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Soils of the Quesnel Area, British Columbia

Report No. 31 | British Columbia Soil Survey | 1982

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Soils of the Quesnel Area, British Columbia

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Report No. 31 of the
British Columbia Soil Survey

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Contribution No. 92

(Map sheets 93 B/NE and 93 G/SE)

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PREFACE

This report and soil maps (map sheets 93 B/NE and 93 G/SE in the National Topographic System) cover 720 200 ha, centered on the city of Quesnel and the valley of the Fraser River in British Columbia.

The report describes the characteristics of the soils and map units, their location, and extent. It gives short accounts of the history and natural features of the map area. The soil maps show the distribution of the soils. Soils were first mapped and described north of Quesnel by Kelley and Farstad (Report No. 2 of the B.C. Soil Survey, 1946) and Farstad and Laird (Report No. 4 of the B.C. Soil Survey, 1954). These surveys were expanded in the 1960s to provide information on soil capability for agriculture and forestry. They culminated in extensive soil surveys in the Fraser Plateau area to provide an inventory of land resources through the Canada Land Inventory (CLI) program. Land capability maps were published during the 1970s. Manuscript soil and terrain maps at a scale of 1:50 000 covering this map area and surrounds are available from B.C. Ministry of Environment.

This publication is one of a series covering the Cariboo-Chilcotin region that provides soils information on maps at a scale of 1:100 000, in legends, and in reports by the use of simplified map units, extended map legends and simple map unit symbols. Much of the data included in this report was originally compiled by E. E. Mackintosh, one of the present authors, in an unpublished manuscript.

GENERAL DESCRIPTION OF THE AREA

Location and extent

The surveyed area (Fig. 1) is in the Interior Plateau of central British Columbia. The area extends from 52°30' to 53°30' north latitude and from 122° to 123° west longitude. It comprises an area of 720 200 ha. The principal city, Quesnel, is situated about 485 km, by air, north of Vancouver.

History and resources

Although Alexander Mackenzie was the first white man to explore the Cariboo country in 1792 and Simon Fraser introduced the fur trade in 1808, few settlers arrived until the Cariboo gold rush of 1859. The town of Quesnel quickly became the main suppply center for the area. Trade and settlement increased with the completion of the Cariboo Road from Yale to Quesnel in 1864 and received a further impetus from the construction of the British Columbia Railway (formerly the Pacific Great Eastern Railway) to Quesnel in 1919.

Before 1850, wheat and a variety of vegetables were grown on the alluvial soils at Fort Alexandria, B.C. By the 1900s growing forages and hay for dairy and beef cattle was the main type of farming on the soils of the Fraser Basin. Today, agriculture is the second largest industry.

Lumbering is the leading industry in the area and is concentrated at or near Quesnel. The industry includes logging operations, lumber and planer mills, chip and pulp mills, and plywood manufacturing.

The tourist industry continues to expand as rapid improvements in access to the plateau country are made. Recreational pursuits include fishing, hunting, hiking, camping, and boating.

Physiography

The survey area lies in the Interior Plateau and contains sections of the Fraser Plateau and Fraser Basin (Holland 1976).

The most prominent physiographic feature is the Fraser River which transects the area from north to south (Fig. 2). It is incised in a deep valley of numerous rock canyons and a series of well-developed terraces. Its major tributaries, the Quesnel, West Road (Blackwater), and Cottonwood rivers and the Naver, Baker, and Narcosli creeks have deep, steep-sided canyons at their mouths, but relatively low valleys in their upper reaches.

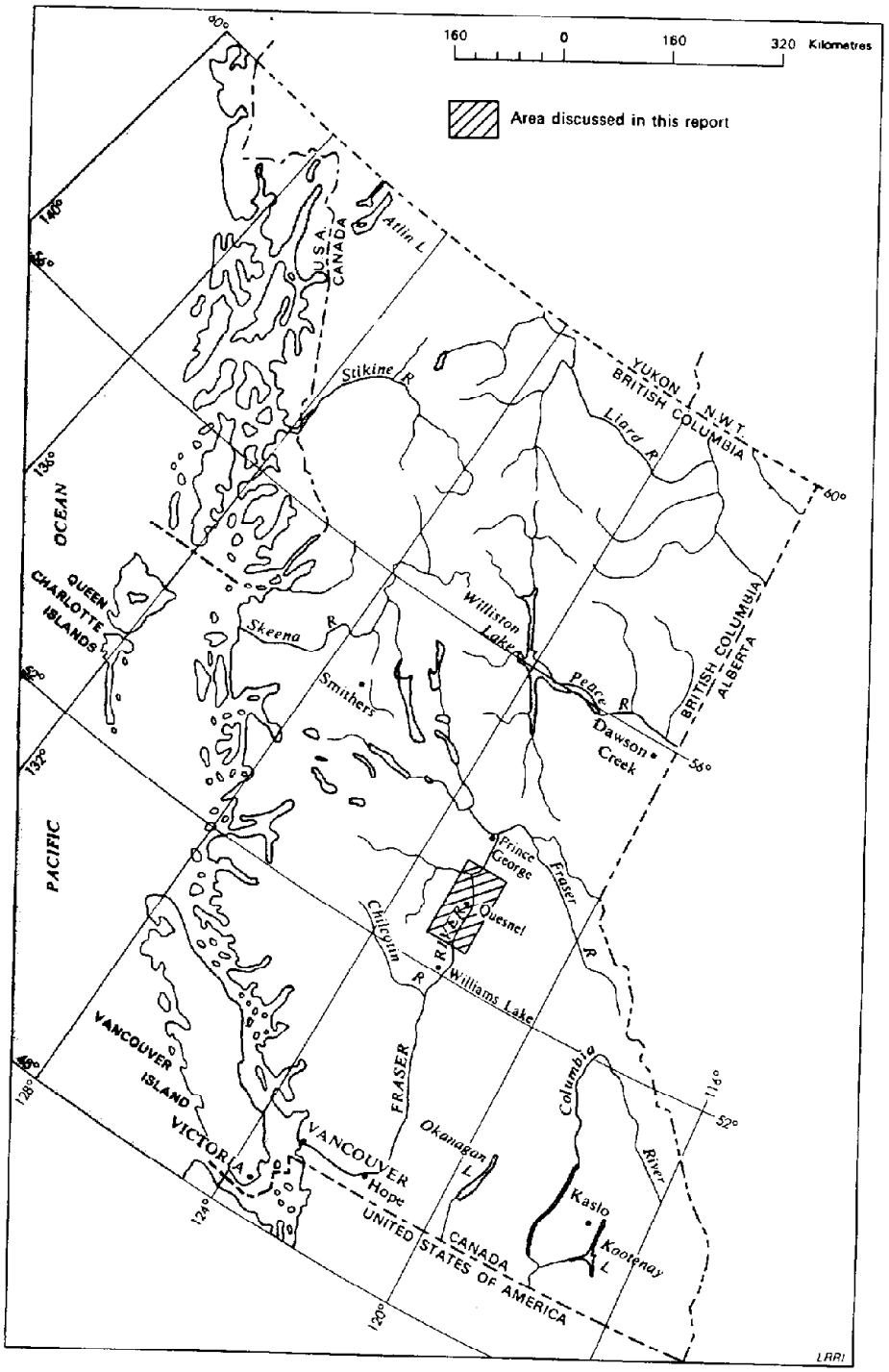

Fig. 1 Location of the Quesnel map area in British Columbia

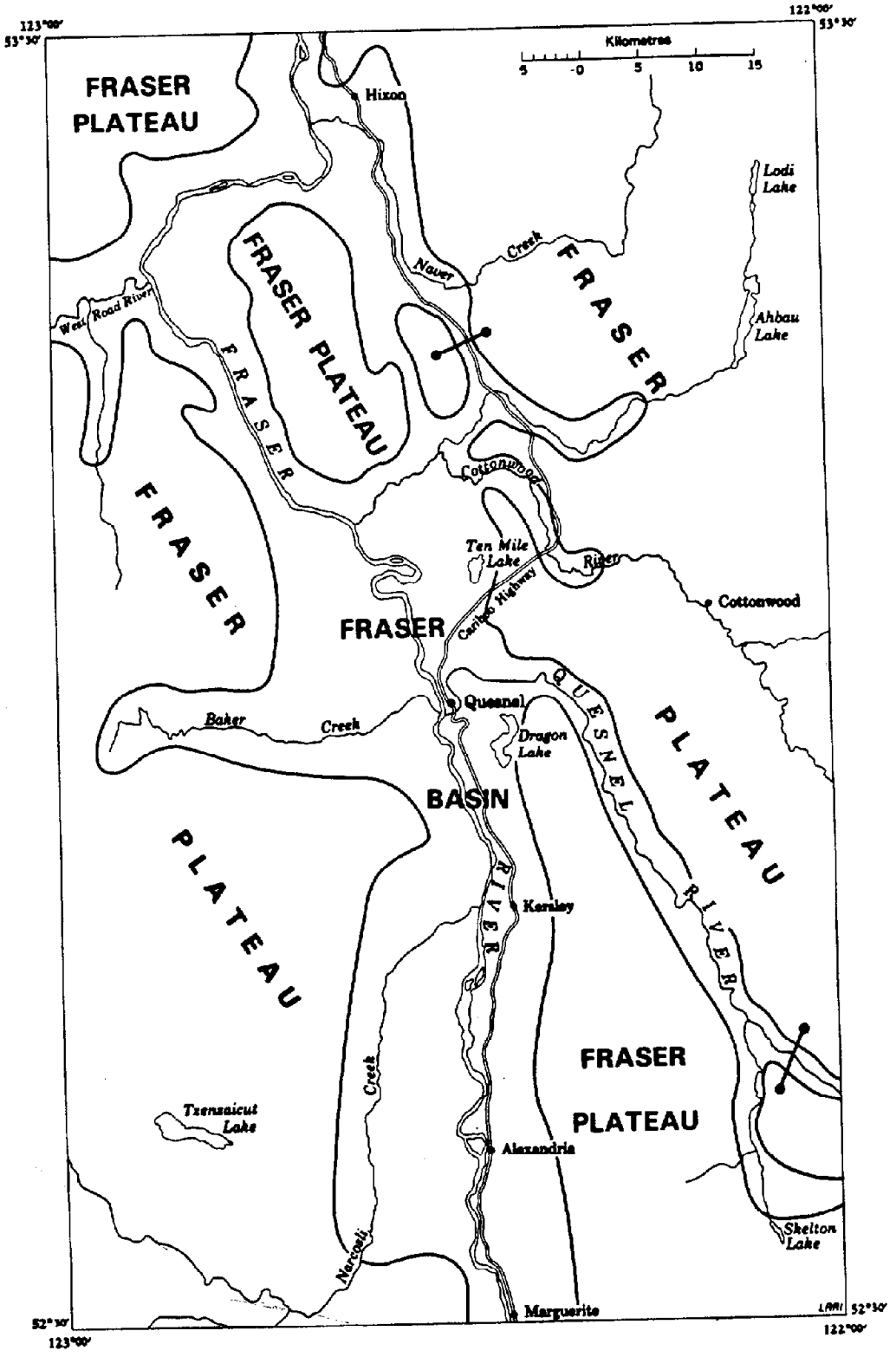

Fig. 2 Physiography and drainage in the Quesnel area

The Fraser Plateau is a rolling, drumlinized till plain dissected by deep valleys and containing many upland surfaces lying between 1200 and 1500 m. Much of the plateau is underlain by flat or gently dipping lava flows of Miocene or Pliocene age. In the main, the plateau lies at 1200 m above sea level; its elevation decreases gradually with proximity to the Fraser River. A series of ridges east of the Fraser River represents the westerly-most extent of the Cariboo Mountains, an extension of the Columbia Mountain System.

The Fraser Basin is described by Holland (1976) as an irregular area of low relief extending from Williams Lake northward through Prince George to the Rocky Mountain Trench. For the purpose of this report, the upper boundaries of the basin in the Quesnel area are approximately the 920 m contour and the limits of the lacustrine deposits. The surface is nearly level or gently rolling.

Drainage was interrupted during the Pleistocene epoch and consequently the landscape is dotted with numerous sloughs and small lakes. The major lakes are Ahbau, Lodi, and Skelton, which occupy former glacial meltwater channels, Ten Mile and Dragon, and Tzenzaicut west of the Fraser River. Although drainage occurs southward via the Fraser River to the Pacific Ocean, the general drainage pattern in the area is distinctly northward. According to Lay (1940, 1941), this reflects a pre-Pleistocene drainage history in which the Fraser River in this vicinity flowed northward via the Peace River to the Arctic Ocean.

Bedrock geology

Bedrock geology of the study area has been mapped and described by the Geological Survey of Canada (1959, 1960). A generalized map showing the location and extent of the various bedrock types is presented in Fig. 3. This figure shows the most of the area covered by a blanket of unconsolidated geologic materials in the form of till, alluvium, lacustrine and colluvial deposits. The mantle appears to be thicker in and to cover a greater proportion of the northeast and east sections of the area. Outcrops of volcanic rocks occur primarily in the southwest, west, and northeast corners. Sedimentary rocks occur mainly as outcrops along the Fraser and Cottonwood rivers in the northern part of the area. Intrusive rocks occupy areas in the northeast, as do metavolcanic and metasedimentary rocks. The latter also occur along the Fraser River between the mouths of the Cottonwood and Blackwater rivers. The widespread dispersal and mixing of these rock types by glacial action has tended to minimize their individual influence on soil development. But some effects can be noted, especially when considering the directions and origins of ice flow (Fig. 4) as described by Tipper (1971) and discussed more fully in the sections following.

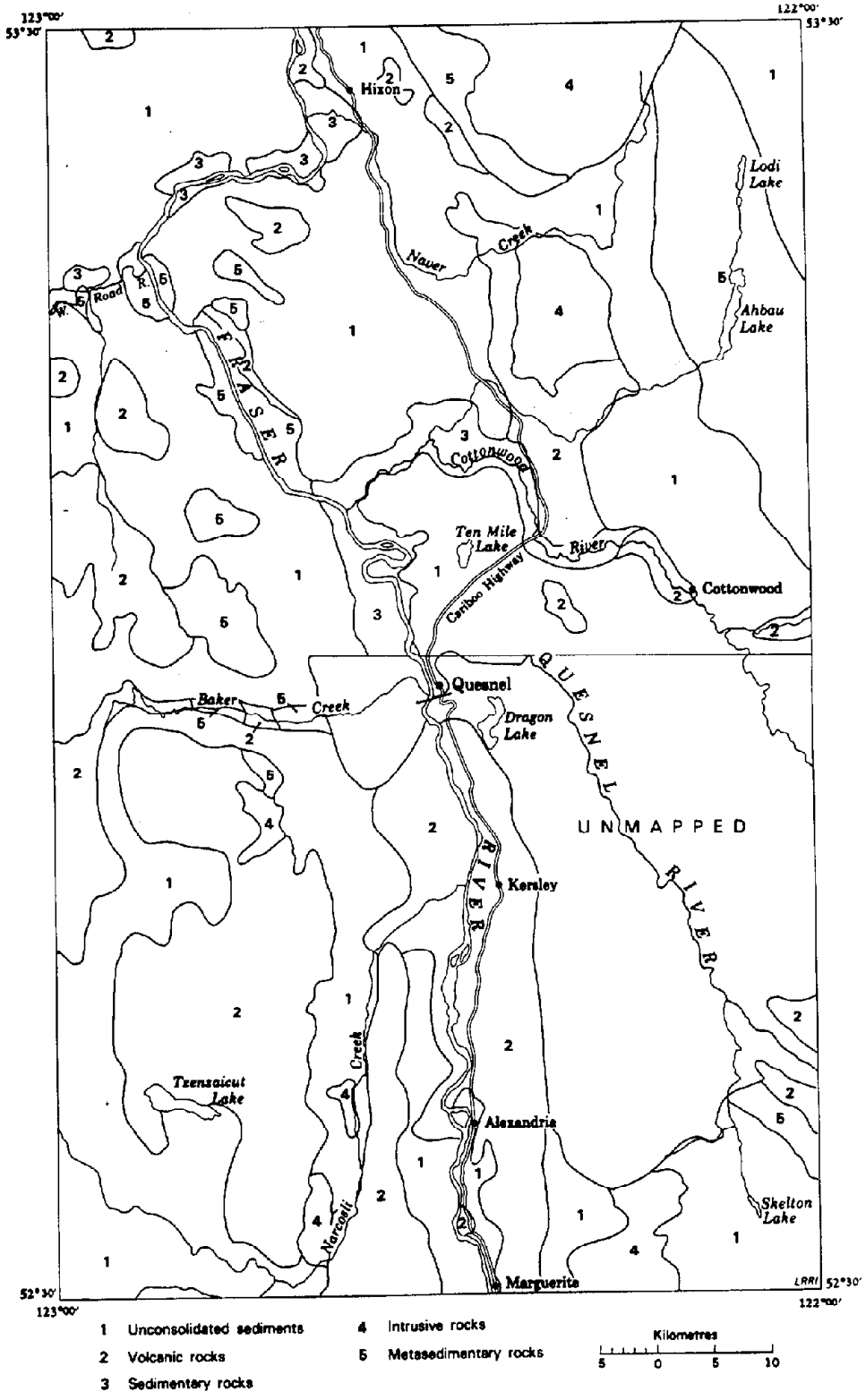

Fig. 3 Generalized bedrock geology

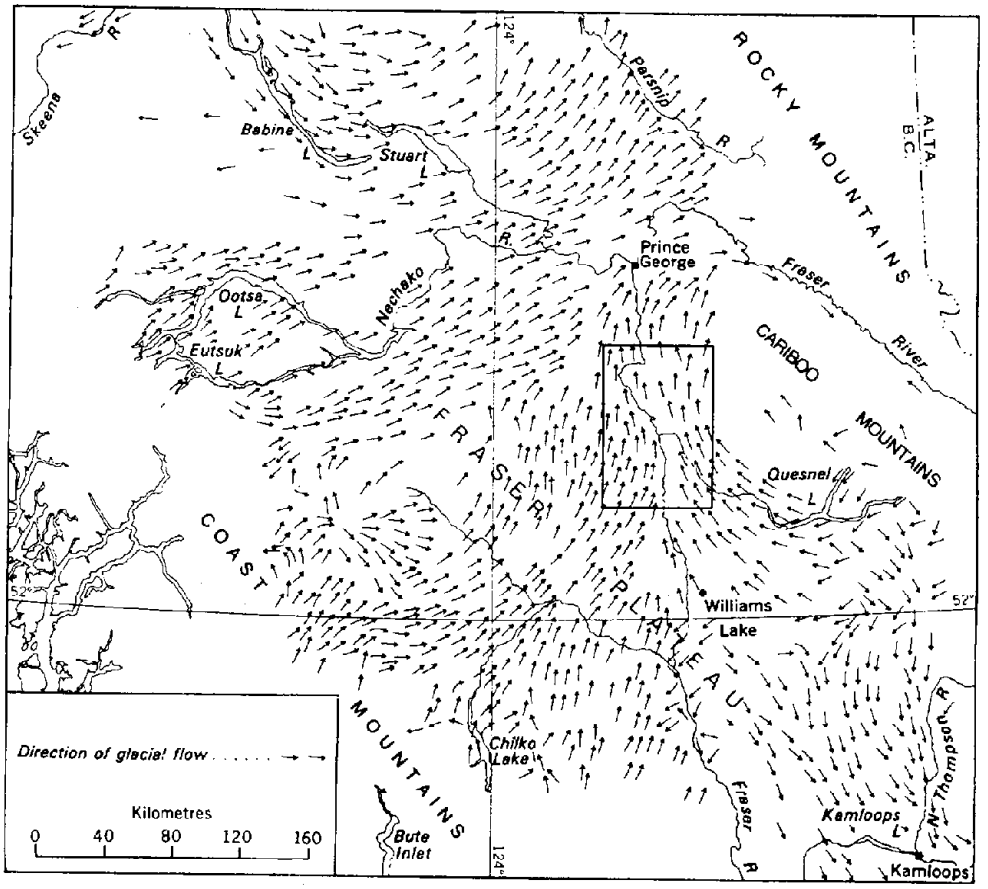

Fig. 4 Direction of ice movement in central British Columbia

Surficial geology and soil parent materials

The glacial geomorphology and Pleistocene history of central British Columbia have been discussed extensively by Tipper (1971). The relationship of surficial deposits to parent materials of the soils is discussed in this section. The general location and extent of these deposits is illustrated in Fig. 5. The deposits have been described and classified according to the Canada Soil Survey Committee (1978).

a) Fluvial deposits

Extensive areas of river terraces and floodplain deposits have formed adjacent to the major river systems from water level to an elevation of approximately 570 m. They vary in their extent and mode of formation and are characterized by level to gently sloping topography with each successive terrace being separated by a steep escarpment. On the lower terraces the land surface is often interrupted by postglacial stream meanders up to a depth of several metres. Fluvial deposits are parent materials for soils of the Fraser, Kersley, McGregor, Quesnel, Saxton, Soda Creek, and Swift associations.

Glaciofluvial deposits are widespread throughout intermediate elevations. They are in close association with morainal deposits between elevations of 735 and 1080 m. Glaciofluvial deposits above 1080 m are not common but do occur. Their complex interrelation with the till deposits precludes, in most instances, mapping areas of pure fluvial materials. They characteristically occur as shallow deposits overlying till ridges or as fillings in intervening hollows between drumlins. For the most part, the deposits appear to be recessional; however areas of esker-kame complexes, pitted plains, and minor kame terraces occur. Small map units of beach deposits (Gunniza soils) may be included in this group or under lacustrine deposits.

Texturally, the glaciofluvial deposits are gravels, gravelly sands, and gravelly loamy sands. However, some areas of sands are found, particularly east of Ahbau Lake. Loamy sands and sandy loams predominate on the lower terraces and are often shallow to underlying gravel deposits.

Soils of the Alix Association occur mainly in the drier parts of the Fraser Basin. Roaring soils occur on gravelly material deposited on the lower plateau slopes, while Ramsey soils occupy large glaciofluvial plains in the eastern part of the uplands.

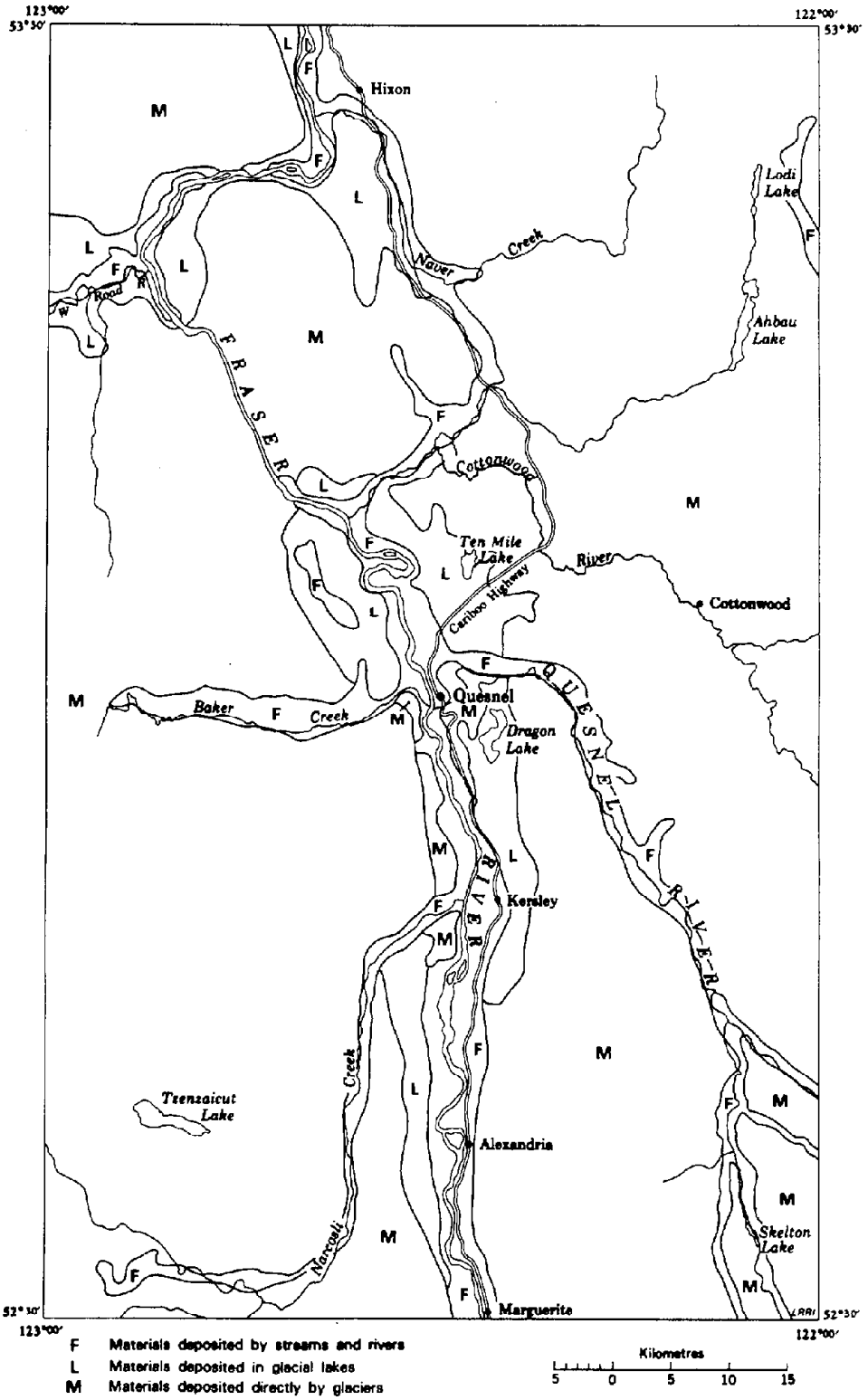

Fig. 5 Surficial geology

b) Lacustrine deposits

The lacustrine deposits of the Quesnel soil survey area are predominantly of glaciolacustrine origin (Tipper 1971).

Glacial lakes Prince George and Quesnel made up a continuous laking basin extending from the upper terraced level to approximately 800 m elevation. Most varved clayey deposits occur adjacent to the Fraser River (Beaverley, Pineview, and Narcosli soils); however, small areas are located up the Cottonwood River and Hixon Creek. In addition, erosion remnants are found up the Quesnel River beyond Beaver Creek. On the eastern banks of the Fraser River, Australian Creek marks the approximate southern limit of the laking basin. It extends somewhat farther south on the western side, but tends to be saline in this area (Cuisson Association). Near the periphery of the basin the deposits gradually thin out and isolated knobs of till protrude above the lacustrine surfaces.

Textures of the deposits within the basin vary from clay loam to heavy clay, but silt and silt loam do occur. The lacustrine silt deposits found up to an elevation of 1000 m are often highly eroded. They are adjacent to former glacial rivers where the rivers entered the lake, suggesting a possible deltaic origin. The predominant textures of these deposits are silt loam and very fine sandy loam (Bednesti and Berman associations).

c) Morainal deposits

Morainal (till) deposits are the most common surficial materials in the area. They are found mainly above an elevation of 735 m. The landscape characteristically contains drumlins varying considerably in their degree of expression. Crag and tail features are more common at the higher elevations in areas shallow to bedrock with lineations or glacial grooves (Twain, Dragon, and Ormond soils). At elevations below 1080 m, parent materials of the soils of the Cinema Association are commonly associated with glaciofluvial materials.

Two types of till are recognized. One is a compact, pseudoplaty-structured deposit occurring throughout the area (Deserters and Barrett soils). The second type is a loose, sandy loam to loam textured material displaying evidence of reworking and water action (Sheridan Association).

Table 1 Selected climatic data

Station	Location	Elev. (m)	Mean annual temp. (°C)	Mean Jan. temp. (°C)	Mean July temp. (°C)	Growing[1] degree-days	Freeze-[2] free period	Mean annual precip. (mm)	May-Sept. precip. (mm)	Average annual snowfall (cm)	Climatic[3] moisture (mm)
Alexis Cr.-* Tautri Cr.	5232.5 N 12311 W	1220	0.3	-13.6	11.6	709	12	419	213	167	-193
Australian	5244 N 12228 W	488			15.9	1540	95	406	197		
Barkerville*	5305 N 12135 W	1274	1.4	- 9.8	12.3	669	49	1149	474	582	+165
Dragon*	5253 N 12220 W	1244	2.6	-10.6	13.1	915	77	600	301		
Hixon	5327 N 12240 W	541	4.4	-11.0	16.0	1390	90	627	256		
Kersley	5248 N 12225 W	671	3.8	-11.4	15.4	1272	84	514	242		
McLeese L.-* Granite	5231 N 12216 W	1123	3.2	-10.0	14.3	1110	77	518	291		-84
Milburn*	5302 N 12245 W	1293	2.5	-12.4	12.6	815	66	635	314		
Naver 11.5	5319 N 12215 W	861			13.3	953	43	793	322		
Pantage L.	5313.5 N 12308 W	814			13.6	1010	30	455	222		
Punchaw	5328 N 12300 W	793			13.1	925	30	643	313		

Quesnel-* Airport	5301 N 12231 W	545	4.4	-11.3	16.4	1341	99	541	259	193	-165
Quesnel-* Moose Hts.	5304 N 12230 W	712	4.1	-10.9	15.8	1333	98	579	253		
Ram	5237 N 12252 W	1409			12.5	1005	80	452	219		
Ramsey	5230 N 12238 W	870			15.0	1390	72	425	204		
Williams L.-* Airport	5211 N 12204 W	941	4.0	-10.2	15.7	1322	92	402	207	153	-157
Willow	5326 N 12201 W	924			13.6	990	44	810	334		

* most reliable data

(1) Growing degree-days: degree-days accumulated above 5°C.

(2) Freeze-free period: days above 0°C.

(3) Climatic moisture: moisture deficit (-) or surplus (+).

Reference: Personal communication - G.E. Cheesman, Air Management Branch, Min. Environment.

The bedrock source can influence soil development. Tipper (1971) shows that the direction of ice flow was predominantly from the south and southeast in the east section of the study area (Fig. 5). Here the soil parent materials are derived largely from coarse textured intrusive rocks with some minor fine textured metasedimentary and metavolcanic rocks. This feature shows up in the soils in the form of loamy to sandy textures with slightly calcareous soil parent materials. In the west and southwest the ice flowed generally from the southwest, passing over fine textured volcanic rocks. Soils developed on these materials tend to have loamy to clayey textures with little or no calcareousness in the soil material (Barrett and Ormond soils).

d) Organic deposits

Many small areas of organic materials occur throughout the map area, scattered fairly uniformly over the plateau and basin. The dominant component is partially decomposed peat material derived from sedges, shrubs, and mosses (Chief soils).

Climate

The climate of the Cariboo forest region is described in some detail by Annas and Coupe (1979). The general trends of climate within the region are governed primarily by elevation, latitude, and position in relation to the mountains.

Because the region is in the lee of the Coast Mountains, the effects of moist air from the Pacific Ocean are reduced. Very light precipitation and a high frequency of clear skies produce a relatively dry climate. The high elevation of the plateau results in a short freeze-free period as well.

Progressing from south to north, a cooler and wetter climate is noticeable. The trend is reflected in figures for the growing degree-days, freeze-free period, January mean temperatures, and precipitation (Table 1).

West of the Fraser River, on the Fraser Plateau, freeze-free periods shorten and growing degree-days lessen. The higher elevation flat lands encourage the formation and retention of cooler air compared to Fraser canyon lands. At higher elevations snowpacks become deeper and more prolonged. The seasonal pattern of precipitation is an interesting feature of the precipitation regime. Within the Fraser canyon, approximately 50% of the precipitation falls during the May-September period. Immediately west of the river, the frequency of summer precipitation (May-September)

increases to 60% in response primarily to an increase in the number of convective storms. Northeast from Marguerite the precipitation gradient increases rapidly. The main factors are an increase in elevation and proximity to the Columbia Mountains. Much of the difference between lowland and high land, in annual precipitation, occurs during the winter. In general, higher snowfall occurs east of the Fraser River.

Vegetation

The vegetation of the ecological zones of the Cariboo forest region has been described on a broad scale by Annas and Coupe (1979). Three of the eight biogeoclimatic zones occur in the Quesnel survey area (Fig. 6). A biogeoclimatic zone is defined as a geographical area in a broadly homogeneous macroclimate under which vegetation, soils, and nutrient cycling form similar patterns. The zones may be subdivided into more homogeneous subzones.

Subboreal spruce zone

The three subzones of the subboreal spruce zone cover most of the survey area (Fig. 6).

In the cold, dry Chilcotin pine subzone (SBSa) of the southwest, white spruce (Picea glauca) and lodgepole pine (Pinus contorta var. latifolia) are the dominant conifers, black spruce (Picea mariana) occurs in bogs, and Douglas fir (Rocky Mountain Douglas fir) (Pseudotsuga menziesii) is generally absent from the subzone. The herb layer is sparse, and pinegrass (Calamagrostis rubescens) cover is variable.

The Douglas fir-white spruce subzone (SBSb) occurs in the northern part of the Fraser Basin and in the high plateau areas of the southeast. 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 blueberry (Vaccinium spp.). Pinegrass is sparse, but herbs such as wild sarsaparilla (Aralia nudicaulis),Canadian bunchberry (Cornus canadensis), and asters (Aster spp.) are common.

The white spruce-subalpine fir-Douglas fir subzone (SBSc) occurs in the northeast plateau area and is strongly influenced by the cold northern climate. White spruce and subalpine fir (alpine fir) (Abies lasiocarpa) are characteristic trees, but other species such as Douglas fir, lodgepole pine, trembling aspen, paper birch, and black cottonwood (Populus balsamifera subsp. trichocarpa) are common.

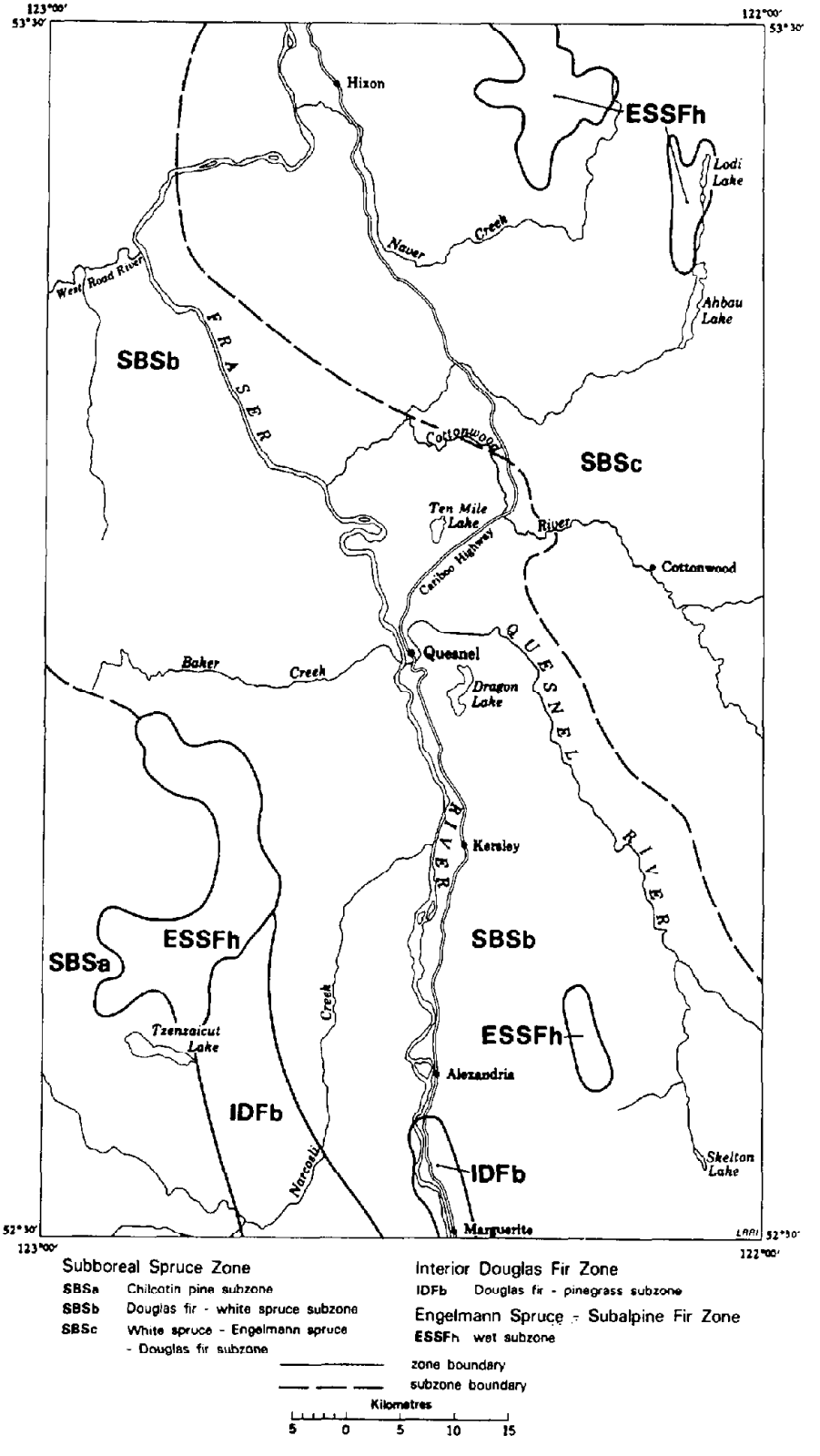

Fig. 6 Biogeoclimatic zones

Interior Douglas fir zone

The Douglas fir-pinegrass subzone (IDFb) extends into the southern part of the survey area in the valley of the Fraser River and follows the river almost as far north as Quesnel. Although a number of 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). Pinegrass, a characteristic grass, is found with other herbs such as blue-leaved wild strawberry (Fragaria virginiana), northern twinflower (Linnaea borealis), and star-flowered false Solomon's seal (Smilacina stellata).

Engelmann spruce-subalpine fir zone

The wet subzone of the Engelmann spruce-subalpine fir zone (ESSFh) occupies a small part of the survey area, mainly west of the Fraser River at elevations greater than 1200 m. Subalpine fir and Engelmann spruce (Picea engelmannii) are the characteristic and most dominant trees of the subzone. The very well developed shrub layer includes white-flowered rhododendron (Rhododendron albiflorum), blueberries, Sitka mountain alder (Alnus viridis subsp. sinuata), and devil's-club (Oplopanax horridus). The herb layer, also well developed, contains Sitka valerian (Valeriana sitchensis subsp. sitchensis), oak fern (Gymnocarpium dryopteris), Canadian bunchberry, and simple-stemmed twistedstalk (Streptopus roseus).

THE SOILS

How the soils were mapped and described

Since the soil surveys conducted under the Canada Land Inventory (CLI) program had a common objective and well-defined guidelines, the authors of this report consider it unnecessary to give a detailed account of survey methods and mapping procedures used. Interested readers, or users unfamiliar with soil reports are referred to recent soil survey reports of British Columbia, in particular to Soil Report No. 25 (Valentine and Schori 1980). Methods and conditions discussed in Report No. 25 under sections Survey and Mapping Procedures and Reliability apply closely to the Quesnel survey. In the Quesnel report the scale of the published soil map is 1:100 000. Soils were classified according to the Canada Soil Survey Committee (1978). The soil association is used and defined in a similar manner in the Quesnel report and Report No. 25. A soil association is a group of related soils developed on similar parent materials, which differ due to different soil water regimes, or other characteristics such as depth to bedrock. The soil association will occur under similar climatic conditions and usually within one physiographic area or vegetation zone. A soil association is named after its most common soil.

A soil association contains a number of different but related soils. The full range of soils will not be represented in every part of the landscape where the soil association occurs. Each soil association is shown on the map by one or more map units, each of which is given a particular combination of letters and numbers.

There are two types of map units:

a) Single map unit - containing soils from only one association, e.g., Deserters Association (D).
D: dominantly deep, moderately well drained soils.
D4: as in D with significant inclusions of wet soils.
D(E): as in D with significant inclusions of eroded soils.

b) Compound map unit - containing soils from two (or three) associations, e.g., Deserters (D) and Ramsey (R) associations.
D-R: dominantly deep, moderately well drained soils derived from loamy till, with significant inclusions of gravelly, stony, excessively drained soils from glaciofluvial materials.

The soil associations of the Quesnel area fall within two clearly differentiated physiographic areas - the Fraser Basin and the Fraser Plateau (Fig. 2). These two areas are separated on the legend and on the soil maps by color hues. The individual associations are separated by combinations of hue (e.g., yellow and red), chroma (intensity), and value (lightness).

SOIL ASSOCIATIONS OF THE FRASER BASIN

For the purpose of this report the main area of the Fraser Basin lies below the general shoreline elevation of the glacial lakes. Glacial lake sediments occur up to an elevation of 920 m in the principal river valleys and at 430 m on the Fraser River at Marguerite.

The basin is composed predominantly of basalt and andesite bedrock in the south, changing to argillite in the north, with inclusions of conglomerate, sandstone, and mudstone in the north central sections. The topography is nearly level or gently rolling, and steep where deeply incised by the Fraser River and its tributaries. Soil parent materials are glaciolacustrine, fluvial, and glaciofluvial with minor areas of morainal and organic materials. Bedrock outcrops occur in the river banks. The soil associations that occur primarily within the Fraser Basin are Alix, Bednesti, Berman, Beaverley, Cinema, Cuisson, Fraser, Gunniza, Kersley, McGregor, Narcosli, Pineview, Quesnel, Saxton, and Soda Creek. The organic soils of the Chief Association occur throughout the survey area but are described under soil associations of the Fraser Plateau. Some map units of Alix Association are found in high elevation valleys above the 900 m contour, transitional to the plateau.

The associations of the Fraser Basin physiographic area are arranged and described in the same way as they are shown in the map legend. Profile descriptions and analyses of common or typical soils are given.

The map units of each association are described briefly.

Alix Association (AX)

The Alix Association consists of sandy-skeletal soils developed on glaciofluvial materials that were deposited near the lake margins. The soils occur on level to strongly sloping lands of stream valleys and basins intermediate between the Fraser Basin and the uplands of the plateau. The elevation ranges from 750 m east of the Fraser River to 1050 m in the western part of the plateau. The association is dominant over 4% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 30-89 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 blueberries, Oregon boxwood, pinegrass, 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 (AX1) dominating in some map units and the eluviated subgroup (AX2) 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 of the Alix Association is from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Soils of the Alix Association have many characteristics associated with other sandy skeletal and gravelly soils of the Roaring and Ramsey associations. These features are discussed in the description of the Roaring Association.

The Alix Association provides lodgepole pine pulpwood, and has potential for recreation and wildlife.

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

Map units

Four map units occur in the Alix Association: two single units, AX1 and AX2, and two compound units, AX-CF and AX-D.

AX1 Alix 1 (18 566 ha): The AX1 map unit occurs in fairly large areas in low elevation valleys to the southeast and at elevations up to 1040 m in the upper valleys of Baker and Ramsey creeks. The deep, rapidly drained soils of the association 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.

AX2 Alix 2 (9562 ha): This map unit is similar to the AX1 map unit in respect to elevation range and topographic classes. The somewhat more leached soils are similar to Ramsey soils. Organic soils (Chief) and soils developed on gravelly morainal materials (Deserters) may occupy 15-20% of the map unit. The main occurrence is in the valleys of Ramsey and Narcosli creeks.

AX-CF Alix-Chief (2589 ha): The Organic soil (Chief) is complexed with Alix soils in these map units 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 AX1 map unit but topography is more subdued.

AX-D Alix-Deserters (1276 ha): Two small areas northeast of Quesnel and two others west of the Fraser River occur with the heavier textured soil on till (Deserters). In these units, the elevations of about 780 m and their location near the upper limits of the Fraser Basin suggest a relationship to shoreline materials (Gunniza). Topographic classes range from moderate to strongly sloping.

Bednesti Association (B)

The Bednesti Association consists of loamy soils developed on silty stratified glaciolacustrine deposits. The soils occur on level to strongly sloping lands that are concentrated mainly along the valley of the Quesnel River. For the most part, the Bednesti soils are found near the margins of former lake basins at elevations ranging from 700 to 1000 m. The association is dominant over 2% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 50-89 days and there are 1030-1309 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 blueberries, Oregon boxwood, pinegrass, and mosses.

Although the parent material of the Bednesti soils is generally nonstony silty loam or fine sandy loam, stones occur where shallow deposits overlie till. The soils are moderately well drained, are moderately pervious, and have a subhumid to humid soil moisture regime.

The classification of the dominant soil of the association is Brunisolic Gray Luvisol. Podzolic Gray Luvisols frequently develop on the coarse-loamy deposits of high elevation watersheds. Under thin litter horizons of needles, twigs and leaves, the typical profile has a grayish surface horizon underlain by a yellowish brown silty horizon and a thick, well developed silty horizon containing some clay. The grayish, stratified parent material is often calcareous. A complete profile description of a Brunisolic Gray Luvisol of the Bednesti Association is from Soils of the Prince George Area (Dawson, in preparation).

Berman soils are somewhat heavier in texture and are classified as Orthic Gray Luvisols. Deserters and Quesnel soils are Brunisolic Gray Luvisols, but the former is developed on gravelly till materials and the latter occurs on loamy, fluvial, terraced deposits along the Fraser River.

The Bednesti soils were first described and mapped by Kelley and Farstad in 1946 (Report No. 2 of the B.C. Soil Survey). The soils have since been recognized in numerous reports dealing with soils of the north central interior. Recent association names for these silty, erodible lacustrine soils recognize the need for differentiating the climatic and vegetational zones in which they occur.

Areas of the Bednesti Association are harvested for timber, and farmed in map units that are accessible and of suitable topography.

Map units

Four map units occur in the Quesnel map area: a single B unit, its eroded phase B(E) and two compound units, B-BY and B-D.

B Bednesti (1828 ha): This map unit occurs as fairly small, widely dispersed delineations. Gravelly sandy soils of the Ramsey Association are found over 20-40% of the surface area of the unit. Topography is mostly gently sloping with some areas of moderate slopes.

B(E) Bednesti-eroded phase (2904 ha): The three long, narrow map delineations of the eroded phase are found from Quesnel upstream on the Quesnel River. Although base slopes on the units are gentle to moderate, water erosion has resulted in 20-60% of the map unit being dissected by deep, steep-walled gullies.

B-BY (Bednesti-Beaverley (1533 ha): Clayey Beaverley soils occupy as much as 40% of each of the two areas of this map unit. Topography is mainly gently sloping in the areas mapped in the Quesnel River valley.

B-D Bednesti-Deserters (8351 ha): The one area of this map unit occurs in the Quesnel River valley along the extreme edge of the glacial lake basin. Elevations range up to 1000 m over moderately to strongly sloping valley sides. Deserters soils occupy about 40% of the unit.

Berman Association (BN)

The Berman Association consists of fine-loamy soils developed on glaciolacustrine deposits. The terrain is nearly level and gently sloping with some very steep eroded slopes. Elevations range from 600 m in the valley of the Cottonwood River to about 900 m in the Narcosli River valley. The association predominates 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 1030-1504 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 blueberries, Oregon boxwood, pinegrass, 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 of the Berman Association 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) lacustrine 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.

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 criteria such as the texture of the parent materials, landform and climatic features, and soil profile characteristics. For the purpose of interpretive groupings most of these associations can be brought together.

Berman soils occur extensively in the Prince George-McLeod Lake map area to the immediate north of the Quesnel area. The map units of the association provide wood for timber and pulp and where cleared are 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 units

Three map units occupy widely scattered areas in the Quesnel map area: a single BN unit, its eroded phase, BN (E), and a compound unit, BN-SN.

BN Berman (2632 ha): The BN map unit occupies four areas at elevations of 800 m near the Fraser River. As much as 15-20% of the unit may be comprised of Organic soils and a further 30% may be other clayey lacustrine soils. Topography ranges from level to rolling.

BN(E) Berman-eroded phase (1712 ha): Two areas of strongly eroded soils (30-50% of the map unit) are delineated along the river banks of the lower Cottonwood River. Slopes range from 2% to 15% in the upstream unit and from 30% to 100% in the large, dissected unit near the river junction.

BN-SN Berman-Sheridan (1254 ha): This large map unit near Castle Rock extends west of the river terraces up slopes of 2-9% to a maximum elevation of 870 m. Variable amounts of sandy skeletal soils (Alix) occur in the map unit.

Beaverley Association (BY)

The Beaverley Association consists of fine-loamy and clayey soils developed on glaciolacustrine deposits. The soils occur on level to undulating land with some steeply sloping phases. The soils are of extensive occurrence, particularly on upper terraces above the Fraser, Cottonwood, and Quesnel rivers. The elevations range from 530 to 850 m. The association is dominant over 11% of the map area.

The mean annual precipitation is 300-750 mm. The freeze-free period is 60-119 days and there are 1030-1504 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 blueberries, Oregon boxwood, pinegrass, and mosses.

Although the parent material is consistently nonstony, stones occur where shallow deposits overlie stony till. Gravel and sandy soils of the Alix Association are commonly associated with Beaverley soils. The soils are moderately well drained, are slowly pervious, and have a subhumid to humid soil moisture regime.

The classification of the dominant soil of the association is Orthic Gray Luvisol. Under thin litter horizons of needles, twigs, and leaves, the typical profile has a grayish surface horizon underlain by a grayish brown loamy horizon and a thick, well developed clayey horizon. The grayish, stratified parent material occurs at depths of 70-85 cm. A complete description of an Orthic Gray Luvisol of the Beaverley Association is from a map unit south of Dragon Lake.

Berman soils, mapped in the large glacial lake basins north of the survey area, are Orthic Gray Luvisols developed on similar parent materials. Other Orthic Gray Luvisols - Cinema, Fraser, Narcosli, and Sheridan - are associated with parent materials that differ in textural range or mode of origin. Beaverley soils were first described in the Quesnel area by Mackintosh et al., in 1965 (unpublished manuscript).

The Beaverley soils are harvested for timber and farmed in map units that are accessible and of suitable topography.

Map units

Beaverley soils predominate in nine map units: a single BY unit, its eroded phase BY(E), and seven compound units that may contain significant inclusions of other soil associations, namely Alix, Cinema, Deserters, Narcosli, Pineview, and Sheridan.

BY Beaverley (17 155 ha): This map unit contains Beaverley soils on level or undulating terrain. About 30% of the soils may be veneered over morainal material or may consist of shoreline gravels (Gunniza).

BY(E) Beaverley-eroded phase (11 651 ha): More than 50% of the soils have been gullied. Topography includes nearly level and sloping areas associated with broken gullied land.

BY-AX Beaverley-Alix (3146 ha): Sandy-skeletal soils of the Alix or Roaring associations may comprise 20-30% of the map unit. Loamy, stony Cinema soils may also occur.

BY-BN Beaverley-Berman (2904 ha): The soils of the two associations, Beaverley and Berman, are similar in many respects. Beaverley soils tend to be more slowly permeable in the subsoil horizons.

BY-C Beaverley-Cinema (2779 ha): Loamy, stony Cinema soils occupy 30% or more of this nearly level to gently undulating map unit.

BY-D Beaverley-Deserters (6905 ha): This map unit is characterized by shallow lacustrine clay veneers overlying till. The loamy, gravelly soils of the Deserters Association make up 20-40% of the map unit.

BY-NC-P Beaverley-Narcosli-Pineview (13 403 ha): Pineview heavy clay and the more loamy Narcosli soils form complex soil landscape patterns in the nearly level to undulating map unit.

BY-P Beaverley-Pineview (22 703 ha): About 30-50% of the soils in this unit may be imperfectly drained Pineview soils or poorly drained Gleysols.

BY-SN Beaverley-Sheridan (567 ha): Up to 60% of the soils in this unit may be gravelly and stony (Sheridan and Alix soils).

Cinema Association (C)

The Cinema Association consists of gravelly loamy soils develped on morainal materials found predominantly in the south central part of the map area. The soils occur on level to strongly sloping and eroded lands lying between the Fraser Basin and the uplands of the plateau. Elevations are mainly less than 900 m. The association is dominant over 5% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 60-89 days and there are 1030-1309 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 blueberries, Oregon boxwood, pinegrass, and mosses.

The parent material of the Cinema soils is gravelly, loamy morainal material 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 soils is Orthic Gray Luvisol. The surface soils are brownish gray sandy loams that overlie a brownish clay loam subsoil. Below this horizon is a gravelly, often stony material that may occasionally be calcareous. A complete profile description of an Orthic Gray Luvisol of the Cinema Association is from a map unit near Marguerite.

Although the Sheridan soils are similar in type of soil development and parent material, these soils appear to be more influenced by glaciofluvial processes than the Cinema soils. Barrett soils are similar to Cinema soils but occur in the moister subboreal spruce zone west of the Fraser River.

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

The soils of the Cinema Association were first described by Mackintosh et al., in 1965 (unpublished manuscript).

Map units

Four map units occur in the Cinema Association: a single C unit, its eroded phase C(E), and two compound units, C-AX and C-K.

C Cinema (10 660 ha): This map unit contains 15-20% of sandy-skeletal soils (Alix) and some Organic soils (Chief). It occurs primarily on level to undulating terrain near the Fraser River in the south part of the map area.

C (E) Cinema eroded phase (3694 ha): Most of the soils of this map unit have formed in variable textured materials in the steep, dissected valley of Baker Creek. The map unit contains variable amounts (20-50%) of eroded clayey soils (Beaverley) and sandy-skeletal soils (Alix).

C-AX Cinema-Alix (18 744 ha): This map unit occurs as five large map delineations associated with Baker, Narcosli, and Cuisson creeks on level or undulating terrain. About 20-50% of the soils within this map unit are gravelly and sandy-skeletal (Alix).

C-K Cinema-Kersley (1629 ha): Soils in this map unit occur in small delineations near Australian Creek on level or undulating terain. About 20-40% of the soils are sandy (Kersley).

Cuisson Association (CU)

The Cuisson Association consists of fine-loamy soils developed on glaciolacustrine deposits that are confined to elevations below 750 m. The soils occur on undulating lands in the valley of the Fraser River, southwest of Alexandria. The association predominates in less than 1% of the map area.

The mean annual precipitation is greater than 300 mm. The freeze-free period is 90-119 days and there are 1310-1504 growing degree-days above 5°C. Interior Douglas fir and trembling aspen occur with a ground cover of blueberries, pinegrass, and mosses.

The parent material of the Cuisson soils is fine-loamy lacustrine material that is nonstony. The deposits are alkaline in reaction and generally contain salt crystals. The soils are moderately well drained, are slowly pervious, and have a semiarid to subhumid soil moisture regime.

The development of the soils is dependent on a number of factors including salinity of the parent material, vegetative cover, and slope position. While Chernozemic and Luvisolic soils occur in the association, a more common soil is the Dark Gray Solod. This soil has a dark-colored surface horizon and a platy structured leached horizon that overlies very compact, saline, subsoil horizons. The parent material is calcareous and loamy. Such a soil is described near Castle Rock, west of the Fraser River.

There are no similar soils in the map area. Cuisson soils are closely associated with soils of the Narcosli Association.

Most of the soils included in the Cuisson Association are being used for livestock grazing and forage production.

The Cuisson soil series was first described in the Quesnel area by Farstad and Laird in 1954 (Report No. 4 of the B.C. Soil Survey).

Map Units

One map unit, CU, is recognized.

CU Cuisson (1781 ha): The two delineations of this single map unit lie between the Kersley and Narcosli associations across the Fraser River from Alexandria. The map unit contains variable amounts of Chernozemic and Luvisolic soils associated with Solonetzic soils.

Fraser Association (F)

The Fraser Association consists of silty and fine loamy soils developed on fluvial materials of the upper benches of the Fraser River. Scattered map units occur throughout the length of the river, but a major concentration is near the mouth of the Cottonwood River. Elevations are less than 735 m. The association predominates in less than 1% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 90-119 days and there are 1310-1504 growing degree-days above 5°C. Lodgepole pine is a common tree, but other species such as white spruce, Douglas fir, trembling aspen, and common paper birch occur with a ground cover of blueberries, Oregon boxwood, pinegrass, and mosses.

The parent materials of the soils are silty and fine-loamy fluvial deposits. Although the predominant terrain form is a nearly level terrace, the landform may be appreciably altered by abandoned stream channels. The soils are well drained, are moderately pervious, and have a subhumid soil moisture regime.

The Fraser Association includes a wide range of soil development from Regosol to Gray Luvisol, with Podzols in some areas. A typical Orthic Gray Luvisol has a grayish, silty leached surface horizon overlying brownish, silty clay loam subsurface horizons. Mottled sand often underlies the parent material. A complete profile description of an Orthic Gray Luvisol of the Fraser Association is from Soils of the Prince George Area (Dawson, in preparation).

On lower river terraces the Fraser soils are often associated with Regosolic soils such as McGregor. Other Orthic Gray Luvisols in the area have developed either on heavy textured lacustrine soils or on stony, gravelly tills.

Many of the Fraser soils have been cleared for hay and pasture and small vegetable gardens.

The Fraser soil was first described by Kelley and Farstad in 1946 (Report No. 2 of the B.C. Soil Survey).

Map units

Two map units occur in the Fraser Association: a single F unit and a compound F-S unit.

F Fraser (2414 ha): Soils of this map unit occur on nearly level terraces along the Fraser River near Hixon, Quesnel, and Kersley. About 20-30% of the soils may be sandy textured.

F-S Fraser-Saxton (2555 ha): Most delineations of this map unit occur near the confluence of the Fraser and Cottonwood rivers. More than 30% of the soils are sandy Orthic Dystric Brunisol (Saxton).

Gunniza Association (GU)

The Gunniza Association consists of sandy skeletal and coarse-loamy soils developed on gravelly beach materials that were formed along the shores of large glacial lakes. These shoreline deposits are found at elevations between 735 and 780 m on moderate to strongly sloping land. The soils occupy a small but significant portion of the map area along the northern margins of the lake basins. The association predominates in less than 1% of the map area.

The mean annual precipitation is 300-500 mm. The freeze-free period is 60-74 days and there are 1030-1169 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 blueberries, Oregon boxwood, pinegrass, and mosses.

The parent material of the soils is gravelly and sandy with scattered accumulations of cobbles and boulders. The soils are rapidly drained, are rapidly pervious, and have a subhumid to humid soil moisture regime.

The Gunniza Association is dominated by coarse textured Orthic Humo-Ferric Podzols. A leached grayish surface horizon overlies yellowish brown gravelly sand that forms a veneer over the compact underlying till. Gunniza soils are described in some detail in certain soil reports (Hortie et al., 1970; Kelley and Farstad 1946). A typical soil is described in Soils of the Prince George Area (Dawson, in preparation).

Gunniza soils are most commonly associated with Beaverley and Deserters soils within the Quesnel map area.

There is some limited forest production on the Gunniza soils.

Map units

Only one map unit, GU, represented by three delineations, is recognized in the map area.

GU Gunniza (1915 ha): The map unit consists of a veneer of coarse skeletal, water-sorted material that may have 20-40% inclusions of lacustrine materials (Beaverley soil) and/or morainal materials (Deserters soil). The Cariboo Highway traverses a large area of Gunniza soils north of Hixon.

Kersley Association (K)

The Kersley Association consists of sandy and loamy soils developed on fluvial materials that were deposited by the Fraser River. The soils occur on terraces along the river from Quesnel to Marguerite where elevations are below 570 m. The association is dominant over 2% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 90-119 days and there are 1310-1504 growing degree-days above 5°C. Douglas fir and trembling aspen are common trees that occur with a ground cover of herbs, pinegrass, and mosses.

The parent material of the Kersley soils is sandy and loamy material that is sometimes gravelly. Although the predominant terrain form is a nearly level terrace, hummocky and ridged landforms occur. The soils are well drained, are rapidly pervious, and have a subhumid soil moisture regime.

The classification of the soils is Eutric Brunisol with the orthic subgroup dominating in most map units. The soils have a thin surface layer of grayish sandy loam or loam. Subsoils are yellowish brown and overlie parent material that may occasionally be calcareous. A complete profile description of an Eluviated Eutric Brunisol of the Kersley Association is from a site near the town of Kersley.

Soda Creek and Saxton soils have similar origins as fluvial deposits but differ from Kersley soils in their development. Kersley soils are closely associated with the Regosolic McGregor soils in the floodplain of the Fraser River.

Under suitable topography, Kersley soils are used for crop, hay, and vegetable production and for residental use. More severely sloping terrain is used for livestock grazing.

The Kersley soils were first described by Farstad and Laird in the Quesnel area in 1954 (Report No. 4 of the B.C. Soil Survey).

Map units

Five map units occur in the Kersley Association: single units K and K1, and the eroded phase K(E), and compound units K-MG and K-CU.

K Kersley (10 706 ha): McGregor soils may occupy 20-30% of this map unit; saline Cuisson soils may be present in areas adjoining the CU map unit near Castle Rock. Topography is gently sloping to undulating.

K1 Kersley 1 (281 ha): Imperfectly drained soils and Regosols occupy 40-60% of this single map delineation. The unit, which occupies a gently sloping fan on Australian Creek, was formerly described as the Australian soil series (Farstad and Laird 1954).

K(E) Kersley-eroded phase (696 ha): Soils of this map unit occupy strongly ridged or hummocky terrain. Much of the land within the unit is deeply gullied. The one small map delineation is near Alexandria.

K-MG Kersley-McGregor (1137 ha): The soils of this map unit have formed from sandy and loamy fluvial material on level or undulating terrain. From 20% to 30% of the soils are Regosols (McGregor). The unit is near Quesnel.

K-CU Kersley-Cuisson (163 ha): A single delineation of the K-CU unit is near Marguerite. Significant inclusions of saline materials are associated with the fluvial Kersley soils.

McGregor Association (MG)

The McGregor Association consists of loamy soils developed on fluvial deposits of the Fraser River and its tributaries. The soils occur on nearly level floodplain areas and river islands along the full length of the Fraser River in its traverse through the map area. Elevations are below 570 m. The association predominates in less than 1% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 75-119 days and there are 1170-1504 growing degree-days above 5°C. Vegetation is typical of river floodplains. Cottonwood, willows, and alder are common with a rich groundcover of herbs, shrubs, and grasses.

The parent material of the McGregor soils is sandy to loamy in texture and neutral to alkaline in reaction. Although the predominant terrain form is a nearly level terrace, undulating and ridged landforms occur. Most of the soils are imperfectly drained, are moderately pervious, and have a subhumid to perhumid soil moisture regime. Seasonally high water tables and periods of inundation are common.

Soils of the McGregor Association are classified as Regosols. Orthic and cumulic subgroups occur but a Gleyed Regosol is considered to predominate. The profile is variable in textures and colors of horizons, and in degree and intensity of gleying and mottling. A profile description of a Gleyed Regosol is from Soils of the Prince George Area (Dawson, in preparation).

Some McGregor soils are farmed. McGregor soils were first separated out of the Fraser alluvial complex during the soil survey in the Rocky Mountain Trench (Hortie et al., 1970).

Map units

Only one map unit, MG, is recognized and mapped in the Quesnel area.

MG McGregor (2258 ha): The numerous delineations of the MG unit show wide variability in textures and internal drainage characteristics of the soil profiles. Most areas are close to river level and are susceptible to high water tables and flooding during spring freshets on the Fraser River.

Narcosli Association (NC)

The Narcosli Association consists of loamy and clayey soils developed on glaciolacustrine deposits that are concentrated west of the Fraser River in the vicinity of Narcosli Creek, at elevations below 800 m. The soils occur on rolling to strongly sloping lands. The association is dominant over 1.5% of the map area.

The mean annual precipitation is greater than 300 mm. The freeze-free period is 75-119 days and there are 1170-1504 growing degree-days above 5°C. Lodgepole pine occurs with Douglas fir and trembling aspen over a ground cover of herbs, pinegrass, and mosses.

The lacustrine parent material of the Narcosli soils is generally shallow (less than 2 m) but of variable thickness overlying till. Although the predominant topography is rolling, ridged and eroded landforms occur. The soils are moderately well drained, are moderately pervious, and have a subhumid soil moisture regime.

The most common soils of the association are Orthic Gray Luvisols. The sequence and textures of horizons are similar to those found in the closely related soils developed on lacustrine deposits of medium and fine texture. The varved parent material is generally free of lime. A complete profile description of an Orthic Gray Luvisol of the Narcosli Association is from a site near Castle Rock.

Although the Narcosli soils have many characteristics in common with such soils as Beaverley and Berman, the association occupies a somewhat drier and warmer environment. Here the Narcosli soils are closely associated with those of the Cinema and Kersley associations at the northerly limits of the Interior Douglas fir vegetation zone.

Much of the Narcosli soils have been cleared and cultivated for agricultural purposes.

The Narcosli soils were first described and mapped by Farstad and Laird in the Quesnel area in 1954 (Report No. 4 of the B.C. Soil Survey).

Map units

Four map units occur in the Narcosli Association: a single NC unit, its eroded phase NC(E), and two compound units, NC-BY and NC-C.

NC Narcosli (1802 ha): The two map delineations of this unit occur on nearly level and undulating topography adjoining a large area of Cuisson soils. Some of these saline soils occur in the Narcosli map unit.

NC(E) Narcosli-eroded phase (2342 ha): Most of the land in the two eroded map delineations associated with Narcosli Creek is steeply sloping, strongly dissected, gullied.

NC-BY Narcosli-Beaverley (3876 ha): The soils of this map unit have formed on loamy and clayey glaciolacustrine materials on undulating or rolling terrain. The map unit contains about 20-40% clayey soils (Beaverley, Pineview).

NC-C Narcosli-Cinema (3811 ha): About 20-40% of the soils of this map unit are developed on loamy morainal material (Cinema soils). These soils form part of a rolling soil landscape that results from thinly veneered morainal deposits associated with the valleys of Baker and Narcosli creeks.

Pineview Association (P)

The Pineview Association consists of clayey and fine-loamy soils developed on glaciolacustrine deposits. The deposits are near the Fraser River at elevations between 600 and 735 m. Pineview soils occur on nearly level to rolling land in the central and northern parts of the map area. The association predominates in less than 1% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 75-119 days and there are 1170-1504 growing degree-days above 5°C. Lodgepole pine is a common tree, but other species characteristic of the subboreal spruce zone—white spruce, Douglas fir, trembling aspen, and common paper birch—occur with a ground cover of blueberries, Oregon boxwood, pinegrass, and mosses.

The parent materials of the Pineview soils are nonstony, neutral, clayey, and fine-loamy lacustrine materials. The soils are imperfectly to moderately well drained, are slowly pervious, and have a subhumid to perhumid soil moisture regime.

Most of the soils included in the Pineview Association are classified as Gleyed Gray Luvisols. These imperfectly drained soils have good structure in the surface horizons but the heavy clay subsoils are structureless, strongly gleyed, and mottled. The parent material is neutral in reaction. A complete profile description of an Orthic Gray Luvisol of the Pineview Association is from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Pineview soils are more poorly drained and heavier textured than other associated Gray Luvisols such as Beaverley and Berman.

Soils of the Pineview Association support agricultural crops in the cleared areas under favorable topography. However, most of the map units are logged or under forest.

The Pineview soil series was first described and mapped by Kelley and Farstad in 1946 (Report No. 2 of the B.C. Soil Survey).

Map units

One map unit, P, is recognized in the Quesnel area. Pineview soils are significant components of the Beaverley Association and form extensive map units near Prince George to the north of the survey area.

P Pineview (5379 ha): This map unit includes blanket (greater than 1 m) deposits containing 20-40% Gleysols and Organic soils as well as thin veneer deposits overlying till. Topography ranges from gently sloping to strongly rolling. The main map delineations are west of the Fraser River north of Hixon.

Quesnel Association (Q)

The Quesnel Association consists of coarse loamy and silty soils developed on fluvial deposits of the Fraser River. The soils occur on a few small terrace units scattered along the river below an elevation of 600 m. The association predominates in less than 1% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 90-119 days and there are 1310-1504 growing degree-days above 5°C. Lodgepole pine, white spruce, Douglas fir, trembling aspen, and common paper birch occur with a ground cover of blueberries, Oregon boxwood, pinegrass, and mosses.

The parent materials of the Quesnel soils are loamy, nonstony, fluvial materials that are neutral in reaction. Although the predominant terrain form is a nearly level terrace, hummocky and ridged landforms occur. The soils are well to moderately well drained, are slowly pervious, and have a subhumid soil moisture regime.

The classification of the soils is Brunisolic Gray Luvisol. Quesnel soils have thin surface horizons of grayish brown sandy loam. Subsoils are grayish silty clay loams that overlie silty parent material. A complete profile description of a Brunisolic Gray Luvisol of the Quesnel Association is from a site near Hixon.

Soils of the Quesnel Association generally show more intensive soil development than the Kersley or McGregor soils, with which they are often associated.

Much of the Quesnel Association map units have been cleared for agricultural or residental use, but forested areas are common.

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

Map units

Two map units occur in the Quesnel Association: a single Q unit, and its eroded phase Q(E).

Q Quesnel (1692 ha): About 20-40% of the soils in this map unit are sandy textured Eutric Brunisols (Kersley). Areas of this map unit occur near Hixon and Quesnel.

Q (E) Quesnel-eroded phase (392 ha): The single map delineation of this eroded phase is near Quesnel. Clayey lacustrine soils of the Beaverley Associaton make up 20-30% of this strongly eroded and dissected unit.

Saxton Association (S)

The Saxton Association consists of sandy soils developed on fluvial materials in the valleys of the Quesnel, Cottonwood, and Fraser rivers. The soils occupy variable terrain at elevations lying between 540 and 600 m. The association is dominant over 2% of the map area.

The mean annual precipitation is 400-750 mm. The freeze-free period is 50-74 days and there are 1030-1169 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 blueberries, Oregon boxwood, pinegrass, and mosses.

The parent material of the Saxton soils is sandy, fluvial material that is generally stone free and neutral in reaction. Although the predominant terrain form is a nearly level terrace, hummocky and ridged landforms occur. The soils are well to rapidly drained, are rapidly pervious, and have a subhumid to humid soil moisture regime.

In the Quesnel area most of the soils of the Saxton Association are Dystric Brunisols with the eluviated subgroup predominating. The soils have sandy surface horizons, yellowish brown loamy sand subsoils, and coarse sandy parent materials. An Eluviated Dystric Brunisol profile from Soils of the Prince George Area (Dawson, unpublished) is described.

Alix and Roaring soils are also Dystric Brunisols but have developed on gravelly glaciofluvial materials, while Swift soils have developed as Podzols on coarse textured fluvial deposits.

Soils of the Saxton Association are used for many purposes including recreation, residental, forestry, and agriculture.

Saxton soils were first named and described by Kelley and Farstad, in 1946 (Report No. 2 of the B.C. Soil Survey).

Map units

Four map units occur in the Saxton Association: three single units, S, S(E), and S4, and one compound unit, S-Q-BY.

S Saxton (9432 ha): Soils in this map unit occur on undulating and terraced terrain. Poorly drained soils and Regosols (McGregor) comprise less than 20% of the unit.

S(E) Saxton-eroded phase (4308 ha): About 30 to 50% of the soils in this map unit are gullied or have rough broken topography.

S4 Saxton 4 (1828 ha): Gleysols or imperfectly drained soils make up 20-30% of this map unit in the valley of Hixon Creek.

S-Q-BY Saxton-Quesnel-Beaverley (1378 ha): Soils in this map unit have formed in sandy and silty fluvial materials and clayey lacustrine deposits on undulating and rolling terrain. This soil complex contains about 30% each of the named soils.

Soda Creek Association (SA)

The Soda Creek Association consists of sandy and loamy soils developed on fluvial materials adjacent to the Fraser River near Marguerite. The soils occur on nearly level terraces at elevations of 450 m or less. The association predominates in less than 1% of the map area.

The mean annual precipitation is greater than 300 mm. The freeze-free period is 90-119 days and there are 1310-1504 growing degree-days above 5°C. Douglas fir occurs with trembling aspen over a ground cover of herbs, pinegrass, and shrubs.

The parent material of Soda Creek soils is sandy and coarse loamy alluvium that overlies calcareous and alkaline gravels. The predominant terrain form is a nearly level terrace. The soils are well to rapidly drained, are rapidly pervious, and have a semiarid soil moisture regime.

The classification of the soils is Dark Gray Chernozemic with the rego subgroup dominating in the map units. The surface soils are dark grayish brown sandy loam. Subsoils are brown sandy loams overlying gravelly materials that are moderately calcareous. A complete profile description of an Orthic Dark Gray Chernozemic soil of the Soda Creek Association is from a site near Marguerite.

Soils of the Soda Creek Association are the only Chernozemic soils described in the map area. They occur in close proximity to the Kersley soils in the extreme southern section of the Fraser River valley.

The Soda Creek soils are presently used for livestock grazing.

The soils were first described in the Quesnel Area by Mackintosh et al., in 1965 (unpublished manuscript).

Map units

One map unit, SA, is described.

SA Soda Creek (704 ha): The four small delineations of this single map unit occupy gently undulating terraces on the Fraser River near Marguerite.

SOIL ASSOCIATIONS OF THE FRASER PLATEAU

That part of the Fraser Plateau in the map area is a rolling, partly drumlinized till plain lying between 920 and 1500 m elevation. It is split almost equally into east and west sections by the deeply incised Fraser River.

The east portion, underlain predominantly by granodiorite, diorite, and granitic bedrock, is mantled with till deposits that were influenced, in part, by local glaciation from the Cariboo Mountains. The soils are generally shallow with bedrock outcrops occurring on ridges and in incised river banks. Soil associations found east of the Fraser River are Dominion, Dunkley, Ramsey, Swift, and Twain, as well as the more widespread Deserters, Dragon, and Chief soil associations.

West of the Fraser River the terrain is slightly less rugged in a landscape dominated by volcanic bedrock. The composition of the morainal deposits was influenced by glacial action from the southwest and west. Within the Quesnel map area the Barrett, Ormond, Sheridan, and Roaring soil associations occur west of the Fraser River. Deserters, Dragon, and Chief soils are found throughout the western section of the plateau.

The soil associations of the Fraser Plateau are arranged and described in the same way as they are shown in the map legend. Profile descriptions and analyses of common or typical soils are given. The map units of each association are described briefly.

Barrett Association (BA)

The Barrett Association consists of gravelly loamy soils developed on morainal materials on rolling and undulating terrain. The soils occur in the western part of the map sheet, northwest of Tzenzaicut Lake at elevations from 850 to 1200 m. The association is dominant over 3% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 30-74 days and there are 780-1196 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 blueberries, Oregon boxwood, pinegrass, and mosses.

The parent material of the Barrett soils is gravelly, moderately stony, and neutral in reaction. The soils are moderately well to well drained, are moderately to slowly pervious, and have a humid to subhumid soil moisture regime.

The classification of the soils is Gray Luvisol with the orthic subgroup dominating in most areas and the brunisolic subgroup occurring in slightly moister environments. The soils have a thin surface layer of grayish sandy loam. Subsoils are grayish brown, gravelly loam that overlies gravelly loamy parent material. A complete profile description of an Orthic Gray Luvisol of the Barrett Association is taken from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Cinema soils are Orthic Gray Luvisols developed on morainal material but they occur in a slightly drier and warmer environment than the Barrett soils. Alix soils occur as associates in most map units.

The present use for Barrett soils is the production of pulpwood and sawlogs.

The Barrett soils were first described by Farstad and Laird in 1954 (Report No. 4 of the B.C. Soil Survey).

Map units

Two single map units, BA and BA4, and one compound unit BA-AX, are recognized in the Quesnel area.

BA Barrett (13 652 ha): Topography ranges from undulating to rolling in the map unit. As much as 30% of the unit may include Brunisolic Gray Luvisols.

BA4 Barrett 4 (1775 ha): This map unit is an extension of larger areas to the west of the Quesnel map sheet. It is distinguished by significant inclusions of Gleysols and Gleyed Gray Luvisols.

BA-AX Barrett-Alix (7338 ha): About 20-40% of the soils in this map unit are gravelly and sandy-skeletal Alix soils.

Chief Association (CF)

The Chief Association consists of organic soils developed on sedge and sphagnum 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 over 2% 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 and grasses. Vegetation on 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 days of the first soil survey in the Interior Plateau (Kelley and Farstad 1946). 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 the current report, Soils of the Quesnel area, this association name is now used mainly to identify organic landforms in which Mesisol and Fibrisols predominate.

Many of the soils of the Chief Association are used for wildlife and livestock grazing. Some map units produce hay from native sedge vegetation or from seeded grasses.

Map units

Three map units, CF, CF(SP), and CF-S4 are recognized in the survey area.

CF Chief (8637 ha): Many small map delineations of this unit occur in the somewhat drier environment of the subboreal spruce zone of the Fraser River. The map units include variable amounts of Humic Mesisol, terric subgroups, and Gleysols. This map unit is characteristic of the fens.

CF(SP) Chief-sphagnic phase (2101 ha): This phase of the Chief Association is restricted to the cooler, moister subzone of the subboreal spruce zone that lies east of the Fraser River. Bog landforms with a surface cover of sphagnum mosses, scattered black spruce, and lodgepole pine are common.

CF-S4 Chief-Saxton 4 (904 ha): This map unit in the Naver River valley includes 20-40% Gleysols developed on fluvial materials.

Deserters Association (D)

The Deserters Association consists of gravelly, loamy soils developed on morainal materials over topography ranging from moderate to very steep slopes. The elevations range from 750 m to about 1500 m. The Deserters Association dominates in the map area and is dominant over 43% of the Quesnel map sheet.

The mean annual precipitation is 300-750 mm. The freeze-free period is 30-74 days and there are 780-1169 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 blueberries, Oregon boxwood, pinegrass, 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 glacial lake may have 30-75 cm 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 of the Deserters Association is from Soils of the Prince George Area (Dawson), in preparation.

Soils of the Barrett and Cinema associations are Orthic Gray Luvisols that occur on similar parent material to that of Deserters soils but under a slightly drier environment. Soils of the Dunkley Association are more clayey and have developed under moister conditions than Deserters soils.

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

Of the nine map units in the Quesnel area, three are single, D, D4, and D(E), and six are compound, D-CF, D-C, D4-R, D-DO, D-DN, and D-RG.

D Deserters (127 992 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 and Humo-Ferric Podzols occur at higher elevations.

D4 Deserters 4 (3395 ha): The two large map delineations of this unit occur on undulating to gently sloping land near Ahbau Lake where 30-40% of the soils are poorly drained Gleysols or Organic soils.

D(E) Deserters-eroded phase (2671 ha): These steeply sloping and dissected lands are mapped mainly in the Quesnel River valley.

D-CF Deserters-Chief (4754 ha): The limited number of delineations of this map unit are in the north central part of the map area at elevations just above the clay basin. Organic soils (Chief) occupy as much as 30-50% of the hummocky terrain.

D-C Deserters-Cinema (8556 ha): One large and one small delineation of this map unit occur on a rolling morainal landscape in the southern boundary area of the map sheet. Cinema soils, Orthic Gray Luvisols, comprise a significant percentage of the unit.

D4-R Deserters-Ramsey (12 510 ha): Also near Ahbau Lake are two large delineations of a complex map unit containing high percentages of gravelly, sandy Podzol soils (Ramsey) with Gleysols and Organic soils in the enclosed depressions.

D-DO Deserters-Dominion (11 907 ha): The uplands and stream valleys tributary to the Quesnel River contain several delineations of this map unit. Luvisolic Humo-Ferric Podzols of the Dominion Association comprise 30-40% of the unit.

D-DN Deserters-Dragon (83 312 ha): This extensive map unit generally lies on mid-upper slopes of ridges, below the shallower, more rocky Dragon map units. Most delineations carry a significant component of these Podzolic soils developed on colluvium.

D-RG Deserters-Roaring (66 473 ha): This unit is mapped on the subdued hummocky terrain lying near the higher elevation ranges of the glacial lake basin. As a consequence, the proportions of gravelly, sandy glaciofluvial or shoreline materials in the unit is generally high. These coarse textured soils are Dystric Brunisols of the Roaring or Alix associations and/or Podzols of the Ramsey Association.

Dominion Association (DO)

The Dominion Association consists of fine-loamy soils developed on morainal materials. These soils have extensive occurrences in map areas immediately east and north of the Quesnel area - Reports No. 23 and 40 of the B.C. Soil Survey (Dawson, Lord, and Green), in preparation. In the Quesnel River area the Dominion Soils occur at elevations from 920 to 1200 m. The association is dominant over 1% of the map area.

The mean annual precipitation is 400-750 mm. The freeze-free period is 60-89 days and there are 1030-1309 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 blueberries, Oregon boxwood, pinegrass, and mosses.

The parent material of the Dominion soils is gravelly, loamy, and netural in reaction. The soils are well drained, are moderately pervious, and have a humid soil moisture regime.

The predominant soil, a Luvisolic Humo-Ferric Podzol, has brownish silty surface horizons, and gravelly loam subsoil and parent material. A complete profile description of a Luvisolic Humo-Ferric Podzol of the Dominion Association is from Soils of the Prince George Area (Dawson, in preparation).

Dominion soils are similar to Dunkley soils in kind of parent material and profile development. Both of these associations have limited occurrence in the Quesnel area.

Dominion soils were first recognized and described in the Prince George area by Dawson, (report in preparation).

Map units

Two map units, DO-D4 and DO-DN, occur in the southwest part of the map sheet.

DO-D4 Dominion-Deserters 4 (1436 ha): This large map delineation on gently rolling hummocky terrain may contain up to 40-60% of Gleysolic and Organic soils.

DO-DN Dominion-Dragon (5846 ha): Many of the soils in this fairly large, strongly sloping delineation are developed on coarse textured colluvium, the parent material of the Dragon soils.

Dragon Association (DN)

The Dragon Association consists of coarse-loamy and fine loamy soils developed on colluvial and morainal materials. The soils occur on strongly sloping terrain above elevations of 900 m. Soils of the Dragon Association are scattered throughout the area at the highest elevations but are concentrated in the eastern portion of the plateau. The association is dominant over 5% of the map area.

The mean annual precipitation is 300-750 mm. The freeze-free period is 30-49 days or less and there are 670-1029 growing degree-days above 5°C. Engelmann spruce and subalpine fir are common trees with a ground cover of blueberries, Oregon boxwood, and mosses.

The parent materials are generally shallow (less than 1 m) colluvium that is derived from bedrock of variable composition. The soils are well drained, are moderately pervious, and have a humid to perhumid soil moisture regime.

The classification of the soils is Humo-Ferric Podzol with the orthic subgroup dominating in most areas in association with lithic soils and bedrock. The soils have thin grayish surface horizons. Subsoils are reddish brown sandy loams and loams that overlie gravelly loamy materials. A complete profile description of an Orthic Humo-Ferric Podzol of the Dragon Association is from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Twain soils closely resemble Dragon soils, but the latter are formed mainly on colluvial materials associated with acidic granitic rocks.

These high elevation soils are logged in some areas for pulpwood and sawlogs.

Dragon soils were first recognized in the Prince George area by Dawson (report in preparaton).

Map Units

One map unit, DN, occurs in the Quesnel area.

DN Dragon (39 506 ha): The numerous delineations of this map unit are associated with up to 50% Brunisolic Gray Luvisols and lithic phases on abraded ridge crests and mountainous terrain.

Dunkley Association (DU)

The Dunkley Association, represented by a few delineations of one map unit (DU) (218 ha), occurs only in the extreme northeast corner of the map area. This map unit is the southern limit of the much more extensive Dunkley Association area to the north, described in the Prince George map area by Dawson (report in preparation). The map unit predominates in less than 1% of the area.

Dunkley soils are developed on fine-loamy, somewhat stony morainal material. The dominant soil is a moderately well drained Luvisolic Humo-Ferric Podzol, occurring on moderately sloping and ridged topography.

The profile description is similar to that of the Dominion soil (described in this report).

Ormond Association (OD)

The Ormond Association consists of gravelly, loamy soils developed in veneers of morainal materials on rolling hummocky terrain. West of Quesnel these soils are associated with the Barrett Association in the Charleson Creek watershed. Elevations are from 650 to 1050 m. The association occupies less than 1% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 30-49 days and there are 780-1029 growing degree-days above 5°C.

One of the common soils, a lithic Dystric Brunisol, is described from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Map units

One map unit, OD-BA, occurs in the Quesnel area.

OD-BA Ormond-Barrett (3493 ha): The two delineations of this map unit are on strongly rolling and steeply sloping land. The Orthic Gray Luvisol of the Barrett Association makes up 20-40% of the soils in the map unit.

Ramsey Association (R)

The Ramsey Association consists of sandy-skeletal and coarse-loamy soils developed on glaciofluvial materials that were deposited near the margins of glacial lakes. The soils occur on nearly level and hummocky lands of stream valleys and basins in the Ahbau Lake area of the plateau. Elevations are about 1000 m. The association is dominant over 3% of the map area. It is much more extensive in map areas north of Quesnel.

The mean annual precipitation is 400-750 mm. The freeze-free period is 30-59 days and there are 1030-1169 growing degree-days above 5°C. Lodgepole pine is a common tree, but other species characteristic of the subboreal spruce zone—white spruce and common paper birch—occur with a ground cover of blueberries, Oregon boxwood, and mosses.

The parent materials of the Ramsey soils are variable in origin and form. They include recessional outwash, deltas, terraces, and kames. The soils are well to rapidly drained, are rapidly pervious, and have a humid soil moisture regime.

The classification of the soils is Orthic Humo-Ferric Podzol. These leached soils have a thin surface horizon of grayish sandy loam. Subsoils are yellowish brown, gravelly, loamy sands that overlie very gravelly materials. The complete profile description of an Orthic Humo-Ferric Podzol of the Ramsey Assocation is from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Alix and Roaring soils occur on similar materials but are classified as Dystric Brunisols. The Swift soils are Podzols that have developed on fluvial soils in an environment similar to that of the Ramsey soils.

Ramsey soils are forested and are used mainly for logging purposes.

Ramsey soil series was first named and described by Mackintosh et al., the Quesnel area in 1965 (unpublished manuscript).

Map units

One single unit, R, and two compound units, R-CF and R-D, are described.

R Ramsey (7490 ha): The few map delineations of this unit are quite pure, containing no more than 15-20% organic soils or areas of till. Topography is rolling and hummocky.

R-CF Ramsey-Chief (6818 ha): Within the hummocky and depressional parts of this map unit poorly drained soils and organic deposits may constitute 30-40% of the soils.

R-D Ramsey-Deserters (6458 ha): This map unit is represented by a few delineations of moderately and strongly sloping ridges. The veneer of gravelly soils is broken by frequent occurrences of loamy till materials.

Roaring Association (RG)

The Roaring Association consists of sandy skeletal and coarse-loamy soils developed on glaciofluvial materials that were deposited near the margins of glacial lakes. The soils occur on hummocky and ridged lands of stream valleys and basins intermediate between the Fraser Basin and the uplands of the plateau. The elevation ranges from 750 m to just over 800 m. The association is dominant over 5.5% of the map area.

The mean annual precipitation is 400-750 mm. The freeze-free period is 30-74 days and there are 780-1169 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 blueberries, Oregon boxwood, pinegrass, and mosses.

Much of the landform of Roaring soils consists of complex esker-kame terrain composed of sands and gravels. The materials are generally stony and acid in reaction. The soils are well to rapidly drained, are rapidly pervious, and have a subhumid to humid soil moisture regime.

The classification of the soils is Dystric Brunisol with the eluviated subgroup predominating in most units. These leached soils have a thin surface horizon of grayish sandy loam. Subsoils are yellowish brown gravelly, loamy, sand that overlies very gravelly material. The complete profile description of an Orthic Dystric Brunisol of the Roaring Association is from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Alix soils are similar to Roaring soils but are generally at lower elevations on more uniform materials and topography. Soils of the Ramsey Association are mainly podzolic.

Roaring soils are used mainly for timber purposes. The Roaring name was first used in the Quesnel area by Mackintosh et al., in 1965 (unpublished manuscript).

Map units

Four map units are recognized - RG, RG-BA, RG-D, and RG-D-B.

RG Roaring (12 697 ha): This map unit has hummocky and ridged terrain. As much as 20% of the soils may be clayey or loamy textured.

RG-BA Roaring-Barrett (8365 ha): The one large delineation of this map unit is in the upper drainage basin of Charleson Creek, northwest of Quesnel. The loamy Orthic Gray Luvisol (Barrett) occupies about 40% of the strongly rolling landscape.

RG-D Roaring-Deserters (21 279 ha): Although there are similarities between this map unit and the one described under the map units of the Deserters Association, here the gravelly, sandy soils predominate in a more strongly rolling and ridged landscape.

RG-D-B Roaring-Deserters-Bednesti (944 ha): The three soil associations appear to make up almost equal proportions of sandy, loamy, and silty soils in this map delineation on Umiti Creek near the community of Cottonwood.

Sheridan Association (SN)

The Sheridan Association consists of coarse-loamy, gravelly, stony glaciofluvial and morainal 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 the few large map units along the southern boundary of the map sheet. The association is dominant over 2.5% of the map area.

The mean annual precipitation is 300-400 mm. The freeze-free period is 30-89 days and there are 780-1309 growing degree-days above 5°C.

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.

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.

Timber on Sheridan soils is now being logged.

In 1965 the Sheridan soils were identified in the Quesnel area. However, the soils have not previously been fully described.

Map units

Two map units, SN and SN-AX, occur in the Quesnel area.

SN Sheridan (6421 ha): The single large map delineation of the unit is in the southwest corner of the survey area. It is relatively inaccessible and contains sloping parts that exceed an elevation of 1200 m.

SN-AX Sheridan-Alix (11 052 ha): The generally subdued topography of the two delineated units, one on each side of the Fraser River, may be a reflection of the high percentage of fluvial materials present (30-40% of Alix soils).

Swift Association (SF)

The Swift Association consists of gravelly, sandy, and coarse loamy soils developed on fluvial materials deposited on terraces along the Swift and upper Cottonwood rivers. Elevations are generally below 900 m. The association predominates in less than 1% of the map area.

The mean annual precipitation is 400-750 mm. The freeze-free period is 50-74 days and there are 1030-1169 growing degree-days above 5°C.

The soils occur at the western boundary of the Quesnel Highland.

The parent materials are similar to those of the Saxton soils. Under a moister environment, Podzols rather than Dystric Brunisols predominate. The soils are rapidly drained, are rapidly pervious, and have a perhumid soil moisture regime.

The dominant soil of the Swift Association is Orthic Humo-Ferric Podzol. Because of the limited extent of this association in the Quesnel area and its similarity to the Ramsey Association, the Swift soil is not described in detail.

Map units

The two delineations of the single map unit SF (Swift) total 5703 ha. The terrain is comprised of level and eroded terraces and floodplain areas. Regosols and eroded soils occupy an estimated 20-40% of the map unit.

Twain Association (TW)

In the Quesnel area, Twain soils are mapped in the vicinity of the Willow River along the northeast boundary of the map sheet. Here they are associated with Dragon soils, which they closely resemble, in the three delineations of the one map unit TW-DN (Twain-Dragon). The map unit predominates in less than 1% of the area. (2770 ha).

The predominant soil is a loamy, moderately well drained Orthic Humo-Ferric Podzol. It occurs on rollng uplands in the subboreal spruce zone at elevations generally somewhat lower than those of the Dragon soils.

A profile is described from Soils of the Nechako-Francois Lake Area (Cotic 1974).

Table 2 Climatic capability classes in interior British Columbia

	Freeze-free period (base o°C) (days)	Growing degree-days (above 5°C)	Moisture deficit or (mm)	Moisture surplus PET ratio
Class 1	90 — 119	1310 — 1504	up to 40	< 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	< 670	> 415	

LAND USE

Canada Land Inventory (CLI) maps show the soil or land capability for the Quesnel area. Land capability for forestry maps are at a scale of 1:125 000 and those for recreation and wildlife (waterfowl and ungulates) are at a scale of 1:250 000. Soil capability maps for agriculture are at a scale of 1:125 000. At these scales the information is suitable for regional planning but is too generalized for more detailed site evaluation.

The important factors and limitations used in the capability classification for agriculture and forestry are given in the descriptive legends of the CLI maps.

No attempt is made in the present report to provide soil interpretations for any sector of natural resources. However, the authors expect that derived and interpretive maps will be available following the publication of this report. A wide range of such maps, including texture groups, drainage, geologic materials,and wetlands, can be produced by Agriculture Canada from original soil information. The following sections on Agriculture and Forestry give brief supplementary information on soil or land capability.

Agriculture

Under the CLI system, climate provides the basic limitations for agriculture. Selected climatic data were collected over the area through a network of short-term stations and related to the few established stations in or near the map area.

In Table 2 the Climatic Division (RAB Tech. Paper No. 1, 1978) defines climatic capability classes in interior British Columbia.

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

Agricultural capability classes are determined first by the climate and then by the degree or intensity of the limitation for crop production. Limitations include low moisture-holding capacity, poor soil structure, stoniness, and adverse topography. A soil having no limitations except a

Table 3 Soil capability for agriculture of the map units in the Quesnel area

Name	Map unit symbol	Climatic capability class 1	2	3	4	5	6	7	Principal subclass limitations (other than climate)
					Fraser Basin				
Alix	AX1			6	6	6			low moisture-holding capacity and stoniness
	AX2		6			6			low moisture-holding capacity and stoniness
	AX-CF			6					low moisture-holding capacity and wetness
	AX-D			6					low moisture-holding capacity and steep topography
Bednesti	B		4	4					a combination of soil limitations
	B(E)		5	5		6			adverse topography
	B-BY			4					a combination of soil limitations
	B-D			5-7					steep slopes, soil limitations
Berman	BN	4	4						a combination of soil limitations
	BN(E)		5-6						adverse topography
	BN-SN		5						a combination of soil limitations and stoniness
Beaverley	BY		4						undesirable structure and low permeability
	BY(E)		5-6	5-6					adverse topography and low permeability
	BY-AX			5					undesirable structure and stoniness
	BY-BN	4							undesirable structure and low permeability
	BY-C		5-7						undesirable structure and stoniness
	BY-D		5-7						undesirable structure and steep slopes
	BY-NC-P	4	4						undesirable structure and low permeability
	BY-P	4							undesirable structure and wetness
	BY-SN			5-6					undesirable structure and stoniness
Cinema	C		5-6						adverse topography, stoniness
	C(E)		6						adverse topography
	C-AX		6						adverse topography, stoniness
	C-K		6						adverse topography
Cuisson	CU	4-5							undesirable structure, salinity
Fraser	F	2-3		4					minor cumulative limitations
	F-S	4-5							adverse topography, low moisture-holding capacity
Gunniza	GU			5-7					adverse topography, stoniness
Kersley	K		2-3						a combination of soil limitations
	K1		1-2						no limitations; minor cumulative limitations
	K(E)		5-6						adverse topography
	K-MG		4-5						low moisture-holding capacity and flooding
	K-CU		4-5						adverse topography, salinity
McGregor	MG		3-5	3-5					wetness and flooding

Narcosli	NC	4						a combination of soil limitations
	NC(E)			5-6				adverse topography
	NC-BY	4						a combination of soil limitations and steep slopes
	NC-C		5-6					a combination of soil limitations and steep slopes
Pineview	P		4-5					soil limitations, wetness, adverse topography
Quesnel	Q	2-3						minor cumulative limitations, adverse topography
	Q(E)	5-6						adverse topography
Saxton	S		3	4				low moisture-holding capacity
	S(E)			5-6				adverse topography
	S4			5				low moisture-holding capacity and wetness
	S-Q-BY			4-5				soil limitations and adverse topography
Soda Creek	SA	3-4						minor cumulative limitations, low moisture-holding capacity

Fraser Plateau

Barrett	BA			6	6-7	6-7		steep slopes, stoniness
	BA4			6				steep slopes, wetness
	BA-AX					6-7		steep slopes, stoniness
Chief	CF		6	6	6	6		wetness
	CF(SP)			6-7	7	7		wetness
	CF-S4			5-6		7		wetness
Deserters	D			7	7	7		steep slopes, stoniness
	D4			7-6		7		stoniness, wetness
	D(E)			6-7				steep slopes
	D-CF			6-7				stoniness, wetness
	D-C			6-7				steep slopes, stoniness
	D4-R				7-6			wetness, stoniness
	D-DO		7	7				adverse topography
	D-DN			7		7	7	adverse topography, stoniness
	D-RG		7-6	7-6				adverse topography, stoniness
Dominion	DO-D4		7					adverse topography, wetness
	DO-DN		7					adverse topography, stoniness
Dragon	DN					7	7	adverse topography, stoniness
Dunkley	DU					7		adverse topography, stoniness
Ormond	OD-BA					7		adverse topography, stoniness

Ramsey	R			7	7			stoniness
	R-CF				7			stoniness, wetness
	R-D		7	7				adverse topography, stoniness
Roaring	RG		7-6	7-6				adverse topography, stoniness
	RG-BA				7	7		adverse topography
	RG-D		7-6					adverse topography, stoniness
	RG-D-B		7-6					adverse topography, stoniness
Sheridan	SN				7-6	7-6		adverse topography, stoniness
	SN-AX	6-7	6-7					stoniness, low moisture-holding capacity
Swift	SF			7-6				adverse topography, stoniness
Twain	TW-DN				7	7		adverse topography

class 4 climate capability could have no better agricultural capability than class 4. Soil capability classes for agriculture indicate an adaptability of a soil to grow a range of crops, but do not represent productivity or suitability.

The CLI soil capability for agriculture map sheets 93 B/NE and 93 G/SE show only the higher capability lands. Soil capability classes 1, 2, 3, and 4 with their subclasses (limitations) were mapped and delineated to provide a basis for the Agriculture Land Reserve in the Cariboo Agriculture Reporting Region. The soil map units of the entire map area are rated for agricultural capability (Table 3).

The highest capability lands of the map area occur along the fluvial benches of the Fraser River between Quesnel and Marguerite. These prime agricultural lands of soil capability classes 1, 2, and 3 include map units belonging to the Kersley, Fraser, Quesnel, and McGregor associations. They comprise about 4% of the land surface.

Approximately 20-25% of the land is limited to soil capability for agricultural class 4. Most of the soils that developed on lacustrine materials and some of the soils that developed on postglacial river terraces are included as map units of the Beaverley, Bednesti, Berman, Cuisson, Narcosli, Fraser, Kersley, McGregor, Pineview, Quesnel, Soda Creek, and Saxton associations.

In some associations climate or other factors such as topography and texture are so severely limiting (classes 5 and 6) that only forage crops or native pasture can be considered. These soil associations are Alix, Cinema, Gunniza, Roaring, and Sheridan. Some map units of other associations are also limited to these classes, namely Beaverley, Bednesti, Berman, Fraser, Cuisson, Kersley, Narcosli, Pineview, and Saxton. Soil capability classes 5 and 6 comprise 35-40% of the area.

An additional one-third of the area is unsuited to any form of agricultural production. The associations included in class 7 are Deserters, Dragon, Ramsey, Swift, and some map units of the Gunniza Association. The soil capability for agriculture classes, climate capability classes, and subclass limitations are given in Table 3.

Forestry

Two published CLI maps on land capability for forestry, Narcosli Creek 93 B/NE and Cottonwood River 93 G/SE, group all soils of the area into one or more of five classes based on inherent ability to grow commercial timber. These maps show, for each map delineation, the land capability classes, the limiting factors, and the tree species indicators.

Table 4 Forest capability and species suitability for the dominant soils in Quesnel area

Soil Name	Capability		Species Suitability[3]		
	classes[1]	subclasses[2]	Lodgepole pine	Engelmann spruce	Douglas fir
Alix	5,4	M	S	NS-LS	LS
Barrett	4,3	M,D,S	S	S	LS
Beaverley	4	D,M	S	LS	S
Bednesti	2,3	M	S	S	LS
Berman	4	M,D	S	LS	S
Chief	7	W	NS	NS	NS
Cinema	4,3	M,D	S	LS	LS
Cuisson	6,7	N,D	NS	NS	NS
Deserters	3,2	D,S	S	S	S
Dominion	3	D,W	S	S	NS
Dragon	4,5	M,R	S	LS	NS
Dunkley	3	D,W	S	S	NS
Fraser	3-4	M,W	S	S-LS	LS
Gunniza	4	M	S	NS	LS
Kersley	4	M	LS	NS	S
McGregor	3	M,W	S	S	NS
Narcosli	4,3	D,M	S	LS	S
Ormond	5,6	R,M	LS	LS	NS
Pineview	3,4	D	S	S	NS
Quesnel	4	M,D	S	S	LS
Ramsey	4,3	M	S	NS	LS
Roaring	4-6	M	S	LS	S
Saxton	4,5	M	S	LS	LS
Sheridan	4,5	M	S	NS	LS
Soda Creek	6	M	LS	NS	LS
Swift	4	M	S	LS	LS
Twain	3,4	S,H	S	S	LS

[1]CAPABILITY CLASSES (cubic metres per hectare per year)

Class 1	7.8+
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	<0.7

[2]CAPABILITY SUBCLASSES

Except for Class 1, all the subclasses indicate the kinds of limitations for each class. The symbols used and the limitations are listed.

Climate

These subclasses are used to denote a significant adverse departure from what is considered to be the median climate of the region, i.e., a limitation as a result of local climate; adverse climate is expressed by the class level.

A - droughty or arid conditions as a result of climate.

H - low temperature, i.e., too cool.

Soil moisture

These subclasses denote that the soil moisture condition is less than optimum for the growth of commercial forests, but they do not include inundation.

M - soil moisture deficiency.

W - excess soil moisture

Permeability and depth of rooting zone

These subclasses denote limitations of soil permeability or physical limitations to rooting depth.

D - physical restrictions to rooting caused by dense or consolidated layers, other than bedrock.

R - restriction of rooting zone by bedrock.

Other soil factors

These subclasses denote factors of the soil that individually or in combinaton adversely affect growth.

I - soils periodically inundated by streams or lakes.

N - excessive levels of toxic elements such as soluble salts.

P - stoniness that affects forest density or growth.

S - a combination of soil factors, none of which affect the class level by themselves but which cumulatively lower the capability class.

[3]SPECIES SUITABILITY

S - suitable

LS - limited suitability

NS - not suitable

Table 4 gives an assessment of the productivity of each dominant soil of the soil associations described and mapped in the Quesnel area. The ratings for each soil are based upon stand volume data taken in a uniform area, representative of the dominant soil identified during the soil survey, or whenever plot data are not available, on observed information about the soil (including subsoil), profile, depth (and moisture relations), and landform. In general, the stands selected for measurement are close to rotation age, (80-100 years), thrifty, fully stocked, and of one species. The mean annual increment (M.A.I.) ranges listed for each class are based on a rotaton age of 100 years.

In Table 4 tree species are rated in three categories - suitable, limited suitability, and not suitable - according to the characteristics of each soil and the silvics of each tree species. Only those tree species of present commercial value occurring or expected to occur on each soil have been considered. It should be noted, however, that black cottonwood can produce more volume per hectare on moderately well to imperfectly drained alluvial material than any of the commercial species considered.

APPENDIX

Descriptions and analyses of the soils

This appendix lists, in alphabetical order, profile descriptions of most of the soils in the Quesnel 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. Descriptions of Chief, Dunkley, and Swift soil associations are not included.

Standard methods of soil analyses were followed in the respective federal or provincial laboratories concerned with the survey projects. Further details are in soil survey reports or may be ascertained by contacting the specific agency.

ALIX SOIL

Location: Lat. 54°08'N Long. 124°08'W NTS: 93K1 Surveyor: IC Agency: BCMA, Kelowna Year of Survey: 1974
Identification: B.C. 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
II C1	28-50	variegated	sandy fine gravel	single grain	loose
II C2	50+	variegated	sandy fine gravel	single grain	loose

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	C:N ratio	Oxalate %		Cation exchange meq/100 g					P1	P2	S	Cu	Zn
					Fe	Al	CEC	Ca	Mg	K	Na	ppm	ppm	ppm	ppm	ppm
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	0.7	0.7	9.2	1.5	0.2	0.1	0.0	115	277	4	14	79
BC	5.0				0.5	0.4	6.0	1.9	0.2	0.1	0.0	146	227	2	20	80
II C1	5.1				0.3	0.2	5.7	2.9	0.5	0.1	0.0	20	51	2	23	43
II C2	5.1						5.8	3.0	0.7	0.2	0.0	9	25	2	24	43

BARRETT SOIL

Location: Lat. 54°17'N Long. 125°44'W NTS: 93F13 Surveyor: IC Agency: BCMA, Kelowna Year of Survey: 1974
Identification: B.C. Soil Survey Report 22

Classification: Orthic Gray Luvisol (1978) Landform and Parent Material: loamy morainal blanket
Drainage: moderately well drained

Slope and Aspect: 18% S Elevation: 1030 m Additional Notes: Mottles are few, fine, faint in ABgj horizon and few, fine, distinct in Btgj horizon. Clay skins are common in Btgj horizon and few in BC horizon. Organic coatings occur in cracks in Cl horizon.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0					
Ael	0-12	light gray (10YR 7/2 d)	gravelly loam	moderate, coarse platy	friable	abundant
Ae2	12-25	light gray (10YR 7/2 d)	gravelly loam	moderate, fine-medium subangular blocky	friable	abundant
ABgj	25-32	light brownish gray (10YR 6.5/2 d)	gravelly loam	moderate, fine-medium subangular blocky	firm	abundant
Btgj	32-50	pale brown to brown (10YR 6/3-5/3 d)	gravelly clay loam	moderate, medium subangular blocky	firm	common
BC	50-85	brown (10YR 5/3 d)	gravelly clay loam	moderate, medium angular blocky	firm	few
Cl	85-	brown (10YR 5/3 d)	gravelly clay loam	pseudo-blocky	very firm	very few

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	C:N ratio	Cation exchange meq/100 g					Particle-size distribution %				Pl	P2	S	Cu	Zn
					CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	ppm	ppm	ppm	ppm	ppm
L-H	3.9	60.0	1.20	53.4	16.0	24.9	5.4	2.2	0.2					58	74	63	8	72
Ael	5.2	0.6	0.04	14.2	9.2	3.8	1.3	0.2	0.1	46	40	14	7	24	67	5	10	70
Ae2	5.1	0.4	0.03	14.2	10.4	4.7	1.7	0.2	0.1					18	118	4	12	51
ABgj	5.0	0.3	0.03	10.6	18.1	9.5	3.6	0.3	0.1					14	130	4	12	56
Btgj	5.1	0.4	0.03	13.0	27.0	14.8	6.0	0.4	0.2	28	38	34	15	9	115	5	30	64
BC	6.0	0.3	0.02	13.8	27.6	16.3	6.7	0.4	0.2	30	40	30	12	3	223	6	32	68
Cl	6.7									32	39	29	12	3	275	4	31	71

BEAVERLEY SOIL

Location: Lat. 52°50'N Long. 122°26'W NTS: 93B16 Surveyor: TML Agency: AC, Vancouver Year of Survey: 1979
Identification: 1572-78

Classification: Orthic Gray Luvisol (1978) Landform and Parent Material: clayey lacustrine blanket
Drainage: Moderately well drained
moderately pervious

Slope and Aspect: 5% N Elevation: 600 m Additional Notes: No free water present, no flood hazard: volcanic bedrock: rooting depth to 70 cm; dominant vegetation: Douglas fir, trembling aspen, white spruce, kinnikinnick, twinflower, Oregon grape.

Site: Slightly mounded, convex upper slope Location: S of Dragon Lake, Lot 959, Dale Lake road

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	3-0	brown (10YR 4/3 m)	silt loam	weak, coarse platy	hard, firm	plentiful, fine, random
Ae	0-8	brown (10YR 4/3 m)	clay loam	strong, medium subangular blocky	very firm	few, fine, random
BA	0-16	dark brown (10YR 3/3 m)	clay	weak, coarse columnar	firm	few, fine, random
Bt	16-44	dark brown (10YR 3/3 m)	silty clay	moderate, medium angular blocky	very firm	very few, fine, random
BC	44-69	dark brown (10YR 3/3 m)	clay	very coarse pseudo-platy and angular	very firm	very few, fine, random
C1	69+					

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Particle size-distribution %				Pl
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	ppm
L-H													
Ae	6.2	1.5	0.11		10.3	3.0	1.1	0.1	7	54	39	5	54
BA													
Bt	5.3	0.6	0.07		17.0	9.8	1.1	0.1	1	24	75	23	22
BC	5.8			27.5	14.9	8.4	0.6	0.5	1	45	54	11	8
C1													

BEDNESTI SOIL

Location: Lat. 54°01'N Long. 122°54'W NTS: 93J2 Surveyor: ABD Agency: BCMA, Kelowna Year of Survey: 1965
Identification: B.C. Soil Survey Report 23

Classification: Podzolic Gray Luvisol (1978) Landform and Parent Material: silty lacustrine blanket
Drainage: moderately well drained

Slope and Aspect: 2% S Elevation: 760 m Additional Notes: Sulfur ranges from 5 to 10 ppm below L-H horizon

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0					abundant
Ae	0-5	light brownish gray (10YR 6/2 d)	silt loam	weak, fine subangular blocky	very friable	abundant
Bf	5-23	light yellowish brown (10YR 6/3 d)	silt loam	weak, fine subangular blocky	very friable	abundant
AB	23-41	light gray (10YR 7/3 d)	silt loam	moderate, medium-coarse subangular blocky	firm	plentiful
Bt	41-66	pale brown (10YR 6/3 d)	silt loam	moderate, medium-coarse subangular blocky	firm	few
BC	66-76	pale brown (10YR 6/3 d)	silt loam	moderate, medium-coarse subangular blocky	firm	few
C1	76-102	pale brown (10YR 6/3 d)	silt loam	coarse pseudo-blocky	friable	
C2	102+	pale brown (10YR 6/3 d)	silt loam		friable	

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Oxalate % Fe	Oxalate % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	Pl ppm
L-H	4.2	34.5	0.83								57
Ae	4.1	1.9	0.09			16.8	2.7	0.4	0.4	0.1	94
Bf	4.7	1.2	0.06	1.0	0.6	13.2	2.5	0.2	0.1	0.1	148
AB	4.8	0.5	0.01			8.1	3.8	0.6	0.2	0.1	21
Bt	4.9	0.4	0.02			13.0	7.3	1.2	0.2	0.1	14
BC	4.9	0.4	0.02			13.2	8.0	1.2	0.2	0.1	13
C1	5.1			0.5	0.3	13.4	8.2	1.4	0.2	0.1	11
C2	5.2					12.2	7.8	1.5	0.2	0.2	10

BERMAN SOIL

Location: Lat. 52°55'00"N Long. 120°30'30"W NTS: 93B15 Surveyor: TML Agency: AC, Vancouver
Year of Survey: 1979 Identification: 1571-79

Classification: Orthic Gray Luvisol (1978) Landform and Parent Material: silty lacustrine blanket
Drainage: moderately well drained
moderately pervious

Slope and Aspect: 5% N Elevation: 750 m Additional Notes: Dominant vegetation: Douglas fir, lodgepole pine, willows, pine grass, Oregon grape, twinflower, mosses. Rooting depth is 63 cm. Free carbonates at 53 cm.

Site: moderately mounded convex upper slope

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-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	53-68	white (10YR 8/2 d)	silty clay loam	weak, coarse pseudo-platy	very friable	very few, fine, horizontal
Cl	68+	brown (10YR 5/3 m)	silt loam	massive	extremely hard, very firm	very few, fine, horizontal

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Particle-size distribution %				Pl
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	ppm
L-F-H													
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
Ck													
Cl													

CINEMA SOIL

Location: Lat. 52°32'30"N Long. 122°23'20"W NTS: 93B9 Surveyor: TML Agency: AC, Vancouver
Year of Survey: 1979 Identification: 1503-79

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 to 72 cm; Alix is a commonly associated soil; many soils on slopes have overlays of gravel silt or clay. Common vegetation includes Douglas fir, trembling aspen, saskatoon, willows, pine grass.

Site: Convex, midslope Location: 4 km on road E from Marguerite

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, slightly sticky	very few, fine, random

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Cation exchange meq/100 g					Particle-size distribution %				Pl
			CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	ppm
L-F-H												
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											

CUISSON SOIL

Location: Lat. 52°36'N Long. 122°31'W NTS: 93B10 Surveyor: TML Agency: AC, Vancouver
Year of Survey: 1979 Identification: 1574-79

Classification: Dark Gray Solod (1978) Landform and Parent Material: loamy lacustrine blanket
Drainage: moderately well drained
slowly permeable

Slope and Aspect: 3% S Elevation: 600 m Additional Notes: Basalt bedrock; salt crystals a) 40 cm. Dominant vegetation: Douglas fir, trembling aspen, rose, Kentucky blue grass, pine grass.

Site: upper slope

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L	1-0					
Ahe	0-12	black (10YR 2/1 m)	very fine sandy loam	weak, fine platy	slightly hard, friable	abundant, fine, random
Ae	12-17	brown (10YR 4/3 m)	silt loam	moderate, coarse platy	slightly hard, firm	plentiful, fine, random
AB	17-19	brown (10YR 4/3 m)	very fine sandy loam	strong, medium subangular blocky	slightly hard, firm	few, fine, random
Bnt	19-34	brown (10YR 4/3 m)	silt loam	strong, coarse prismatic	extremely hard, very firm	few, fine, random
Bt	34-40	brown (10YR 4/3 m)	silty clay	strong, medium-coarse subangular blocky	hard, firm	few, fine, random
Bs	40-46	brown (10YR 4/3 m)	silt loam	moderate, medium subangular blocky	slightly hard, friable	few, fine, random
Cca	46+	dark grayish brown (2.5Y 4/2 m)	silt	moderate, coarse pseudo-platy	very friable	very few, fine, random

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Particle-size distribution %				Electric cond. m S/cm	Pl ppm
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay		
L														
Ahe	5.9	2.8	0.45	17.7	10.1	5.2	0.2	0.3					0.23	6
Ae	5.8	0.8	0.08	9.0	3.8	3.5	0.1	0.6	16	72	12	2	0.20	5
AB														
Bnt	7.2	0.8	0.08						8	58	34	12	1.09	5
Bt	7.9								5	53	42	13	2.57	5
Bs	8.3								4	71	25	5	7.28	7
Cca	8.2												1.09	7

DESERTERS SOIL

Location: Lat. 53°42'N Long. 122°49'W NTS: 93G10 Surveyor: ABD Agency: BCMA, Kelowna
Year of Survey: 1969 Identification: B.C. 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						
Ae	0-2	light gray (10YR 7/2 d)	sandy loam	single grain	loose	abundant
Bm	2-17	brown (10YR 5/3 d)	sandy loam	weak, fine subangular blocky	soft	abundant
AB	17-50	light brownish gray (10YR 6/2 d)	gravelly sandy loam	moderate, medium sub-angular 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	

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Oxalate % Fe	Oxalate % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	Pl ppm
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	0.6	0.3	8.6	1.9	1.1	0.2	0.1	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			0.4	0.3	13.1	8.3	3.2	0.1	0.2	2

DOMINION SOIL

Location: Lat. 54°31'W Long. 122°40'W NTS: 93J10 Surveyor: ABD Agency: BCMA, Kelowna
Year of Survey: 1967 Identification: B.C. Soil Survey Report 23

Classification: Luvisolic Humo-Ferric Podozol Landform and Parent Material: loamy morainal blanket (1978) Drainage: well drained

Slope and Aspect: 10% W Elevation 780 m Additional Notes: Clay films are few in th AB horizon and common in BA and Bt horizons.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0					abundant
Ae	0-7	light gray (10YR 7/2 d)	silt loam	single grain	loose	abundant
Bf1	7-25	pale brown (10YR 6/3.5 d)	silt loam	weak, fine subangular blocky	soft	abundant
Bf2	25-40	pale brown (10YR 6/3 d)	sandy loam	weak, fine-medium subangular blocky	soft	abundant
AB	40-65	grayish brown (2.5Y 5/3 d)	gravelly sandy loam	moderate, medium subangular blocky	slightly hard	plentiful
BA	65-90	dark grayish brown (2.5Y 4.5/2 d)	gravelly loam	moderate, coarse angular blocky	hard	plentiful
Bt	90-115	dark grayish brown (2.5Y 4.5/2 d)	gravelly loam	moderate, coarse angular blocky	hard	few
C	115+	grayish brown (2.5Y 5/2 d)	gravelly loam		hard	

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Particle-size distribution %				P1 ppm	P2 ppm	S ppm	Cu ppm	Zn ppm
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay					
L-H	4.5	32.7	1.01	71.8	34.9	5.9	1.2	0.1					18	27		12	99
Ae	3.9	0.9	0.06	9.8	1.5	0.3	0.1	0.0	32	60	8		23	43	10	6	62
Bf1	4.6	0.6	0.05	7.6	1.5	0.2	0.1	0.0					18	74	8	10	58
Bf2	4.6	0.5	0.04	7.4	1.4	0.2	0.1	0.0					15	75	11	13	47
AB	4.6			6.3	1.7	0.4	0.1	0.1						69	8	16	45
BA	4.4			12.2	5.5	1.7	0.2	0.0	37	40	23	8		58	11	32	60
Bt	4.6			14.1	7.4	2.1	0.1	0.1						96	9	29	
C	5.7			13.8	10.0	0.2	0.1	0.1	35	41	24	6			6		59

DRAGON SOIL

Location: Lat. 54°00'N Long. 124°50'W NTS: 93J15 Surveyor: IC Agency: BCMA, Kelowna Year of Survey: 1974
Identification: B.C. Soil Survey Report 22

Classification: Orthic Humo-Ferric Podzol Landform and Parent Material: acidic bedrock Drainage: rapidly drained
1978

Slope and Aspect: 20% SE Elevation: 1230 m Additional Notes: Described in Report 22 of the B.C. Soil Survey. 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	lose	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+					

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	C:N ratio	Oxalate % Fe	Oxalate % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	P1 ppm	P2 ppm	S ppm	Cu ppm	Zn ppm
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		1.7			0.9	0.6	14.1	1.4	0.2	0.2	0.0	51	99	9	8	48
Bf2		1.5	0.1	23.3	0.9	0.9	13.5	1.4	0.2	0.1	0.0	44	93	9	13	52
BC					0.5	0.5	7.8	0.7	0.1	0.1	0.0	30	70	6	16	26
C					0.4	0.3						28	62		17	25

FRASER SOIL

Location: Lat. 54°04'N Long. 122°24'W NTS: 93J1 Surveyor: ABD Agency: BCMA, Kelowna Year of Survey: 1965
Identification: B.C. Soil Survey Report 23

Classification: Orthic Gray Luvisol (1978) Landform and Parent Material: silty fluvial, terraced
Drainage: moderately well drained

Slope and Aspect: simple Elevation: 585 m Additional Notes: Rooting depth is 85 cm. Mottles in BCgj horizon are few, faint; in Cg horizon there are many prominent mottles; colors are 10YR 3.5/4. Clay films in Bt1 and Bt2 horizons are many, in Bt3 they are common.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	8-0					abundant
Ae	0-13	light gray (10YR 7/2 d)	silt loam	weak, fine-medium platy	very friable	abundant
Bt1	13-23	light brownish gray (10YR 6/2.5 d)	silt loam	moderate, coarse angular blocky	firm	abundant
AB	23-38	pale brown (10YR 5.5/3 d)	silt loam	moderate, medium-coarse subangular blocky	friable	plentiful
Bt2	38-53	brown (10YR 5.5/3 d)	silty clay loam	strong, coarse angular blocky	firm	few
Bt3	53-69	brown (10YR 5.5/3 d)	silty clay loam	strong, coarse angular blocky	firm	few
BCgj	69-84	pale brown (10YR 6/3.5 d)	silty clay	medium-coarse subangular blocky	firm	few
Cg	69-109	pale brown (10YR 6/3.5 d)	silty clay loam	massive	firm	
II Cg	109+		sand	single grain	loose	

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Pl ppm
				CEC	Ca	Mg	K	Na	
L-H	4.7	52.1	1.35						70
Ae	4.4	2.4	.13	24.2	7.0	2.1	0.2	0.1	67
Bt1	4.8	1.7	.10	20.4	7.5	1.8	0.2	0.1	11
AB	5.1	.5	.03	8.5	4.0	1.2	0.1	0.1	4
Bt2	5.5	.5	.03	14.3	7.8	2.8	0.1	0.1	3
Bt3	5.6	.6	.04	17.4	9.2	3.8	0.2	0.2	3
BCgj	5.5	.6	.05	19.5	9.9	4.3	0.2	0.2	2
Cg	5.5			16.2	8.1	4.2	0.1	0.2	
II Cg	5.3			5.4	2.7	0.9	0.2	0.2	

GUNNIZA SOIL

Location: Lat. 54°11'N Long. 122°38'W NTS: 93J2 Surveyor: ABD Agency: BCMA, Kelowna
Year of Survey: 1965 Identification: B.C. Soil Survey Report 23

Classification: Orthic Humo-Ferric Podzol (1978) Landform and Parent Material: gravelly lacustrine veneer over morainal material
Drainage: moderately well drained

Slope and Aspect: simple Elevation: 705 m

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0	light gray (10YR 7/1 d)	gravelly loamy sand	weak, fine-medium granular	soft	abundant
Ae	0-15	light yellowish brown (10YR 5/4 d)	gravelly loamy sand	weak, fine-medium granular	soft	abundant
Bf	15-28		gravelly sand	single grain	loose	plentiful
II C1	28-91		gravelly sand	single grain	loose	few
II C2	91-152					

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Oxalate % Fe	Oxalate % Al	Pyrophos. % Fe	Pyrophos. % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	Pl ppm	S ppm
L-H	5.2	47.3	1.10										36	8
Ae	5.2	0.4	0.02					4.9	2.1	0.6	0.1	0.0	9	8
Bf	4.9	0.7	0.03	0.7	0.4	0.3	0.28	8.9	1.4	0.8	0.2	0.0	200	8
II C1	5.0			1.3	0.7			5.9	1.1	0.3	0.1	0.0	157	8
II C2	5.2							5.0	0.8	0.2	0.1	0.0	22	8

KERSLEY SOIL

Location: Lat. 52°48'00"N Long. 122°26'30"W NTS: 93B16 Surveyor: TML Agency: AC, Vancouver
Year of Survey: 1979 Identification: 1573-79

Classification: Eluviated Eutric Brunisol (1978) Landform and Parent Material: sandy fluvial, terraced
Drainage: well drained
moderately permeable

Slope and Aspect: 5% W Elevation: 550 m Additional Notes: Rooting depth to 60 cm. Common vegetation: Douglas fir, trembling aspen, willows, bunchberry, thimbleberry, mosses.
slightly mounded, convex upper slope

Location: on old road about 1.5 km W of Kersley.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L	4-3					
F-H	3-0					abundant, fine, horizontal
Aej	0-18	brown (10YR 4/3 d)	sandy loam	moderate, coarse subangular blocky	slightly hard, slightly sticky	plentiful, fine, horizontal
Bm	18-50	brown (10YR 4/3 d)	loamy sand	moderate, medium-coarse subangular blocky	very friable, non sticky	few, medium, random
IICB	50+	dark brown (10YR 3/3 m)	sand	single grain	loose	
(Btj at 24 cm)		brown (10YR 4/3 m)	sandy loam	moderate, angular block	hard, plastic	

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Pl ppm
				CEC	Ca	Mg	K	Na	
L									
F-H									
Aej	4.9	0.6	0.0		5.5	1.3	0.2	0.1	33
Bm	5.9	0.3	0.0		5.2	1.7	0.3	0.0	29
IICB	6.2			6.3	3.7	1.9	0.1	0.0	12
(Btj)	6.1	0.3	0.0		5.3	2.6	0.2	0.1	15

McGREGOR SOIL

Location: Lat. 53°57'N Long. 122°41'W NTS: 93G15 Surveyor: ABD Agency: BCMA, Kelowna
Year of Survey: 1968 Identification: B.C. Soil Survey Report 23

Classification: Gleyed Regosol (1978) Landform and Parent Material: silty fluvial, terraced Drainage: imperfectly drained

Slope and Aspect: simple Elevation: 570 m Additional Notes: Mottles in F-Hb2 horizon are few, distinct; in IIICk are few, faint; and in VCgjk are few, distinct; colors are 10YR 4/4-5/4. Effervescence is weak to very weak throughout the profile.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0					abundant
Ck	0-8	dark grayish brown (2.5Y 4.5/2 m)	fine sandy loam	weak, fine pseudo-platy	very friable	abundant
F-Hb1	8-10	very dark brown (10YR 2/2 m)				
IICk	10-13	dark grayish brown (2.5Y 4.5/2 m)	fine sandy loam	weak, fine pseudo-platy	very friable	abundant
F-Hb2	13-15	very dark brown (10YR 2/2 m)				
IIICk	23-43	dark grayish brown (2.5Y 4.5/2 m)	silt loam	weak, fine pseudo-blocky	friable	abundant
IVCk	43-51	dark grayish brown (2.5Y 4/2 m)	fine sand	single grain	loose	few
VCgjk	51-64	grayish brown (2.5Y 5/3 m)	very fine sandy loam	weak, medium pseudo-platy	friable	few

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %
L-H			
Ck	7.6	1.1	0.80
F-Hb1	7.6	6.2	0.36
IICk	7.6		
F-Hb2	7.7	1.2	0.11
IIICk		0.5	0.05
IVCk	7.7	0.2	0.03
VCgjk	7.7	0.3	0.04

NARCOSLI SOIL

Location: Lat. 52°36'N Long. 122°32'W NTS: 93B10 Surveyor: TML Agency: AC, Vancouver Year of Survey: 1979
on forestry access road to Tzenzaicut Lake
Identification: 1577-79

Classification: Orthic Gray Luvisol (1978) Landform and Parent Material: clayey lacustrine blanket
Drainage: moderately well drained
moderately permeable

Slope and Aspect: 15% W Elevation: 720 m Additional Notes: Rooting is effective to the carbonate layer at 75 cm. Bedrock is basalt. The IIIC horizon is morainal material. Dominant vegetation is Douglas fir, white birch, rose, blue grass, pine grass, mosses.
straight upper slope

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F	2-0					
Ah	0-4	very dark grayish brown (10YR 3/2 d)	sandy loam	medium, coarse granular	soft, very plastic	plentiful, fine, random
Ae	4-19	brown (10YR 5/3 d)	very fine sandy loam	strong, coarse angular blocky	hard, very firm	very few, medium, random
BA	19-26	dark brown (10YR 4/3 d)	silty clay loam	strong, medium sub-angular blocky	hard, sticky	few, medium, random
Bt	26-51	dark brown (10YR 3/3 d)	clay	weak, medium prismatic to strong blocky	hard, very sticky	few, medium, random
CB	51-75	dark brown (10YR 4/3 d)	clay	moderate, medium sub-angular blocky	slightly hard, firm	few, medium, random
IICca	75-100	pale brown (10YR 6/3 d)	silty clay	moderate, fine-medium pseudo-platy	slightly hard, friable	very few, fine random
IIIC	100+					

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Particle-size distribution %				Pl
				CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	ppm
LF													
Ah	5.6	13.8	0.88		37.9	9.5	0.4	0.1					11
Ae	5.1	1.1	0.09		6.9	4.3	0.1	0.2	17	68	15	5	3
BA	5.3	1.0	0.09		9.6	7.7	0.2	0.3					3
Bt	6.2				14.9	12.9	0.3	0.7	12	32	56	22	8
CB	6.8			27.5	11.1	12.8	0.3	1.7	21	29	50	13	4
IICca	7.9								1	47	52	7	4
IIIC	8.0												

ORMOND SOIL

Location: Lat. 54°08'N Long. 124°38'W NTS: 93K2 Surveyor: IC Agency: BCMA, Kelowna
Year of Survey: 1974 Identificaion: B.C. Soil Survey Report 22

Classification: Orthic Dystric Brunisol (lithic) (1978) Landform and Parent Material: shallow loamy colluvium overlying basic bedrock Drainage: rapidly drained

Slope and Aspect: 14% NE Elevation: 930 m Additional Notes: Soil description is from Report No. 22 of the B.C. Soil Survey. Bedrock is basalt.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0					
Bm1	0-7	brown (10YR 5/3 d)	gravelly sandy loam	weak-moderate, subangular blocky	very friable	abundant
Bm2	7-17	brown (10YR 5/3 d)	gravelly loam	weak-moderate, subangular blocky	very friable	abundant
Bm3	17-27	brown (10YR 5/3 d)	gravelly loam	weak, fine subangular blocky	slightly hard	abundant
C	27-45	pale brown (10YR 6.5 5/2 d)	gravelly loam	pseudo-platy	hard	common
R	45+					

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	C:N ratio	Oxalate % Fe	Oxalate % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	P1 ppm	P2 ppm	S ppm	Cu ppm	Zn ppm
L-H	4.2	7.2	1.6	19.6			44.7	15.3	3.8	1.4	0.1	10	187		14	64
Bm1	4.8	9.2	0.9	11.1	0.8	0.9	17.9	3.2	0.7	0.6	0.0	88	150	7	14	9
Bm2	4.8	2.6	0.3	11.6	0.8	0.9	16.6	2.2	0.6	0.2	0.0	104	194	5	15	71
Bm3	4.7	1.7	0.2	11.0	0.7	0.7	16.5	3.0	1.5	0.2	0.0	119	242	9	16	64
C	4.9	1.0	0.1	8.5	0.6	0.5	12.6	3.8	2.3	0.2	0.1	54	159	8	12	45

PINEVIEW SOIL

Location: Lat: 53°55'N Long. 123°46'W NTS: 93G13 Surveyor: IC Agency: BCMA, Kelowna
Year of Survey: 1974 Identification: B.C. Soil Survey Report 22

Classification: Gleyed Gray Luvisol (1978) Landform and Parent Material: clayey lacustrine blanket
Drainage: imperfectly drained

Slope and Aspect: depression Elevation: 815 m Additional Notes: Mottles in Btgj horizon are few, distinct; in Btg horizon mottles are common, distinct; in BCgj horizon mottles are few, common, distinct; colors are 7.5YR 4/4 m. Many clay flows occur in Btgj and Btg horizons.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
F	6-2					
H	2-0					
Ae	0-10	brown (10YR 4/3 m)	silty clay	moderate, coarse platy	firm	abundant
AB	10-17	light brownish gray (10YR 6/2 m)	clay	moderate, coarse subangular blocky	firm	common
Btgj	17-35	reddish gray (5YR 5/2 m)	heavy clay	strong, coarse - very coarse prismatic	very firm	few
Btg	35-50	dark brown (7.5YR 4/4 m)	heavy clay	moderate, medium-coarse angular blocky	firm	few
BCgj	50-65	light brownish gray (10YR 6/2 m)	clay	moderate, medium-coarse angular blocky	firm	few
C	65+	brown (7.5YR 5/2 m)	clay	pseudo-platy	firm	few

PHYSICAL AND CHEMICAL 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
F	4.8	62.0	1.49	45.8	129.4	23.7	8.9	1.9	0.2				
H	4.8	58.2	1.63	40.1	139.7	29.9	13.8	3.3	0.4				
Ae	5.3	1.4	0.11	14.9	18.3	6.9	4.5	0.5	0.1	4	50	46	4
AB	5.5	0.7	0.07	11.2	15.9	6.2	5.2	0.7	0.1				
Btgj	6.1	0.6	0.08	10.4	28.8	10.7	13.3	0.7	0.4	2	30	68	20
Btg	6.6	0.5	0.06	9.9	28.3	9.6	12.9	0.6	0.5				
BCgj	7.0									0	38	62	13
C	7.5												

QUESNEL SOIL

Location: Lat. 53°25'30"N Long. 122°38'45"W NTS: 93G7 Surveyor: TML Agency: AC, Vancouver
W of Hixon at end of Thorely Rd. Lot 3223
Year of Survey: 1979 Identification: 1575-79

Classification: Brunisolic Gray Luvisol (1978) Landform and Parent Material: silty fluvial, terraced
Drainage: well drained, moderately pervious

Slope and Aspect: 3% S Elevation: 555 m Additional Notes: Flood hazard is rare. Dominant vegetation (in adjoining forest): white spruce, trembling aspen, kinnikinnick, willows, bunchberry, twinflower.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
Ap	0-5	dark brown (10YR 3/3 m)	very fine sandy loam	moderate, fine cloddy	slightly hard, plastic	plentiful, fine random
Bm	5-13	dark brown (10YR 3/3 m)	very fine sandy loam	moderate, medium subangular blocky	hard, very friable	few, fine, random
AB	13-30	brown (10YR 4/3 m)	very fine sandy loam	weak, very coarse platy	very hard, friable	few, fine, random
Bt	30-50	brown (10YR 4/3 m)	silty clay loam	weak, medium columnar	firm, sticky	few, fine, random
BC	50-60	brown (10YR 4/3 m)	silt loam	moderate, medium angular blocky	friable, slightly sticky	few, fine, random
C	60+	brown (10YR 4/3 m)	silt loam	massive		

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Oxalate % Fe	Oxalate % Al	Pyrophos. % Fe	Pyrophos. % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	Particle-size distribution % Sand	Silt	Total clay	Fine clay	Pl ppm
Ap																	
Bm	5.0	1.7	0.10	0.5	0.3	0.3	0.2		7.1	1.0	0.1	0.1					126
AB																	
Bt	5.2								12.7	5.2	0.3	0.1	1	64	35	12	18
BC																	
C	5.7							20.3	10.8	5.4	0.2	0.1	8	66	26	9	8

RAMSEY SOIL

Location: Lat. 54°14'N Long. 125°28'W NTS: 93K3 Surveyor: IC Agency: BCMA, Kelowna
Year of Survey: 1974 Identification: B.C. Soil Survey Report 22

Classification: Orthic-Humo-Ferric Podzol (1978) Landform and Parent Material: gravelly glaciofluvial
Drainage: rapidly drained

Slope and Aspect: 9% S Elevation: 1230 m

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	5-0					
Ae	0-10	light brownish gray (10YR 6/2 d)	gravelly loamy sand	moderate, medium granular	soft	abundant
Bhf	10-20	strong brown (7.5YR 5/6 d)	gravelly loamy sand	moderate, medium granular	soft	abundant
Bf	20-40	yellowish brown (10YR 5/6 d)	gravelly sand	weak, medium granular	loose	abundant
IIC	40+	variegated	sandy gravel	single grain	loose	common to few

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	C:N ratio	Cation exchange meq/100 g					P1	P2	S	Cu	Zn
					CEC	Ca	Mg	K	Na	ppm	ppm	ppm	ppm	ppm
L-H	4.8	53.0	1.6	37.5	92.9	37.5	5.3	1.6	0.1	34	54	17	9	152
Ae	4.3	1.4	0.0	28.6	10.9	2.4	0.6	0.1	0.1	27	50	1	6	31
Bhf	4.4	2.8	0.0	61.4	24.8	0.3	0.2	0.2	0.1	158	230	12	16	60
Bf	4.8	0.8	0.0	23.0	8.4	0.5	0.1	0.1	0.1	64	139	3	15	55
IIC	5.2		0.0		3.8	0.7	0.1	0.1	0.0	21	388	1	14	38

ROARING SOIL

Location: Lat. 54°21'N Long. 124°17'W NTS: 93K1 Surveyor: IC Agency: BCMA, Kelowna
Year of Survey: 1974 Identification: B.C. Soil Survey Report 22

Classification: Orthic Dystric Brunisol (1978) Landform and Parent Material: gravelly glaciofluvial, esker
Drainage: rapidly drained

Slope and Aspect: 25% S Elevation: 830 m

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	2-0					
Ah	0-2	dark grayish brown (10YR 4/2 d)	gravelly loamy sand	weak, medium granular	soft	abundant
Bm	2-10	dark brown (10YR 3/3 d)	gravelly loamy sand	weak, fine subangular blocky	soft	abundant
C1	10-35	variegated	gravelly sand	single grain	loose	abundant
C2	35+	variegated	gravelly sand	single grain	loose	abundant

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	C:N ratio	Cation exchange meq/100 g					P1	P2	S	Cu	Zn
					CEC	Ca	Mg	K	Na	ppm	ppm	ppm	ppm	ppm
L-H	5.4	36.0	3.1	30.2	78.0	56.4	7.2	3.4	0.1	69	135		15	179
Ah	5.5	2.6	1.6	17.5	14.5	8.2	1.4	1.3	0.0	112	574	5	13	137
Bm	5.1	1.3	0.1	13.6	10.6	4.4	0.5	0.6	0.0	155	500	9	14	129
C1	5.9				9.1	4.4	0.5	0.4	0.0	59	288	1	14	71
C2	5.8				7.1	3.7	0.6	0.4	0.0	23	48	1	18	59

SAXTON SOIL

Location: Lat. 53°50'N Long. 122°45'W NTS: 93G15 Surveyor: ABD Agency: BCMA, Kelowna
Year of Survey: 1965 Identification: B.C. Soil Survey Report 23

Classification: Eluviated Dystric Brunisol Landform and Parent Material: sandy fluvial, terraced
Drainage: rapidly drained

Slope and Aspect: simple Elevation: 600 m Additional Notes: Sulfur averages 5-10 ppm in surface horizons and 5 ppm in subsoil.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-H	2-0					abundant
Ae	0-2	light brownish gray (10YR 6/2 m)	loamy sand	single grain	soft	abundant
Bm1	2-15	dark yellowish brown (10YR 3/4 m)	loamy sand		soft	abundant
Bm2	15-33	dark brown (10YR 3.5/3m	loamy sand	very weak, fine subangular blocky	loose	plentiful
BC	33-46	brown (10YR 4/3 m)	sand	single grain	loose	few
C1	46-90		sand	single grain	loose	few
C2	90+		sand	single grain	loose	

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Oxalate % Fe	Oxalate % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	Pl ppm
L-H	4.3	29.0	0.65								73
Ae											125
Bm1	5.1	1.1	0.03	0.9	0.8	8.5	1.9	0.2	0.3	0.1	99
Bm2	5.3	0.4	0.02	1.0	0.9	6.0	1.5	0.2	0.3	0.1	48
BC	5.4					5.6	1.8	0.4	0.2	0.1	17
C1	5.5			0.8	0.4	5.0	2.1	0.3	0.3	0.1	7
C2						5.1	2.7	0.4	0.3	0.1	8

SHERIDAN SOIL

Location: Lat. 52°31'N Long. 122°44'W NTS: 93B10 Surveyor: TML Agency: AC, Vancouver
Year of Survey: 1979 Identification: 1552-79

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 Additional Notes: Some common plants are lodgepole pine, white spruce, willows, blueberries, bunchberry, bedstraw, mosses.
moderately mounded, straight

PROFILE DESCRIPTION

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

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Cation exchange meq/100 g					Particle-size distribution %				Pl
			CEC	Ca	Mg	K	Na	Sand	Silt	Total clay	Fine clay	ppm
LF												
Ael	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

SODA CREEK SOIL

Location: Lat. 53°31'N Long. 122°27'W NTS: 93B9 Surveyor: TML Agency: AC, Vancouver Year of Survey: 1979
Identification: 1569-79

Classification: Orthic Dark Gray (1978) Landform and Parent Material: sandy fluvial, terraced Drainage: rapidly drained rapidly permeable

Slope and Aspect: 2% N slight mounded, concave Elevation: 450 m Additional Notes: No flood hazard; effective rooting to 70 cm; moderate effervescence in Ck, Cl, and C2 horizons. Dominant vegetation: Douglas fir, juniper fringed sage, saskatoon, grasses

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
L-F	1-0					
Ahe	0-10	very dark grayish brown (10YR 3/2 d)	very fine sandy loam	weak, medium platy	hard	few, fine, horizontal
Bm	10-16	brown (10YR 5/3 d)	very fine sandy loam	strong, medium subangular blocky	slightly hard	few, medium, oblique
BC	16-22	brown (10YR 5/3 d)	fine sandy loam	moderate, medium subangular blocky	slightly hard	few, medium, oblique
Ck	22-32	brown (10YR 5/3 d)	loamy fine sand	weak, coarse angular blocky	soft	very few, medium, oblique
Cl	32-70	brown (10YR 5/3 d)	loamy fine sand	massive	soft	very few, medium, oblique
C2	70	dark grayish brown (2.5YR 4/2 d)	loamy fine sand	single grain	loose	none

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	Cation exchange meq/100 g					Pl ppm
				CEC	Ca	Mg	K	Na	
LF									
Ahe	6.1	5.6	0.41	27.0	18.3	3.9	0.7	0.0	19
Bm	6.1	1.8	0.17	18.0	12.8	3.1	0.2	0.1	5
Bc	6.7	0.9	0.09	14.9	10.7	2.8	0.1	0.2	6
Ck	7.8								6
Cl	7.8								
C2	7.8								

TWAIN SOIL

Location: Lat. 54°16'N Long. 124°29'W NTS: 93K1 Surveyor: IC Agency: BCMA Kelowna Year of Survey: 1974
Identification: Soil Survey Report 22

Classification: Luvisolic Humo-Ferric Podzol (1978) Landform and Parent Material: loamy morainal
Drainage: well drained

Slope and Aspect: 15% NE Elevation: 1130 m Additional Notes: Clay skins are common in Bt1; there are many in Bt2 and few in BC horizon.

PROFILE DESCRIPTION

Horizon	Depth cm	Color dry (d) moist (m)	Texture	Structure	Consistence	Roots
LFH	8-0					abundant
Ae	0-5	light brownish gray (10YR 6/2 d)	sandy loam	moderate-strong, medium granular	soft	abundant
Bf1	5-17	yellowish brown (10YR 5/4 d)	silt loam	moderate-strong, medium granular	soft	abundant
Bf2	17-30	pale brown (10YR 6/3.5 d)	silt loam	moderate, fine-medium subangular blocky	soft	common
AB	30-47	light gray (10YR 7/2 d)	silt loam	strong, fine-medium subangular blocky	friable	common
Bt1	47-70	light gray (10YR 7/2.5 d)	gravelly silt loam	strong, medium angular blocky	firm	few
Bt2	70-90	light gray (10YR 7/2.5 d)	gravelly silty clay loam	strong, medium angular blocky	firm	few
BC	90-105	light gray (10YR 7/2 d)	gravelly loam	pseudo-platy	firm	few
C1	105+	light brownish gray (10YR 6/2 d)	gravelly loam	pseudo-platy	friable	

PHYSICAL AND CHEMICAL DATA

Horizon	pH in $CaCl_2$	Organic C %	Total N %	C:N ratio	Oxalate % Fe	Oxalate % Al	Cation exchange meq/100 g CEC	Ca	Mg	K	Na	Particle-size distribution % Sand	Silt	Total clay	Fine clay	P1 ppm	P2 ppm	S ppm	Cu ppm	Zn ppm
LFH	3.7	55.0	1.3	50.0			82	11.5	3.7	1.9	0.1					44	61	31	4	52
Ae	4.6	1.1	0.1	17.3			12.1	5.6	0.8	0.3	0.1					82	147		5	41
Bf1	5.1	1.3	0.1	16.0	0.9	1.2	14.8	2.6	0.6	0.3	0.1	27	57	16		126	288	0	11	113
Bf2	5.0	1.2	0.1	10.8	0.6	0.9	10.2	1.3	0.5	0.3	0.1					45	106	2	12	101
AB	4.8	0.2	0.0	8.5			13.0	6.6	2.4	0.3	0.1	17	64	19	4	15	185		22	58
Bt1	5.3						12.8	8.4	3.0	0.3	0.1	20	58	22	8	7	279		25	58
Bt2	5.6						14.6	10.2	3.7	0.3	0.2	19	52	29	15	4	337		28	65
BC	5.7						11.8	8.3	3.1	0.2	0.1					4	284		20	53
C1	5.8				0.2	0.1	7.6	4.7	1.8	0.2	0.1					4	176		13	46

DERIVED AND INTERPRETIVE MAPS

Agriculture Canada is able to produce maps based on the soil information. These may be either interpretive maps like the soil capability for agriculture, or they may be derived from the original soil information, such as maps of texture, slope, or drainage. They can be made because the original boundaries and map unit symbols are stored in a computer as part of the Canada Soil Information System (CanSIS).

Soil maps are drafted by the Cartography Section in the Land Resource Research Institute of Agriculture Canada, Ottawa. As part of the procedure, map unit symbols and the location of map unit boundaries are recorded in a computer. The soil map is therefore stored in its color printed form, or as a black and white printout from the computer. In conjunction with the computer map there is also a list of all the map unit symbols and the area they cover. This list is called the "map index linkage." Therefore, Agriculture Canada has the means to list, by these symbols, all the map units of a soil map, and to reproduce the map itself as lines and symbols on a plain transparent sheet of paper. This provides the basis for the production of additional types of derived or interpretive maps as the need arises.

It is possible that a map showing only the different types of geological materials is required. The procedure involves replacing the original map unit symbol by a new symbol that indicates the type of geological material. The same boundaries are retained, with the exception of those that have the same new symbols on either side. In this case the boundary is deleted. No new boundaries are added.

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