - Hawks (6451 ha): This map unit is not extensive, but it is composed of Williams Lake soils complexed with 20-40% gravelly Hawks soils on irregular hummocky terrain.

ZENZAKO Soil Unit (ZO)

Zenzako are loamy soils formed in glaciolacustrine sediments on undulating terraces. Topography is quite variable and complex ranging from nearly level to strongly sloping. Elevations range from 750 to 1050 m. The soils cover less than 1% of the map area in the valleys of the Chilcotin River and its tributaries.

The mean annual precipitation is 300-400 mm. The freeze-free period is 60-89 days and there are 1170-1504 growing degree-days above 5°C. Within the interior Douglas fir zone,

Douglas fir and lodgepole pine are the main tree species with an understory of rose, kinnikinnick and pine grass.

The soils are deep, moderately well drained, moderately pervious, and have a semiarid moisture regime. They are classified as Orthic Brown Chernozemic soils. A typical profile description (Valentine et al., in preparation) is included in the Appendix.

These soils have moderate productivity for livestock range. Strong saline characteristics and the effects of soluble salts on vegetation are readily apparent near Redstone, Alexis Creek, and around Williams Lake. Although the Cuisson soil, a Dark Gray Solod developed on saline glaciolacustrine materials south of Quesnel, was not mapped in the present report area, similar soils occur. The Cuisson soil, as described in Soils of the Quesnel Area (Lord and Mackintosh 1982) is developed on calcareous fine-loamy deposits that show electrical conductivity readings in the Bs horizon greater than 7 m S/cm. It is important for land managers to be aware of the possibly undesirable effects of even moderately high levels of soluble salts.

Map unit

ZO Zenzako (5208 ha): There are scattered delineations of the map unit, all in the southwest. Topography is complex and slopes range up to 30%. This map unit is associated with the forested Gay Lake soils. It frequently contains gullies, and has some saline spots with stones and boulders on the surface.

LAND USE

As mentioned in the section Soils , the soil mapping described here was conducted under the auspices of the Canada Land Inventory (CLI) (Canada Land Inventory, 1970a). The primary objective of this program was to determine and map the land or soil capability for various purposes. This mapping has been accomplished for the Williams Lake-Alexis Creek area (Fig. 1). Maps showing soil capability for agriculture are published at a scale of 1:125 000. Land capability for forestry maps are published at the same scale. Three separate maps are published at 1:250 000, covering land capability for recreation, waterfowl and wild ungulates. Present land use maps at a scale of 1:50 000 (in manuscript form) are also available. However, these maps have not been up-dated from their original compilation in the early 1970s. The user of the capability maps should realize that at these small scales, the information is suitable for regional planning but is too generalized for detailed site evaluation.

As part of the CLI program, analyses of the soil and land capability information were undertaken in a composite manner for the individual sectors. These analyses are termed Land Capability Analyses. The Land Capability Analysis : Cariboo Area (Canada Land Inventory, 1973a) at a scale of 1:250 000 includes all of the map area marked in Fig. 1.

Given the nature of soil mapping and the manner in which soil and map information is stored in computer files, it is possible to provide mapped and tabular information for a wide variety of land characteristics. Such characteristics could include, among others, texture groups, drainage, geologic materials, and wetlands. This report does not include such information. However, derived and interpretive maps such as those described can be made available upon request to the Land Resource Research Centre, Agriculture Canada, Vancouver, B.C.

The following sections on agriculture, forestry, wildlife (waterfowl and ungulates) and recreation provide brief supplementary information on soil or land capability of the study area (see Reference section for publications). The reader is referred to the descriptive legends contained on the published maps for information on the important factors and limitations used in the capability classifications.

Agriculture

Capability for agriculture, under the CLI system (Canada Land Inventory 1976), is controlled mainly by climate. Table 2 (taken from RAB Tech. Paper No. 1, 1978) defines climatic capability classes for the interior of British Columbia (Air Studies Branch 1981). In addition, climatic data were collected over the area through a network of selected short-term stations and related to the few established long-term stations in or near the map area. These data are presented in Table 1.

The May to September precipitation ranges from 200 to 250 mm through climate capability classes 1,2, and 3. Classes 1 and 2 are confined to the Fraser Basin and some lower slopes of the Fraser Plateau. Class 3 occurs as narrow bands along the slopes of the plateau. The higher parts of the Fraser Plateau and the Nechako Plateau fall into climatic capability classes 5 and 6 with minor class 4. In general, the main limiting factors to crop growth are the lack of heat units, the aridity of the Fraser Basin and lower elevations of the Fraser Plateau, the frostiness and a low number of growing degree-days in the upper part of the Fraser Plateau and the Nechako Plateau, and the extremely severe winters.

The highest capability lands of the map area (classes 1 and 2) occur along the fluvial benches of the Fraser River north from Hargreaves. These are limited areas (approximately 5% of the map area) of high capability agricultural lands where the main limitation is a moisture deficit during the growing season. This limitation is readily overcome by irrigation.

Class 3 soils occur mainly in the Hawks Creek area and are of very limited extent. Class 4 soils are generally associated with lacustrine and alluvial parent materials. They occur generally in the Chilcotin River valley and in extensive areas east of the Fraser, north and south of Williams Lake. They occupy approximately 25% of the map area. Owing to topographic, climatic, and textural limitations, most of the map area (approximately 40%) is limited to classes 5 and 6 which are best suited for forage crops or native grazing. The remainder of the area (approximately 20%) is rated as a combination of classes 6 and 7 due to severe climatic or topographic constraints. Although unrated for agricultural capability, Organic soils occur throughout the map area, particularly in the northern half. They are generally associated with lakes and creek valley bottoms. These soils are considered very important to the ranching industry of the area particularly if they are easily drained and cleared. The reader is referred to the publication by Kenk and Cotic (1983) for a description of classifying Organic soils for agricultural capability.

Table 2. Climatic capability for agriculture classes in interior British Columbia

	Freeze-free period (base 0°C) (days)	Growing degree-days (above 5°C)	Climatic moisture deficit (mm)	Climatic moisture surplus ratio
Class 1	90 - 119	1310 - 1504	40	0.00 - 0.33
Class 2	75 - 89	1170 - 1309	40 - 115	0.34 - 0.55
Class 3	60 - 74	1030 - 1169	116 - 190	0.56 - 0.75
Class 4	50 - 59	1030 - 1169	191 - 265	0.76 - 1.00
Class 5	30 - 49	780 - 1029	266 - 340	>1.00
Class 6	< 30	670 - 779	341 - 415	
Class 7	< 30	0 - 669	415 +	

Climatic moisture deficit: the negative difference between May-September precipitation and potential evapotranspiration.
Climatic moisture surplus: the positive difference between May-September precipitation and potential evapotranspiration expressed as a ratio.

Forestry

The text table below outlines the land capability classes for forestry, based on a productivity range determined as the mean annual increment of the best species adapted to the site at or near rotation age (generally 100 years). The land capability for forestry maps show, for each map delineation, the land capability classes, limiting factors, and suitable species. Productivity classes are expressed as cubic metres per hectare per year as follows:

Class 1.....7.8 - 9.1 +
Class 2.....6.4 - 7.7
Class 3.....5.0 - 6.3
Class 4.....3.6 - 4.9
Class 5.....2.2 - 3.5
Class 6.....0.8 - 2.1
Class 7..... < 0.8

Owing to climatic considerations, class 5 soils predominate east of Stum Lake while class 6 soils predominate west of Stum Lake. The highest capabilities are found in the northeastern part of the survey area, where class 4 and minor class 3 soils occur wherever soil moisture conditions are more favourable. Classes 5 and 6 occur throughout the area due mainly to moisture limitations. Class 7 occurs on organic soils and wetlands throughout the map area as well as in areas influenced by very arid soil conditions, particularly in the Alexis Creek and Williams Lake areas.

Wildlife

Ungulates

The main ungulate species considered in the survey area are moose and mule deer. The highest capability (Canada Land Inventory 1973b) is class 1 which occurs in the valley bottom of the Chilcotin river near Redstone and in the Alexis Creek valley area northwest of Alexis Creek. Class 2 winter range occurs along the floodplain of the Chilko and Chilcotin rivers as well as in isolated areas near McLeese Lake and Hawks Creek. Areas of class 3 winter range occur in the eastern third (Fraser Basin) of the map area as well as in the vicinity of Alexis Creek, Chilko River, Puntzi Lake and Stum Lake. The remainder of the area is considered a combination of classes 3 and 4, with some class 4 and 5 occurring at higher elevations where the main limitation is excessively deep snow.

Waterfowl

As a consequence of topographic and climatic limitations, the capability of the lands in the area to produce or sustain waterfowl is generally rated as classes 5 and 6 (Canada Land Inventory 1971), with most of the area rated as class 7. Class 3 areas are located near Stum, Summit and Tanilkul lakes. These areas are generally quite small and isolated. Small areas of class 3 occur in isolated areas, particularly east of Williams Lake and in the wetlands north of Alexis Creek. A large area of class 2 occurs southeast of Drummond Lake and a small area also occurs in the Westwick Lake area near Pablo Creek. One area of class 1 occurs immediately east of Meldrum Creek.

Recreation

The land capability for recreation maps show that the moderate or better capability lands are confined almost entirely to valley bottomlands and to lakes and their shorelines. These areas are generally rated as classes 2 and 3. Soils on till are generally rated as class 6 with some 5. High elevation areas are generally rated as class 5 because it is difficult to use them for activities other than hiking and horseback riding.

DERIVED AND INTERPRETIVE MAPS

Agriculture Canada is able to produce maps based on the soil information presented here. These maps may be interpretive, such as those previously discussed on soil capability, or they may be derived, such as those displaying surface texture, drainage, or slope classes. Such maps would be derivative because they are based on the original soil mapping. These maps can be produced because the original boundaries and map unit symbols are stored in a computer as part of the Canadian Soil Information System (CanSIS).

The capability to provide such maps is dependent on the data stored in the computer and methods available to interpret the data. The information output from the computer is based solely on that which is initially entered. Therefore, no new map unit boundaries can be produced, whereas some can be deleted.

For further information, the reader is encouraged to contact Agriculture Canada, Land Resource Research Institute, Vancouver.

REFERENCES

Air Studies Branch. 1981. Climatic capability classification for agriculture in British Columbia. APD Technical Paper 4. Ministry of Environment, Victoria, B.C. 23 pp.

Annas, R.M.; Coup , R., editors. 1979. Biogeoclimatic zones and subzones of the Cariboo Forest Region. Ministry of Forests, Victoria, B.C. 103 pp.

B.C. Directory. 1975. Alexis Creek. Lord Byng High School. p. 99.

B.C. Directory. 1975. Williams Lake. Lord Byng High School. p. 95.

Benn, D.R.; Lebaron, S. 1974. Land capability for recreation, Quesnel 93 B. Lands Directorate, Environment Canada, Ottawa, Ont. (map only).

Benson, W.A., coordinating chairman, British Columbia Land Inventory. 1973. The Cariboo land capability analysis. Lands Directorate, Environment Canada, Ottawa, Ont. (map only).

Canada Land Inventory. 1970. Objectives, scope, and organization. Department of Regional Economics. Ec. Rep. No. 1. 61 pp.

Canada Land Inventory. Reprinted 1972. Soil capability classification for agriculture. Canada Land Inventory. Report No. 2, Canada Department of Forestry, Ottawa, Ont. 16 pp.

Canada Land Inventory. 1976a. Soil capability for agriculture, Williams Lake 93 B/SE. Lands Directorate, Environment Canada, Ottawa, Ont. (map only).

Canada Land Inventory. 1976b. Soil capability for agriculture, Alexis Creek 93 B/SW. Lands Directorate, Environment Canada, Ottawa, Ont. (map only).

Canada Land Inventory. 1976c. Land capability for agriculture. A preliminary report. Lands Directorate, Environment Canada, Ottawa, Ont. 27 pp.

Canada Soil Survey Committee. 1976. Glossary of terms in soil science. Agric. Can. Publ. 1459 (Revised), Ottawa, Ont. 44 pp.

Canada Soil Survey Committee. 1978. The Canadian system of soil classification. Agric. Can. Publ. 1646. Supply and Services Canada, Ottawa, Ont. 164 pp.

Cheesman, G. 1984 (unpublished). Climatic data for the Williams Lake-Alexis Creek soil survey area. Ministry of Environment, Victoria, B.C. (personal communication).

Cotic, I.; van Barneveld, J.; Sprout, P.N. 1976. Soils of the Nechako-Francois Lake area. Interim report, Soils Branch, B.C. Department of Agriculture, Kelowna, B.C. 218 pp.

Dawson, A.B. (in preparation). Soils of the Prince George area. Report No. 23 of the B.C. Soil Survey. Surveys and Resource Mapping Branch, Ministry of Environment, Victoria, B.C.

Farstad, L.; Laird, D.G. 1954. Soil Survey of the Quesnel, Nechako, Francois Lake, and Bulkley-Terrace areas, in the Central Interior of B.C. Report No. 4 of the B.C. Soil Survey. Agriculture Canada, University of British Columbia and B.C. Department of Agriculture. 88 pp.

Geological Survey of Canada. 1959. Map No. 12-1959, sheet 93B, bedrock geology, Quesnel, B.C. Department of Energy, Mines, and Resources, Ottawa, Ont. (map only).

Holland, S.S. 1976. Landforms of British Columbia, a physiographic outline. 2nd edition. B.C. Dep. Mines and Pet. Res. Bull. 48. 138 pp.

Kelley, C.C.; Farstad, L. 1946. Soil Survey of the Prince George area. B.C. Report No. 2 of the B.C. Soil Survey. B.C. Department of Agriculture, Agriculture Canada, Ottawa, Ont. 58 pp.

Kenk, E.; and Cotic, I. 1983. Land capability classification for agriculture in British Columbia. MOE Manual 1. B.C. Ministry of Agriculture and Food and B.C. Ministry of Environment, Victoria, B.C. 62 pp.

Kot, R.; Wood, J.; Kowall, R.C. 1971. Land capability for forestry, Williams Lake 93 B/SE. Lands Directorate, Environment Canada, Ottawa, Ont. (map only).

Krajina, V.J. 1969. Ecology of forest trees in British Columbia. In Ecology of Western North America, 2(1):1-146.

Lay, D. 1940. Fraser River Tertiary drainage-history in relation to placer-gold deposits. B.C. Dep. Mines Bull. 3.

Lay, D. 1941. Fraser River Tertiary drainage-history in relation to placer-gold deposits (Part 2). B.C. Dep. Mines and Pet. Res. Bull 11.

Leskiw, L.A.; Farstad, L.; Lord, T.M. 1973. A soil resource and land use survey of the Williams Lake Indian Reserve. Edited by Carlyle, R.E. Report No. 278, Research Station, Agriculture Canada, Vancouver, B.C. 21 pp.

Leskiw, L.A.; Farstad, L.; Sneddon, J.I. 1973. A soil resource and land use survey of the Redstone Indian Reserve. Edited by Carlyle, R.E. Report No. 277, Research Station, Agriculture Canada, Vancouver, B.C. 18 pp.

Lindsay, F.W. 1958. The Cariboo story (privately edited). 52 pp.

Lord, T.M.; Mackintosh, E.E. 1982. Soils of the Quesnel area. Report No. 31 of the B.C. Soil Survey, Agriculture Canada, Vancouver, B.C. 93 pp.

Lord, T.M. 1984. Soils of the Horsefly Area. Report No. 32 of the B.C. Soil Survey. Agriculture Canada, Vancouver, B.C. 108 pp.

Mapping System Working Group. 1981. A soil mapping system for Canada: revised. Agriculture Canada, Land Resource Research Institute, Ottawa, Ont. 94 pp.

McKeague, J.A. editor. 1976. Manual on soil sampling and methods of analyses. Prepared by Subcommittee of Canada Soil Survey Committee on Methods of Analysis. Soil Research Institute, Ottawa, Ont. 212 pp.

Mide, B.; Mathews, B. 1973. Land capability for wildlife-ungulates, Quesnel 93 B. Canada Land Inventory, Department of Regional Economic Expansion, Ottawa, Ont. (map only).

Senyk, J.P.; Kowall, R.C.; Sneddon, I. 1972. Land capability for forestry, Alexis Creek 93 B/SW. Lands Directorate, Environment Canada, Ottawa, Ont. (map only).

Taylor, E.W.; Carreiro, J.F. 1971. Land capability for wildlife-waterfowl, Quesnel 93 B. Canada Land Inventory, Department of Regional Economic Expansion, Ottawa, Ont. (map only).

Taylor, R.L.; MacBryde, B. 1977. Vascular plants of British Columbia. Tech. Bull. No. 4. The Botanical Garden, University of British Columbia, Vancouver, B.C. 754 pp.

Tipper, H.W. 1971. Glacial geomorphology and Pleistocene history of central British Columbia. Geol. Surv. Can. Bull. 196. Department of Energy, Mines, and Resources, Ottawa, Ont. 89 pp.

Valentine, K.W.G.; Sprout, P.N.; Baker, T.E.; Lavkulich, L.M., editors. 1978. The soil landscapes of British Columbia. Ministry of Environment, Victoria, B.C. 197 pp.

Valentine, K.W.G.; Schori, A. 1980. Soils of the Lac la Hache - Clinton area, British Columbia. Report No. 25 of the B.C. Soil Survey, Agriculture Canada, Vancouver, B.C. 118 pp.

Valentine, K.W.G.; Watt. W.; Bedwany, A. (in preparation). Soils of the Taseko Lakes area. Report No. 36 of the B.C. Soil Survey.

Working group on soil survey data, Canada Expert Committee on Soil Survey. 1983. The Canada soil information system (CanSIS), Manual for describing soils in the field; 1982 revised. Agriculture Canada, Land Resource Research Institute, contribution no. 82-52, Ottawa, Ont. 97 pp.

APPENDIX. DESCRIPTIONS AND ANALYSIS OF THE SOILS

This appendix lists, in alphabetical order, profile descriptions of most of the soils the area. Some descriptions, with their accompanying chemical and physical data, were drawn from adjoining soil survey report areas, usually from where the soils were first named and described.

Standard methods of soil analyses (McKeague 1976) were followed in the respective federal or provincial laboratories concerned with the survey porjects. Further details are in soil survey reports or may be ascertaied by contacting the specific agency.

ALIX SOIL

Location: 54°08'N 124°08'W | NTS: 93K1 | Surveyor: IC | Agency: BCMA, Kelowna, 1974

Identification: BC Soil Survey Report 22 | Classification: Orthic Dystric Brunisol (1978) | Landform and parent material: glaciofluvial, sandy, gravelly

Drainage: rapidly drained | Slope and aspect: level | Elevation: 880 m

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence
L-H	5-0				
Bm	0-17	yellowish brown (10YR 5/4 d)	sandy loam	weak, fine to medium subangular blocky	very friable
BC	17-28	pale brown (10YR 6/3 d)	gravelly sandy loam	weak, fine subangular blocky	very friable
IIC1	28-50	variegated	sandy fine gravel	single grain	loose
IIC2	50+	variegated	sandy fine gravel	single grain	loose

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	C:N ratio	Cation exchange meq/100 g					Oxalate (%)		P1 (ppm)	P2 (ppm)	S (ppm)	Cu (ppm)	Zn (ppm)
					CEC	Ca	Mg	K	Na	Fe	Al					
L-H	4.1	58.0	1.52	37.7	83.6	21.2	6.4	3.0	0.1			60	136			
Bm	4.9	1.0	0.10	10.6	9.2	1.5	0.2	0.1	0.0	0.7	0.7	115	277	4	14	79
BC	5.0				6.0	1.9	0.2	0.1	0.0	0.5	0.4	146	227	2	20	80
IIC1	5.1				5.7	2.9	0.5	0.1	0.0	0.3	0.2	20	51	2	23	43
IIC2	5.1				5.8	3.0	0.7	0.2	0.0			9	25	2	24	43

BERMAN SOIL

Location: 52°55'N 120°30'30"W | NTS: 93B15 | Surveyor: TL | Agency: AC, Vancouver, 1979

Identification: BC Soil Survey Report 31 | Classification: Orthic Gray Luvisol (1978) | Landform and parent material: silty, glacio-lacustrine blanket

Drainage: moderately well drained, moderately pervious | Slope and aspect: 5% N | Elevation: 750 m | Additional notes: rooting depth is 63 cm; free carbonates at 53 cm

Vegetation: lodgepole pine, willows, pine grass

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	3-0					
Ae	0-8	light brownish gray (10YR 6/2 d)	silt loam	moderate, medium platy	hard, firm	plentiful, fine fine-coarse, horizontal
Bt	8-28	brown (10YR 5/3-4/3 d)	silty clay loam	strong, fine subangular blocky	very hard, friable	few, medium, horizontal
BC	28-53	brown (10YR 4/3 d)	silt	moderate, coarse subangular blocky	hard, very friable	few, coarse, horizontal
Ck	53-69	white (10YR 8/2 d)	silty clay loam	weak, coarse pseudo-platy	very friable	very few, fine, horizontal
C1	68+	brown (10YR 5/3 m)	silt loam	massive	extremely hard, very firm	very few, fine, horizontal

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Particle size distribution (%)				P1
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	(ppm)
Ae	5.3	0.88	0.05		7.0	2.9	0.7	0.1	7	77	16	3	41
Bt	6.4				12.7	9.3	0.7	0.2	5	65	30	15	25
BC	7.7								1	92	7	1	12

CHASM SOIL

Location: 51°04'21"N 121°23'57"W | NTS: 92P3 | Surveyor: AS | Agency: AC, Vancouver

Identification: BC Soil Survey Report 25 | Classification: Eluviated Eutric Brunisol (1978) | Landform and parent material: colluvial veneer

Drainage: moderately well drained, moderately pervious, semiarid | Slope and aspect: 35% SE | Elevation: 1050 m | Additional notes: some volcanic ash in upper horizons; moderate effervescence in IICk horizon

Vegetation: Douglas fir-ponderosa pine-bluebunch wheatgrass regenerating seral community; Interior Douglas fir zone

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	2-0					
Ae	0-5	grayish brown (10YR 5.5/2 d)	loam	weak, fine platy	soft	plentiful, fine
Btj	5-30	brown (10YR 4.5/3 d)	loam	moderate, medium subangular blocky	slightly hard	plentiful, fine
Bm	30-43	grayish brown (10YR 5/2.5 d)	loam	weak, fine subangular blocky	slightly hard	plentiful, fine
IICk	43-114	pale brown (10YR 6/2.5 d)	gravelly loam	weak, fine subangular blocky	friable	very few, fine

CHILCOTIN SOIL

Location: 51°49'30"N 122°33'30"W | NTS: 92O15 | Surveyor: AB | Agency: AC, Vancouver

Identification: BC Soil Survey Report 36 | Classification: Orthic Dark Brown (1978) | Landform and parent material: loamy eolian over sandy glaciofluvial blanket, gullied and terraced

Drainage: well drained, moderately pervious | Slope and aspect: gently sloping, NE | Elevation: 820 m | Additional notes: on terraces above Fraser River near Gang Ranch; subject to slumping and gullying

Vegetation: sagebrush, bluebunch wheatgrass

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Roots
Ah	0-12	very dark grayish brown (10YR 3/2 m) grayish brown (10YR 4.5/2 d)	sandy loam	weak, coarse, angular blocky	plentiful
Bm	12-45	grayish brown (10YR 4.5/2 m) brown (10YR 4/2.5 d)	sandy loam	weak, medium, subangular blocky	few
Ck	45-112	brown (10YR 5/2.5 m) brown (10YR 5/2.5 d)	sandy loam	weak, medium, pseudo-blocky	few
IICk	112-150	brown (10YR 5/2.5 m) light brownish gray (10YR 6/2d)	very gravelly sand	structureless, single grain	very few

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	C:N ratio	Particle size distribution (%) Sand	Silt	Total clay
Ah	7.1	1.09	0.11	9.91	53	42	5
Bm	7.6				55	42	3
Ck	8.6				62	36	2

CHIMNEY SOIL

Location: 51°52'35"N 123°02'45"W | NTS: 92O14 | Surveyor: WW | Agency: AC, Vancouver, 1971

Identification: BC Soil Survey Report 36 | Classification: Orthic Dark Gray (1978) | Landform and parent material: gravelly, loamy, morainal blanket

Drainage: well drained | Slope and aspect: 5% NE | Elevation: 990 m | Additional notes: Stop No. 16; W. Watt M.Sc. thesis site 1; located on Chilco Lake Ranch; very stony; bedrock is andesite; gravel content: Ah=10%, Bm=30%, BC=74%, Ck=25%

Vegetation: Douglas - pine grass (grasslands subzone)

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
Ah	0-13	dark grayish brown (10YR 4/2 d)	loam	weak, coarse prismatic	friable	abundant, fine
Bm	13-25	dark brown (10YR 4/3 d)	gravelly clay loam	weak, medium prismatic	friable	plentiful, fine
BC	25-35	grayish brown (10YR 5/2 d)	gravelly loam	moderate-strong, fine angular blocky	firm	few
Ck	35+	light brownish gray (10YR 6/2 d)	gravelly loam	moderate-strong, pseudo-blocky	firm	

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Particle size distribution (%)				P1 (ppm)
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	
Ah	6.2	2.7	0.2	26.2	13.1	12.4	2.3	0.1	31	41	28	10	54.0
Bm	6.6	1.3	0.1	29.7	13.6	18.0	0.8	0.2	24	35	41	13	
Ck	7.8	1.0		19.4	23.9	16.4	0.4	1.0	30	44	26	4	

CINEMA SOIL

Location: 52°32'30"N 122°23'20"W | NTS: 93B9 | Surveyor: IL | Agency: AC, Vancouver, 1979

Identification: BC Soil Survery Report 31 | Classification: Orthic Gray Luvisol (1978) | Landform and parent material: loamy morainal blanket

Drainage: well drained | Slope and aspect: 10% W | Elevation: 900 m | Additional notes: basalt bedrock; rooting depth 72 cm

Vegetation: Douglas fir, trembling aspen, saskatoon, willow, pine grass

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	4-0					
Ae	0-10	grayish brown (10YR 5/2 d)	silt loam	strong, medium platy	slightly hard, slightly sticky	plentiful, fine, random
AB	10-17	dark brown (10YR 3/3 d)	loam	strong, medium subangular blocky	hard, firm, sticky	few, fine, random
Bt1	17-32	dark yellowish brown (10YR 3/4 d)	loam	strong, medium-coarse subangular blocky	hard, very sticky	few, medium, random
Bt2	32-42	dark brown (10YR 4/3 d)	loam	moderate, fine-medium subangular blocky	slightly hard, firm, sticky	few, medium, random
BC	42-72	dark brown (10YR 4/3 d)	silt loam	strong, fine angular blocky	very firm, slightly sticky	few, medium, random
Cca	72+	brown (10YR 5/3 d)	loam	pseudo-angular blocky	very firm, slighty sticky	very few, fine, random

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Cation exchange meq/100 g					Particle size distribution (%)				P1
			CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	(ppm)
Ae	6.1	1.1	12.6	7.6	3.2	0.9	0.1	35	55	10	2	23
AB												
Bt1	6.0	0.6	32.2	15.3	11.1	1.0	0.0	30	43	27	15	46
Bt2	6.2	0.5	26.9	13.8	10.0	0.6	0.0	35	48	17	6	40
BC	6.2		27.0	13.3	9.3	0.5	0.0	35	52	13	3	32
Cca	7.7											

DESERTERS SOIL

Location: 53°42'N 122°49'W | NTS: 93G10 | Surveyor: AD | Agency: BCMA, Kelowna

Identification: BC Soil Survey Report 23 | Classification: Brunisolic Gray Luvisol (1978) | Landform and parent material: loamy morainal blanket

Drainage: moderately well drained | Slope and aspect: 22% W | Elevation: 925 m

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	2-0					
Ae	0-2	light gray (10YR 7/2 d)	sandy loam	single grain	loose	abundant
Bm	2-17	brown (10YR 5/3 d)	sandy laom	weak, fine subangular blocky	soft	abundant
AB	17-50	light brownish gray (10YR 6/2 d)	gravelly sandy loam	moderate, medium subangular blocky	slightly hard	plentiful
BA	50-75	light brownish gray (10YR 6/2 d)	gravelly loam	moderate, medium-coarse subangular blocky	hard	few
Bt	75-100	brown (10YR 5/3 d)	gravelly loam	strong, coarse angular blocky	firm	few
BC	100-120	brown (10YR 5/3 d)	gravelly loam	massive	very firm	

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Oxalate (%)		P1 (ppm)
				CEC	Ca	Mg	K	Na	Fe	Al	
L-H	4.9	50.0	1.2								111
Ae	4.2	1.3	0.6	8.7	1.9	0.7	0.3	0.1			60
Bm	4.6	0.8	0.4	8.6	1.9	1.1	0.2	0.1	0.6	0.3	110
AB	4.8	0.4	0.2	6.5	2.3	0.7	0.2	0.1			42
BA	4.9	0.1	0.2	6.7	2.7	0.9	0.1	0.1			9
Bt	5.5	0.1	0.2	12.5	6.8	2.6	0.2	0.1			6
BC	6.7			13.1	8.3	3.2	0.1	0.2	0.4	0.3	2

DOG CREEK SOIL

Location: 51°33'N 122°14'W | NTS: 92O | Surveyor: AB | Agency: AC, Vancouver

Identification: BC Soil Survey Report 36 | Classification: Orthic Dark Brown (1978) | Landform and parent material: sandy skeletal, mixed fluvial, glaciofluvial, morainal

Drainage: rapidly drained, rapidly pervious | Slope and aspect: 28% complex S | Elevation: 800 m | Additional notes: frequently gullied

Vegetation: bluebunch wheatgrass, pasture sage

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
Ah	0-13	dark grayish brown (10YR 4/2 d)	loamy sand	weak, fine-medium subangular blocky	soft	plentiful
Bm	13-30	brown (10YR 5/2.5 d)	loamy sand	weak-moderate, medium subangular blocky	slightly hard	plentiful
IICk	30+		very gravelly sand	weak, stratified	loose	few

DRAGON SOIL

Location: 54°00'N 124°50'W

NTS: 93J15

Surveyor: IC

Agency: BCMA, Kelowna, 1974

Identification: BC Soil Survey Report 22

Classification: Orthic Humo-Ferric Podzol (1978)

Landform and parent material: shallow sandy colluvium, acidic bedrock

Drainage: rapidly drained

Slope and aspect: 20% SE

Elevation: 1230 m

Additional notes: many of the Dragon soils have less than 50 cm of colluvial or morainal material overlying bedrock and are classified as lithic phase

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0					abundant
Ae	0-5	light gray (10YR 7/1 d)	sandy loam	weak, fine subangular blocky	loose	abundant
Bf1	5-7	yellowish brown (10YR 5/4 d)	sandy loam	moderate, fine-medium subangular blocky	very friable	abundant
Bf2	7-20	yellowish brown (10YR 5/4 d)	sandy loam	moderate, fine-medium subangular blocky	very friable	abundant
BC	20-45	brown (10YR 5/3 d)	gravelly sandy loam	moderate, fine-medium subangular blocky	very friable	common
C	45-55	light brownish gray (10YR 6/2 d)	gravelly sandy loam	pseudo-platy	friable	very few
R	55+					

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	C:N ratio	Cation exchange meq/100 g					Oxalate (%)		P1 (ppm)	P2 (ppm)	S (ppm)	Cu (ppm)	Zn (ppm)
					CEC	Ca	Mg	K	Na	Fe	Al					
L-H	3.9	60.0	1.2	31.1	107.0	22.4	2.9	2.0	0.0			42	54		9	42
Ae	3.7	1.6	1.1	27.5	12.3	2.4	0.3	0.2	0.0			7	14	8	3	19
Bf1	5.5*	1.7			14.1	1.4	0.2	0.2	0.0	0.9	0.6	51	99	9	8	48
Bf2	6.0*	1.5	0.1	23.3	13.5	1.4	0.2	0.1	0.0	0.9	0.9	44	93	9	13	52
BC	6.0*				7.8	0.7	0.1	0.1	0.0	0.5	0.5	30	70	6	16	26
C	6.1*									0.4	0.3	28	62		17	25

* in water

ELLIOT SOIL

Location: 51°57'39"N 121°47'53"W | NTS: 92P13 | Surveyor: KV | Agency: AC, Vancouver, 1980

Identification: BC Soil Survey Report 25 | Classification: Rego Humic Gleysol, carbonated phase (1978) | Landform and parent material: fluvial, fine loamy

Drainage: imperfectly drained, moderately pervious | Slope and aspect: level | Elevation: 850 m | Additional notes: small amounts of marl in H horizon

Vegetation: sedges. arrow grass, smooth brome, water hemlock

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	5-0	black (2.5Y 2/0 m)		structureless		
Ahk1	0-8	black (2.5Y 2/0.5 m)	silt loam	structureless	slightly sticky, slightly plastic	abundant
H	8-13	black (2.5Y 2/0 m)		structureless	very sticky, plastic	abundant
Ahk2	13-33	very dark gray (2.5Y 3/0 m)	silty clay loam	structureless	very sticky, plastic	few
Ckg	33-75	dark gray (5Y 4/1 m)	silty clay loam	structureless	very sticky, plastic	few

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	C:N ratio	Cation exchange meq/100 g				
					CEC	Ca	Mg	K	Na
L-F-H	6.9	35.6	2.9	12.2	118.1	119.1	50.9	2.0	4.7
Ahk1	7.2	7.9	0.5	14.9	34.3	150.3	32.5	1.3	3.9
H	7.0	26.9	2.1	12.8	117.8	208.3	47.9	1.4	5.2
Ahk2	7.6	4.6	0.3	13.9	31.4	157.9	23.9	1.3	3.9
Ckg	7.5	1.5	0.1	12.5	30.1	33.5	16.9	1.3	2.6

GAY LAKE SOIL

Location: 52°02'0"N 123°14'30"W | NTS: 92O | Surveyor: TL | Agency: AC, Vancouver

Identification: BC Soil Survey Report 36 | Classification: Orthic Eutric Brunisol (1978) | Landform and parent material: lacustrine, fine, silty, terraced

Drainage: moderately well drained, moderately pervious | Slope and aspect: 3% NE | Elevation: 750 m

Vegetation: Douglas fir, rose, kinnikinnick, lodgepole pine

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F	1-0					
Ahe	0-5	dark grayish brown (10YR 4/2 m) light brownish gray (10YR 5.5/2 d)	silty loam	weak, medium, subangular blocky	sticky, friable, slightly hard	abundant
Ae	5-10	grayish brown (10YR 5/2 m) light gray (10YR 6.5/2 d)	silty loam	strong, very coarse, subangular blocky	sticky, firm, hard, plastic	few
Bm	10-26	brown (10YR 4/3m) crushed pale brown (10YR 5.5/3 d)	silty clay loam	weak, medium, columnar	sticky, firm, hard, plastic	few
BC	26-38	pale brown (10YR 5.5/3 m) very pale brown (10YR 6.5/3 d)	silty clay loam	moderate to strong, fine, angular blocky	very sticky, firm, hard, plastic	very few
Cca	38-61	pale brown (10YR 6/3 m) very pale brown (10YR 7/3 m)	silt	weak, medium, platy	sticky, firm, hard, plastic	
Ck	61-80	pale brown (10YR 6/3 m) (10YR 7/2.5 d)	silt	weak, medium, platy	sticky, firm, hard, plastic	

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	C:N ratio	Cation exchange meq/100 g					Particle size distribution (%)			
					CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay
Ahe	6.3	2.1	0.2	12.1	26.3	13.2	7.1	0.9	0.1				
Ae	5.9	1.5	0.1	13.4	28.5	12.8	8.9	0.8	0.1	12	51	36	15
Bm	5.9	1.0			28.8	13.1	10.3	0.6	0.2	7	53	40	14
BC	6.5	0.7			22.4	11.5	7.7	0.3	0.2	2	61	36	8
Cca	7.5				15.3	28.5	6.8	0.2	0.3				

HARGREAVES SOIL

Location: 51°59'50"N 122°16'30"W | NTS: 92O16 | Surveyor: AB | Agency: AC, Vancouver

Identification: BC Soil Survey Report 36 | Classification: Orthic Eutric Brunisol (1978) | Landform and parent material: glaciofluvial, coarse-loamy, terraced

Drainage: well drained, rapidly pervious | Slope and aspect: gently sloping NE | Elevation: 670 m | Additional notes: on Fraser River terraces

Vegetation: Douglas fir, pine grass, bunchgrasses

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	2-0					
Ahej	0-6	brown (10YR 4.5/3 d)	sandy loam	weak, fine to medium subangular blocky	friable	abundant
Bm	6-41	yellowish brown (10YR 5/4 d)	sandy loam	weak, medium subangular blocky	friable	plentiful
Cca	41-53	light gray (10YR 6.5/2 d)	loamy sand	weak, medium subangular blocky		few
Ck	53+	light gray (10YR 6.5/2 d)	loamy sand	weak, medium subangular blocky		very few

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	C:N ratio	Particle size distribution (%) Sand	Silt	Total clay
Ahej	6.7	1.1	0.1	11.9	65	28	7
Bm	6.9	0.3			72	21	7
Cca	7.9	0.1			80	17	3
Ck	8.0	0.4			77	19	4

HAWKS SOIL

Location: 51°46'45"N 122°49'51"W | NTS: 92015 | Surveyor: AB | Agency: AC, Vancouver, 1971

Identification: BC Soil Survey Report 36 | Classification: Eluviated Eutric Brunisol (1978) | Landform and parent material: sandy glaciofluvial terrace

Drainage: rapidly drained | Slope and aspect: level | Elevation: 1150 m | Additional notes: Stop No. 36; airphoto BC 5242-133

Vegetation: Douglas fir - pine grass (northern phase subzone)

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	2-0					
Ahe	0-8	dark grayish brown (10YR 4.5/2 d)	gravelly fine sandy loam	weak, fine-medium subangular blocky	soft, very friable	abundant
Bm	8-30	brown (10YR 5/3 d)	gravelly loamy sand	weak, medium subangular blocky	soft, very friable	plentiful
BC	30-60	brown (10YR 5/3 d)	gravelly loamy sand	weak, medium subangular blocky	soft, very friable	few
Ck	60+	light brownish gray (10YR 6/2.5 d)	gravelly loamy sand	weak, fine pseudo-blocky	soft, very friable	few

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Pyrophos. (%)	
				CEC	Ca	Mg	K	Na	Fe	Al
Ah	6.4	2.2	0.1	19.0	11.6	5.7	2.9	0.0	0.4	0.1
Bm	6.3			14.5	7.5	7.3	0.7	0.0	0.6	0.1
BC	7.1			12.7	6.7	7.5	0.6	0.0	1.1	0.1
Ck	8.2			7.9	19.9	7.9	0.4	0.1	0.9	0.1

MELDRUM SOIL

Location: 52°22'20"N 122°29'30"W | NTS: 93B8 | Surveyor: TL | Agency: AC, Vancouver, 1984

Identification: BC Soil Survey Report 53 | Classification: Orthic Gray Luvisol (1978) | Landform and parent material: hummocky, bouldery, coarse-loamy, morainal

Drainage: well drained, rapidly pervious | Slope and aspect: 15% NE | Elevation: 925 m | Additional notes: many large surface boulders

Vegetation: lodgepole pine, pinegrass, kinnikinnick, soopolallie; Douglas fir regeneration

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
Ae	0-7	dark brown (7.5YR 4/2 m)	silt loam	moderate, medium platy	friable	very few, fine-medium
Bt	7-18	dark brown (7.5YR 3/2 m)	loam	moderate, medium subangular blocky	sticky	very few, fine-medium
BC	18-53	dark brown (7.5YR 4/2 m)	sandy loam	very weak, medium subangular blocky	very friable	very few, fine-medium
C1	53+	dark grayish brown (10YR 4/2 m)	sandy loam	weak, pseudo-blocky	very friable	very few, fine-medium

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Particle size distribution (%)			P1
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	(ppm)
Ae	7.2	0.6	0.03	13.8	3.9	3.9	0.4	0.0	39	54	7	13
Bt	6.9	0.5	0.02	18.6	5.5	7.9	0.4	0.0	50	38	12	18
BC	6.7			11.3	3.9	4.4	0.2	0.0	57	37	6	15
C1	6.8			4.6	1.6	2.1	0.1	0.0	62	36	2	8

RAIL SOIL

Location: 51°58'22"N 121°27'06"W | NTS: 92P14 | Surveyor: KV | Agency: AC, Vancouver, 1980

Identification: BC Soil Survey Report 25 | Classification: Terric Mesisol (1978) | Landform and parent material: organic blanket

Drainage: very poorly drained | Slope and aspect: level | Elevation: 1175 m | Additional notes: ponded; seepage present; decomposition: OM1, OM2, OM3 slightly decomposed, OH moderately decomposed; woody material in OM3 horizon is 2 cm size and 20% of volume

Vegetation: sedges, willows, ground birch, mosses, reeds

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence
Om1	0-36	very dark grayish brown (10YR 3/2 m)			
Om2	36-61	very dark brown (10YR 2.5/4 m)			
volcanic ash	61-64	pale brown (10YR 6/3 m)	sandy loam	structureless	nonsticky
Om3	64-114	dark brown (10YR 4/3 m)			
Oh	114-145	very dark gray (10YR 3/1.5 m)			
Cg	145-180	greenish gray (5BG 5/1 m)	silty clay loam	structureless	slightly sticky

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Particle size distribution (%)				Bulk Density
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	
Om1	6.3	43.0	3.0	133.9	63.1	22.2	1.1	2.5					0.15
Om2	5.8	44.4	3.1	141.3	73.6	22.5	0.1	1.1					0.15
volcanic ash	5.9	7.5	0.5	21.8	12.5	3.5	0.1	0.3	56	41	3	1	
Om3	5.7	41.5	2.7	153.2	80.7	24.1	0.2	1.1					0.14
Oh	5.5	41.2	1.8	205.2	127.4	35.7	0.3	1.1					0.17
Cg	6.6	0.5	0.0	14.7	8.9	4.2	0.8	0.2	44	37	19	6	

SALT LAKE SOIL

Location: 52°09'N 123°14'W | NTS: 9383 | Surveyor: TL | Agency: AC, Vancouver, 1984

Identification: BC Soil Survey Report 53 | Classification: Orthic Gray Luvisol (1978) | Landform and parent material: silty/coarse loamy morainal, undulating

Drainage: well drained, slowly pervious | Slope and aspect: level 3% | Elevation: 1100 m | Additional notes: Beaver Lake forest access road, north of Siwash Lake; the distinct change in texture at 40 cm indicates a coarser underlying material

Vegetation: lodgepole pine, trembling aspen, pine grass; regeneration is pine under an open canopy

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F	2-0	fibrimor				
Ae	0-8	brown (7.5YR 5/2 m)	silt loam	weak, fine-medium platy	friable, firm	few-plentiful, fine
AB	8-16	dark brown (7.5YR 4/2 m)	silt loam	weak, medium subangular blocky	friable	few, medium
Bt	16-31	dark brown (10YR 4/3 m)	clay loam	moderate, medium subangular blocky	firm	very few, fine
BC	31-40	dark grayish brown (10YR 4/2.5 m)	loam	weak, medium angular blocky	friable	very few
IIC1	40+	olive brown (2.5Y 4.5/2 m)	gravelly sandy loam	weak, pseudo-blocky	friable	

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Particle size distribution (%)			P1
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	(ppm)
Ae	5.8	0.7	0.0	12.5	4.4	2.2	0.5	0.0	25	62	13	13
Bt	5.8	0.5	0.0	25.3	9.1	6.0	0.5	0.1	33	35	32	27
IIC1	6.1			6.8	3.0	1.7	0.1	0.0	70	24	6	14

SHERIDAN SOIL

Location: 52°31'N 122°44'W | NTS: 92B10 | Surveyor: TL | Agency: AC, Vancouver, 1982

Identification: BC Soil Survey Report 31 | Classification: Brunisolic Gray Luvisol (1978) | Landform and parent material: loamy morainal

Drainage: moderately well drained, slowly pervious | Slope and aspect: 2% W | Elevation: 1050 m

Vegetation: lodgepole pine, white spruce, willows, blueberries, mosses

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F	2-0					abundant, fine
Ae1	0-3	brown (10YR 5/3 m)				plentiful, few
Bm	3-15	dark yellowish brown (10YR 4/4 m)	sandy loam	moderate, medium granular	friable, slightly plastic	abundant, fine
Ae2	15-30	brown (10YR 5/3 m)	sandy loam	moderate, medium subangular blocky	friable, slightly plastic	plentiful, fine
Bt	30-53	dark brown (10YR 4/3 m)	clay loam	moderate, medium subangular blocky	firm sticky	very few, fine
BC	53+	dark brown (10YR 4/3 m)	loam	moderate, medium angular blocky	firm	none

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Cation exchange meq/100 g					Particle size distribution (%)				P1
			CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	(ppm)
Ae1	4.4	1.0		2.2	0.9	0.1	0.1					24
Bm	4.8	0.7		2.6	1.5	0.1	0.1					33
Ae2	5.0	0.5		2.9	1.9	0.1	0.1	58	34	8	2	13
Bt	5.8		22.4	8.9	10.7	0.2	0.1	33	36	31	15	2
BC	6.5		10.0	4.6	4.5	0.1	0.1	50	40	10	3	2

TASEKO SOIL

Location: 51°51'N 122°41'W | NTS: 92O15 | Surveyor: AB | Agency: AC, Vancouver

Identification: BC Soil Survey Report 36 | Classification: Rego Dark Brown (1978) | Landform and parent material: fluvial, sandy, terraced

Drainage: well drained, rapidly pervious | Slope and aspect: 8% SE | Elevation: 675 m | Additional notes: floodplain deposits, variable surface textures and thickness

Vegetation: Ponderosa pine - bunchgrass zone, plateau subzone

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
Ah	0-15	dark grayish brown (10YR 3.5/1.5 m) grayish brown (10YR 4.5/2 d)	loamy fine sand	weak, fine subangular blocky	friable, soft	abundant
Ck	15-35	light grayish brown (10YR 5.5/2 d)	loamy fine sand	weak, subangular blocky	friable, soft	few
IICk	35+		gravelly sand			

TYEE SOIL

Location: 52°13'20"N 122°03'24"W | NTS: 93B1 | Surveyor: WS | Agency: AC, Vancouver, 1966

Identification: BC Soil Survey Report 25 | Classification: Orthic Gray Luvisol (1978) | Landform and parent material: morainal blanket

Drainage: moderately well drained | Slope and aspect: 5% SE | Elevation: 1000 m | Additional notes: LFH horizons consist of slightly decomposed leaves (20%) and needles (80%); the Bt horizon has many, moderately thick clay films in pores, channels, and on ped faces

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	3-0	forest litter				
Ae	0-18	light gray (10YR 7/2 d)	sandy loam	weak, fine granular	very friable	plentiful, exped
AB	18-28	light brown, gray (10YR 6/2 d)	loam	moderate, fine subangular blocky	firm	plentiful, exped
Bt	28-50	yellowish brown (10YR 5/4 d)	loam	moderate-strong, fine subangular blocky	firm	plentiful, exped
IIBC	50-76	pale brown (10YR 6/3 d)	gravelly loam	moderate, medium subangular blocky	firm	plentiful, exped
IIC	76-100	pale brown (10YR 6/3 d)	gravelly loam	moderate, medium pseudo-blocky	friable	few, exped
IICk	100-120	grayish brown (2.5Y 5/2 d)	gravelly loam	moderate, medium pseudo-blocky	friable	very few, exped

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	Cation exchange meq/100 g					Particle size distribution (%)			
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay
L-F-H	4.7		0.4	48.0	23.9	5.0	1.4	0.2				
Ae	4.4	0.5	0.0	8.2	3.0	1.0	0.2	0.1	49	45	6	2
AB	4.9	0.6	0.0	15.0	8.1	3.6	0.4	0.1	43	39	18	8
Bt	5.6	0.4	0.0	24.0	14.2	7.8	0.6	0.1	38	46	16	13
IIBC	6.2	0.2	0.0	19.4	12.2	6.5	0.5	0.1	43	33	24	6
IIC	6.4	0.1	0.0	16.9	11.1	5.2	0.4	0.1	45	33	22	6
IICk	7.3	0.1	0.0	15.4	23.0	4.3	0.3	0.1	45	33	22	6

WHISKEY CREEK SOIL

Location: 51°48'N 122°35'W | NTS: 920 | Surveyor: AB | Agency: AC, Vancouver

Identification: BC Soil Survey Report 36 | Classification: Orthic Eutric Brunisol (1978) | Landform and parent material: morainal, gravelly coarse-loamy blanket

Drainage: well drained, moderately pervious | Slope and aspect: strongly sloping | Elevation: 1000 m | Additional notes: on wooded slopes of major valleys tributary to Fraser River

Vegetation: Ponderosa pine - bunchgrass zone, plateau subzone

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	3-0					
Ahe	0-5	dark grayish brown (10YR 4/2 m)	very fine sandy loam	weak, fine to medium subangular blocky	nonsticky, friable, soft	abundant
Bm	5-27	brown (10YR 4/3 m)	very fine sandy loam	weak, fine to medium platy	slightly sticky, firm, soft	plentiful
BC	27-47	brown (10YR 5/3 m)	gravelly fine sandy loam	moderate, medium subangular blocky	slightly sticky, firm, hard	few
CK	47-63	light brownish gray (10YR 5.5/2 m)	gravelly fine sandy loam	moderate, medium to coarse pseudo-blocky	sticky, firm, hard	few
IICK	63+		very gravelly sand	single grain		

WILLIAMS LAKE SOIL

Location: 52°12'10"N 121°52'14"W

NTS: 92P4

Surveyor: TL

Agency: AC, Vancouver, 1972

Identification: BC Soil Survey Report 25

Classification: Orthic Gray Luvisol (1978)

Landform and parent material: loamy morainal blanket

Drainage: moderately well drained

Slope and aspect: 10% S

Elevation: 1080 m

Additional notes: moderately stony; Bt horizons have many thick clay films in roots, pores and on ped faces; gravel content increases from 10% in AB to 25% in C horizon

Vegetation: mature Douglas fir - pinegrass community

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F-H	3-0	leaves (20%) and needles (80%)				
Ae	0-5	grayish brown (10YR 5/2 m)	fine sandy loam	moderate, fine granular	loose	plentiful
AB	5-9	very dark grayish brown (10YR 3/2.5 m)	loam	moderate, medium subangular blocky	firm	
Bt1	9-28	very dark grayish brown (10YR 3/2 m)	clay loam	strong, coarse subangular blocky	firm	
Bt2	28-46	very dark grayish brown (10YR 3/2.5 m)	clay loam	strong, coarse subangular blocky	firm	very few
BC	46-76	very dark grayish brown (10YR 3/2.5 m)	clay loam	moderate, medium subangular blocky	firm	
IICk	76-102		gravelly clay loam	moderate, medium pseudo-blocky	firm	
IIC	102-183		gravelly clay loam			

ZENZAKO SOIL

Location: 51°58'00"N 123°10'30"W | NTS: 92O | Surveyor: KV | Agency: AC, Vancouver

Identification: BC Soil Survey Report 36 | Classification: Orthic Brown (1978) | Landform and parent material: lacustrine, loamy, terraced

Drainage: moderately well drained, moderately pervious | Slope and aspect: 30% SE | Elevation: 850 m | Additional notes: map unit contains frequent gullies

Vegetation: grasses, forbs, shrubs; potentilla species, wildflax, Kentucky bluegrass, saskatoon, yellow salsify

PROFILE DESCRIPTION

Horizon	Depth (cm)	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
Ah1	0-5	brown (10YR 3.5/3 m) brown (10YR 5/3 d)	silt loam	very weak, fine granular	loose	few
Ah2	5-12	brown (10YR 3.5/3 m) brown (10YR 4.5/3 d)	silt loam	moderate, fine granular	slightly hard	few
Btj	12-25	brown (10YR 4/3 m)	silt loam	moderate, medium subangular blocky	slightly hard	plentiful
BCca	25-50	light brownish gray (10YR 6/2 m)	silt loam	strong, medium angular blocky	slightly hard	
Ck	50+	light gray (10YR 6/1 m)	silt loam	strong, coarse platy	hard	

CHEMICAL AND PHYSICAL DATA

Horizon	pH in $CaCl_2$	Organic C (%)	Total N (%)	C:N ratio	Cation exchange meq/100 g				
					CEC	Ca	Mg	K	Na
Ah1	6.3	2.1	0.2	10.0	17.5	8.4	4.8	1.0	0.1
Ah2	6.6	1.5	0.1	10.0	19.7	7.7	8.2	0.8	0.1