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Soils of the Prince George-McLeod Lake Area

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SOILS OF THE PRINCE GEORGE-McLEOD LAKE AREA

Report No. 23
British Columbia Soil Survey

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INTRODUCTION

A reconnaissance soil survey of the Prince George - McLeod Lake map area was started in the Special Sales Area in 1965. Its primary purpose was to provide basic soils information for determining the Canada Land Inventory soil capability for agriculture and forestry ratings within the Special Sales Area.

With the expansion of the Canada Land Inventory into Central British Columbia in 1965, subsequent soil surveys were conducted in the western three-quarters of the map area (93G/10-15 and 93J/2-7) from 1966 to 1968. Finally ir 1972, with the extension of the Canada Land Inventory to the east, the soil survey was completed in the eastern quarter of the map area (93G/9, 16 and 93J/1, 8). The total map area is 3.6 million acres, or about 5,650 square miles.

The majority of the report was prepared shortly after the completion of the field survey, hence Imperial units of measurement and the 1970 System of Soil Classification were used. These units have not been converted to the metric system nor has the soil classification been updated because to do so would have further delayed publication and also would not appreciably improve the value of most information in the report.

This report, with the enclosed 1:100 000 scale soil maps, provides information pertaining to the soils, landforms, climate, and vegetation of 93G north half and 93J south half, with each of the 51 soil associations described in detail. A variety of soil interpretations for agriculture, engineering, forestry and recreational uses are also presented. Together they will aid land managers and planners in decisions involving use of the land resource.

Soil capability for agriculture and forestry maps have also been prepared for the map area. These published maps are at a scale of 1:125 000 - manuscript (working) copies at 1:50 000 scale are also available.

ACKNOWLEDGEMENTS

The soil survey of the Prince George - McLeod Lake area was conducted by the Soils Branch, British Columbia Department of Agriculture during the period from the mid-1960's to the mid-1970's. Field mapping assistance was provided by I. Cotic, J. Jungen, J. Belsham and G. Young.

Chemical and physical soil analyses and engineering test data were determined in the Soils Branch laboratory under the supervision of V.E. Osborne.

The manuscript soil and land capability for agriculture and forestry maps were initially compiled in the Soils Branch drafting section by S. Bertolami, F. Waterman and J. Naito. The published 1:100 000 scale soil maps accompanying this report were prepared by the Thematic Mapping Unit, Surveys and Resource Mapping Branch, B.C. Ministry of Environment and Parks.

G. Cheeseman, Climatology Section, Resource Analysis Branch, B.C. Ministry of Environment compiled and contributed the climate portion of the report. Vegetation and ecology were studied and described by W. Arlidge, Research Branch, British Columbia Forest Service, and J. van Barneveld prepared the vegetation section. The section on forestry interpretations was prepared by R. Kowall, R.P.F.

Special acknowledgement is due to P.N. Sprout, former Head, Soils Branch for his positive direction, advice and support during the field work. G.D. Hope provided valuable advice and assistance in the preparation of the manuscript while H.A. Luttmerding provided final technical and literary editing and guided the report and maps through the publication process.

HOW TO USE THE SOIL MAPS AND REPORT

The descriptions of the soils, the environments in which they occur, and their capability or suitability (or limitations) for specific uses are presented in this report. Copies of the 1:100 000 scale soil maps are enclosed. They should be used in combination with the report at all times.

The soil maps indicate the extent and distribution of the various kinds of soil and indentifies the soils by means of symbols. The map legend relates these symbols to the various soils, which are described in more detail in the report.

The soil mapping is at a reconnaissance level and is intended to be used for overview planning purposes and for general management decisions. Detailed, on-site applications will require further inspection to confirm the exact soils present. The definitions of the soil associations are objective and will facilitate more detailed investigations.

General information about the map area is in Part I of the report. Detailed soil association descriptions are contained in Part II, and data on the suitability (or limitations) of the soils for specific use is presented in Part III.

Detailed soil profile descriptions and laboratory data are not included in this report, but are stored in the British Columbia Soil Information System (BCSIS) and are available from: Surveys and Resource Mapping Branch, Ministry of Environment and Parks, Parliament Buildings, Victoria, British Columbia, V8V 1X5.

Copies of the maps and reports are available from: MAPS-BC, Surveys and Resource Mapping Branch, Ministry of Environment and Parks, Parliament Buildings, Victoria, British Columbia, V8V 1X5.

PART I

GENERAL DESCRIPTION OF THE AREA

LOCATION AND EXTENT

The Prince George - McLeod Lake map area (Figure 1) is located in central British Columbia. It lies between 53° 30' and 54° 30' north latitude and is respectively bounded on the east and west by 122° 00' and 124° 00' west longitude, The map area, extending about 80 miles from east to west and 70 miles from north to south, encompasses approximately 5,650 square miles (3,616,000 acres).

Figure 1. Location of the Prince George - McLeod Lake Map Area

HISTORY AND DEVELOPMENT

Population and Facilities

Prince George, the third largest city in British Columbia (1976 Census - 59,929 persons), is located in the east-central part of the map area. The city experienced a rapid increase in population and expansion in the 1960's due mainly to increased activity in the forest industry.

The village of Vanderhoof (1976 Census - 2,082 persons) is located near the west-central boundary of the map area. Several small rural communities are scattered in the eastern half of the map area with only a few in the west central part. A large portion of the map area is unpopulated, but is partially accessible along a large number of forestry roads.

Prince George is strategically located in central British Columbia and serves as a distribution and service centre for this part of the province. The city has all the major facilities and conveniences that are available in any thriving city. Vanderhoof has most of the basic necessities provided in Prince George, but on a considerably reduced scale.

Services and Transportation

Highway 16 provides ready access west to Prince Rupert and east to Edmonton. Highway 97 is the major road to the Peace River area and to the southern interior. Secondary and logging roads of variable quality radiate from the two major highways to various parts of the map area.

Rail freight and passenger service to the east, west and south is available from Prince George. A branch line also brings coal from the north-east, on its way to the port at Prince Rupert. The large airport provides scheduled flights to and from many locations. Smaller airline and helicopter companies, based in Prince George, serve the general area. Several trucking firms and major bus companies provide daily service to and from Prince George.

Most of the settled parts of the map area have electricity and telephone service. Natural gas is available in Prince George and Vanderhoof.

General Economy

The economy is mainly based on the forest industry which employs the largest proportion of the labour force. Lumbering has been the major enterprise since the World War II and large amounts of lumber are shipped from the area annually. Two pulp mills commenced production in 1966, a third in 1968, with a combined capacity of about 2,000 tons per day of kraft pulp and paper. This sudden injection into the economy helped stimulate the rapid expansion in and around Prince Geroge.

Lesser but significant contributions to the economy are made by the service industries, trade, construction, agriculture, mining and tourists.

PHYSICAL FEATURES

Physiography and Relief

The map area is located within the Interior Plateau which is one of the main physiographic divisions in the central and southern interior of the province (Holland, 1964). Subdivisions of the Interior Plateau (Figure 2) occurring in the map area consist of the following:

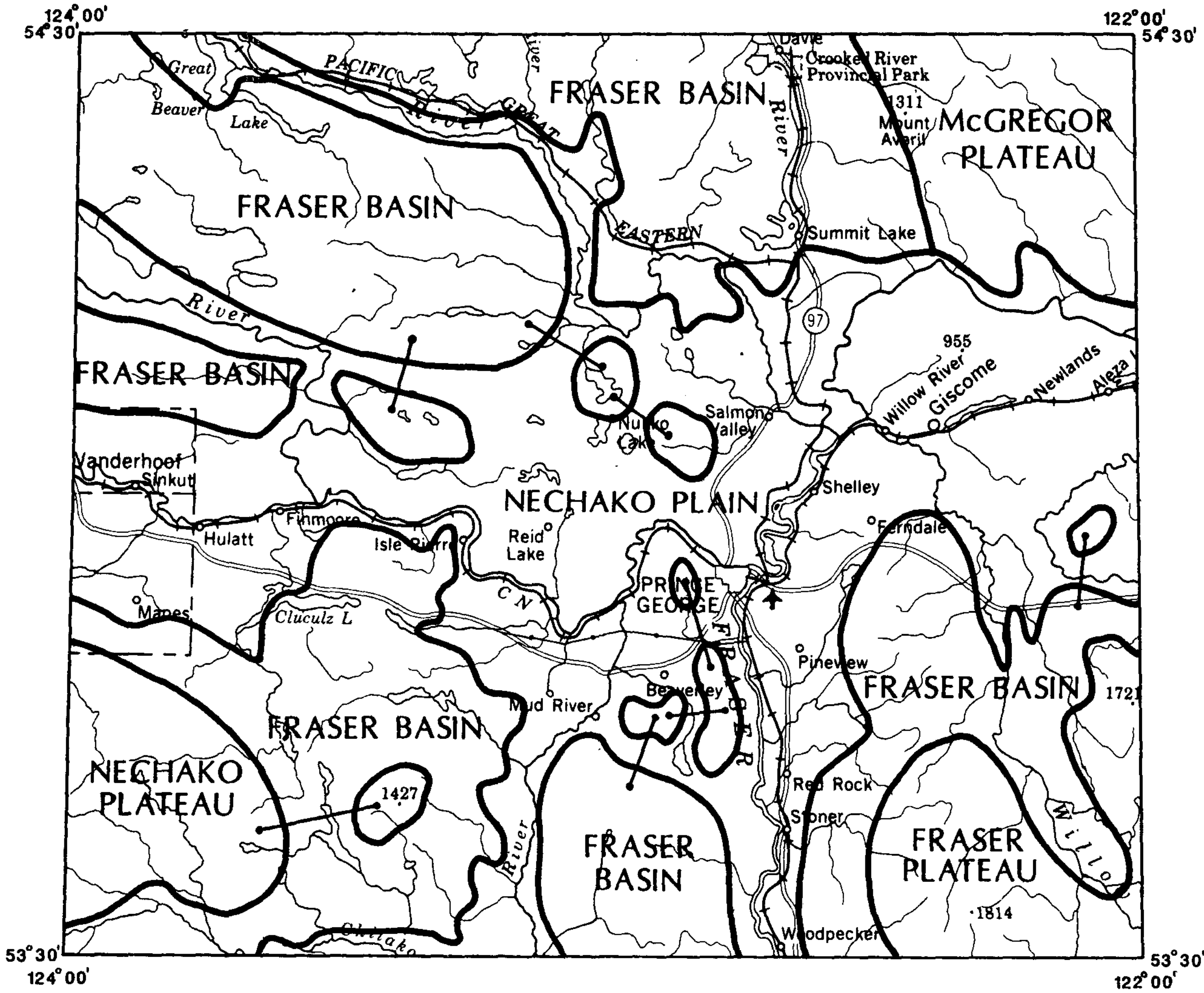

Figure 2. Physiography (Holland, 1964) and Drainage of the Map Area

1. About one-fifth of the map area is occupied by portions of three plateaus, the Nechako Plateau in the southwest, the Fraser Plateau in the southeast, and the McGregor Plateau in the northeast.

2. Approximately four-fifths of the map area consists of the Fraser Basin and the Nechako Plain.

Nechako Plateau

The Nechako Plateau occupies extensive areas to the southwest, west, and northwest of the map area but only a small section extends into the southwest corner of the Prince George - McLeod Lake map area.

Within the map area, the Nechako Plateau has steeply to extremely sloping topography lying at elevations above about 3,000', the general separation from the Fraser Basin. The highest elevations occur on the Nulki and Sinkut hills; one summit within the latter rises to 4,865'. Bobtail Mountain, within the Fraser Basin, is an outlier of the plateau and attains an elevation of 4,683'.

Fraser Plateau

The Fraser Plateau occupies a large area to the south but only a small section extends into the southeast corner of the map area.

Within the Prince George - McLeod Lake map area, the Fraser Plateau has steeply to extremely sloping topography. It occurs above about 3,000' elevation on the lower slopes of the Mount George highland and above an arbitrary elevation between 3,000' and 3,400' in the Grizzly Lake - Pitoney Lake - Upper Willow River locality. The highest elevations occur on the Mount George highland where many of the upper ridges are above the 5,000'. One summit attains an altitude of 5,686' and Spring Mountain reaches 5,645'.

McGregor Plateau

The McGregor Plateau is smaller in size compared to the area occupied by the Nechako and Fraser Plateaus. It is located in the northeast of the map area, on the north side of the Fraser River and to the east of the Crooked River.

The McGregor Plateau has steeply to extremely sloping topography within the map area and occurs above about 3,000' elevation, below which it merges with the Fraser Basin. The highest elevations are Mount Averil, Mount Beauregard, and an unnamed mountain at 4,265, 4,500 and 5,100 ', respectively.

The Fraser Basin

The Fraser Basin lies below the level of the three plateaus at a generalized elevation of separation of about 3,000'. Irregular in shape, it extends beyond the borders of the map on all four sides. It is characterized by low relief and has varied topography that ranges from hilly to rolling and undulating.

Within the north half of the map area, relatively low, isolated summits occur on Mount Prince (4,065'), Merton Hill (3,448'), Coffee Pot Mountain (3,365'), Tea Pot Mountain (3,029'), and Pilot Mountain (3,252'). Similar summits in the southeast are Mount Baldy Hughes (3,700'), Tabor Mountain (4,125'), and Mount Bowron (3,900').

Nechako Plain

The Nechako Plain is the major physiographic subdivision of the Fraser Basin. It consists of three glacial lake basins known individually as the Prince George, Vanderhoof and Fort St. James basins. The upper elevation of these basins varies from about 2,600' in the west to about 2,500' in the eastern part of the map area.

The Nechako Plain is very irregular in shape and only parts of the three glacial lake basins occur within the map area, in the general vicinity of their respective city or village names. The Prince George basin occupies the largest acreage in the map area, the Fort St. James basin the least.

The basins have variable topography which ranges from nearly level or undulating to rolling. The latter is usually associated with glacial till deposits while the previous consist mostly of glaciolacustine or glaciofluvial and fluvial deposits.

Drainage

The major drainage within the map area (Figure 2) is the deeply incised Fraser River, which flows southward through the eastern half of the map area. All the main rivers in the map area eventually drain into the Fraser River, except for the Crooked River which drains north from Summit Lake. Significant tributaries of the Fraser River in the map area are: in the north, the Salmon River and its tributary, the Muskeg River; in the northwest, the Stuart River; in the west, the Nechako River; in the southwest, the Chilako; and in the southeast, the Willow River. The McGregor and Bowron rivers are major tributaries that enter the eastern part map area for short distances.

In addition, numerous creeks of varying size drain the map area and eventually reach the major rivers. Much of the area has poorly organized drainage and numerous small lakes, ponds, and poorly drained depressions are randomly scattered through the various glacial deposits.

Great Beaver Lake is the largest lake in the map area. Other major lakes in the western half include Margaret, Clauminchil, Chief, Saxton, Sinkut, Cobb, Cluculz, Bednesti, Norman, Dahl, Eulatazella, Little Bobtail, and Naltesby. Major lakes in the eastern half are Summit, Eaglet, Aleza, Tabor and Nadsilnich.

Bedrock Geology

The bedrock in the map area has been mapped by the Geological Survey of Canada (Tipper, 1961; Tipper and Muller, 1961). The majority is of Mesozoic (65 to 225 million years old) and Palaeozoic (225 to 600 million years old) age; a minor amount is correlated with the Cenozoic era (<65 million years old). A generalized map, derived from published geology maps, showing the location and extent of the various bedrock types is presented as Figure 3. It indicates that the bedrock in much of the map area is covered by deep glacial deposits. Most of the bedrock exposures are on the Nechako, Fraser and McGregor Plateaus, with only minor outcroppings in the Fraser Basin.

There are four broad groupings of rocks within the map area. These can be broadly grouped according to origin and age as follows:

1. Igneous Rock

   (a) Plutonic (or intrusive) rocks of mid-Mesozoic age, composed mainly of granodiorite,

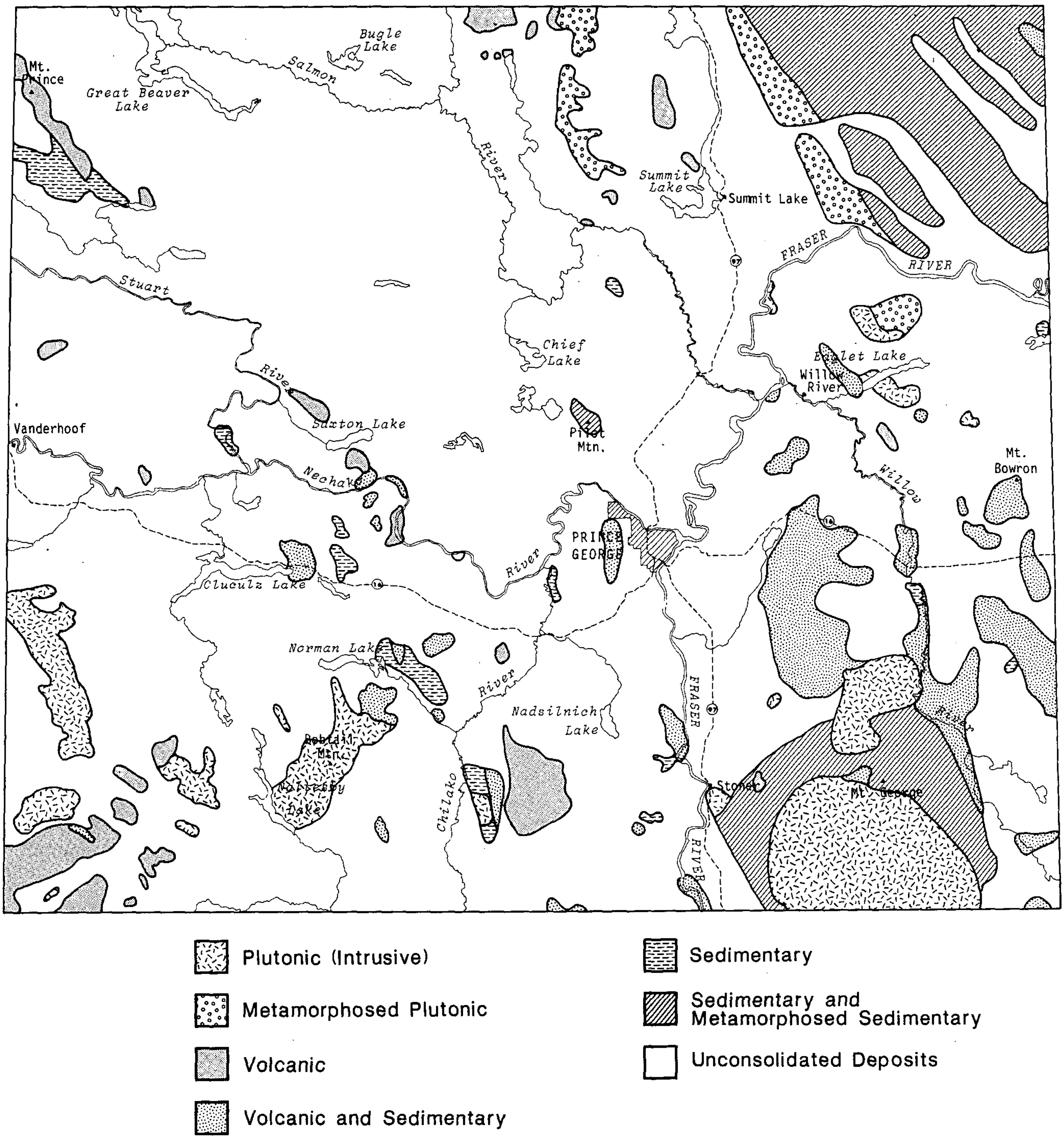

Figure 3. Generalized Bedrock of the Map Area

quartz diorite, quartz monzonite, monzonite and granite occur extensively on the Mount George highland and the Sinkut Hills, and northeast of Bobtail Mountain.

In addition, plutonic and metamorphosed plutonic rocks of Lower Mesozoic age, composed mainly of serpentinized peridotite and serpentinite, occur on Bobtail Mountain, in the Sinkut Hills area and west of Mount Baldy Hughes.

(b) Metamorphosed and granitized rocks of Palaeozoic age occur to the east and west of the Crooked River, and to a minor extent to the north and south of Eaglet Lake. These rocks are separated from the sedimentary and metamorphosed sedimentary rocks which underlie the McGregor Plateau by the McLeod Lake Fault. This fault separates the rock sequences of the Rocky Mountains to the east from the rocks of central British Columbia to the west (Tipper and Muller, 1961).

(c) Volanic (or extrusive) rocks of Cenozoic, Mesozoic and Palaeozoic age, composed mainly of basalt and andesite, are scattered throughout the map area with practically all of the exposures either occurring on the Nechako Plateau or in the Fraser Basin. Isolated mountains include Mount Baldy Hughes, Tea Pot Mountain, Coffee Pot Mountain, Merton Hill and Mount Prince.

2. Mixed Volcanic and Sedimentary Rock

(a) Mixed volcanic and sedimentary rocks of Mesozoic and Palaeozoic age occur in the vicinity of Tabor Mountain, Spring Mountain, Mount Bowron, Connaught Hill, along the Fraser, Willow and Bowron rivers, and in the vicinity of the Pinchi Fault. This fault, which trends southeastward through the map area from Mount Prince to Mount Baldy Hughes, has an overall length of more than 500 miles through the Central Interior (Tipper and Muller, 1961).

3. Sedimentary Rock

(a) Sedimentary rocks of upper Palaeozoic age composed mainly of limestone, ribbon chert, and argillite, occur near the west side of the Pinchi Fault and in the vicinity of Mount Prince.

(b) Sedimentary rocks of Cenozoic age, which include conglomerate, sandstone, mudstone, lignite, and diatomite, occur intermittantly along or near the channels of the Fraser, Willow and Bowron rivers.

4. Metamorphosed Sedimentary and Sedimentary Rock

(a) Sedimentary and metamorphosed sedimentary rocks of Lower and Middle Palaeozoic age, which are the oldest in the map area, occur mainly on the Fraser and McGregor Plateaus.

(b) Lower Palaeozoic rocks composed mainly of quartzite, phyllite, argillite, and minor limestone occur at the lower elevations of the Mount George Highland. An outlier of similar rock occurs on Pilot Mountain.

(c) Lower and Middle Palaeozoic rocks east of the McLeod Lake Fault are predominantly limestone and dolomite with inclusions of silty and shaly limestone, sandstone, calcareous siltstone, calcareous schist, quartzite, sandy dolomite and slate. Two belts of similar sediments, with minor volcanic rocks of possible Mesozoic age, also occur within these older bedrock formations.

Landforms and Soil Parent Materials

The landform classification system used in this report is based on the system described by Lueder (1959). He defines a landform as a "terrain feature created by natural processes in such a way that it may be described and recognized in terms of typical features wherever it may occur, and which, when identified, provides dependable information concerning its own structure and either composition and texture or uniformity".

The map area has been extensively glaciated and landforms resulting from glaciation dominate. Post-glacial landforms deposited by water, wind and gravity also occur. More detailed information can be obtained from several published reports. Armstrong and Tipper (1948) have described the glaciation in the area. The surficial geology of the Prince George map sheet (93G) has been mapped by Leaming and Armstrong (1969) and Tipper's report (1971) describes the surficial geology.

A generalized map of the landforms and soil parent materials in the map area is presented in Figure 4. The landforms are briefly described in the following section according to their general origins and surface form or pattern.

Basal Till Deposits

Till (morainal material) is deposited directly by glacier ice. It consists of material that was originally eroded by the base of the glacier and/or material that was deposited on the glacier surface by avalanches and rockfalls. Basal till has been transported by the ice and re-deposited as the base of the ice melted. Basal till is variable in texture and generally consists of compacted, non-stratified material composed of heterogeneous mixtures of sand, silt, clay, gravel, cobbles and stones.

Due to the limited extent of exposed bedrock in the map area, the specific bedrock types appear to have had only localized effect on the characteristics of the related basal till and on subsequent soil development. The majority of the basal tills have inherited their properties from a heterogeneous mixture of bedrock and other materials.

Basal till landforms are variable in surface form and pattern. Much of the map area is extensively drumlinized and/or glacially grooved which give a good indication of the direction of the glacier flow. Drumlins and glacial grooves are numerous to abundant at the lower elevations but occur less frequently above 4,000'. The topography of the basal till landforms ranges from undulating, rolling or hilly to moderately to extremely sloping.

The soil associations developed on basal till are: Barrett, Captain Creek, Deserters, Dominion, Dunkley, Lanezi, Saunders, Torpy River, and Twain.

Ablation Till Deposits

Ablation till is material that has been transported by glacial ice and deposited when melting occurred at the ice surface, together with some sorting and re-distribution by glacial meltwater. The deposits are generally loose to slightly compacted, poorly sorted and partially stratified. They are usually coarse textured and gravelly, cobbly, stony, and/or bouldery.

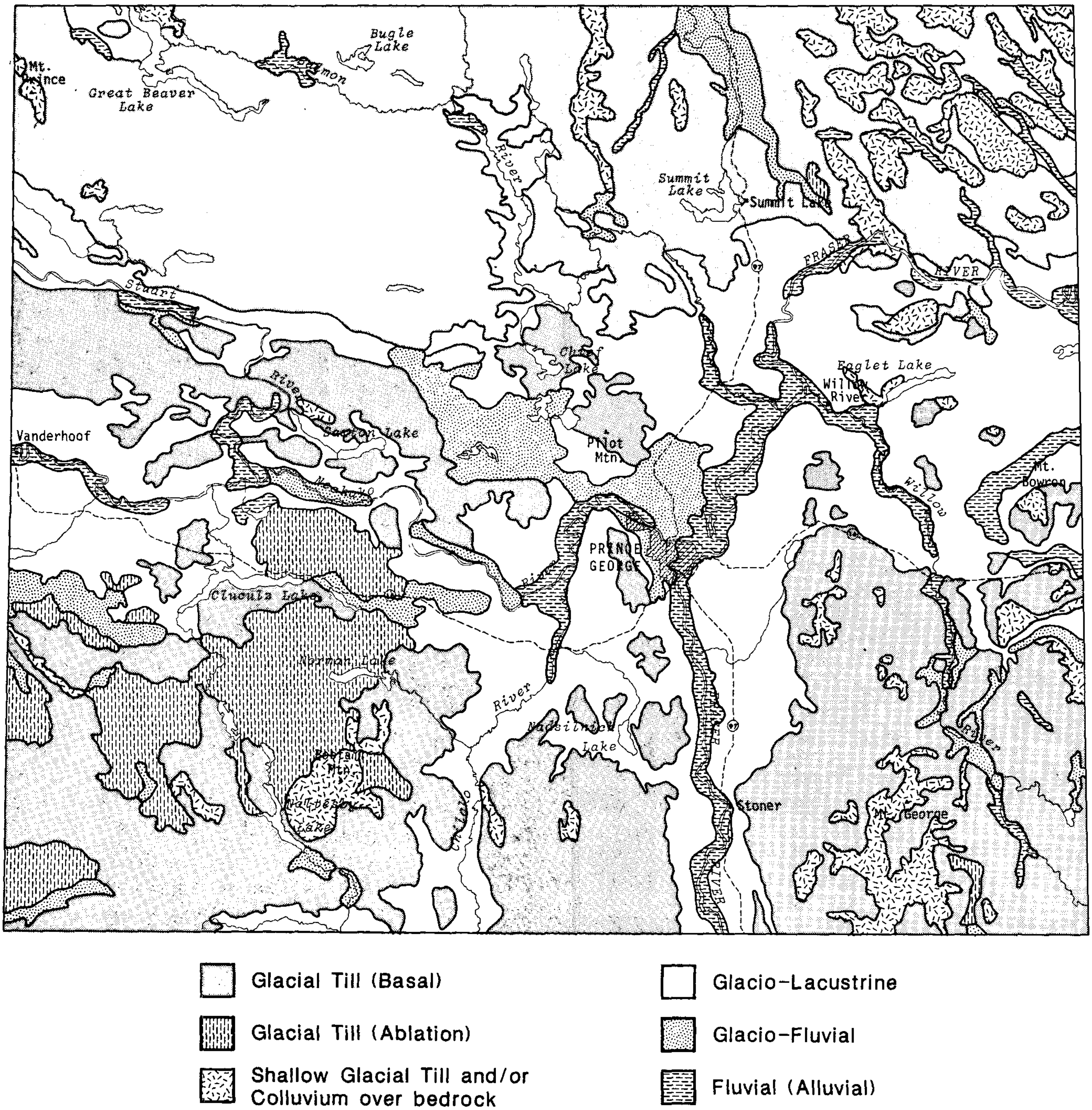

Figure 4. Distribution of Landforms and Soil Parent Materials in the Prince George - McLeod Lake Map Area

Ablation till landforms are irregular in shape and characterized by hummocky, kettled, ridge-and-swale topography with low relief. In many places, the deposits conform to, or interfill the topography of the underlying basal till terrain.

The soil associations developed on ablation till are Cobb and Crystal.

Shallow Glacial Till and/or Colluvial Deposits Over Bedrock

As indicated in Figure 4, glaciation covered much of the pre-existing terrain with variable depths of glacial till. Exposed bedrock is rare in the map area, except at the higher elevations. Deposits that are shallow over bedrock are generally less than 5' deep.

On steeper slopes, the glacial till is subject to both weathering and gravity, resulting in down-slope movement and alteration of the glacial till at or near the land surface. Colluvium also occurs from gravity acting on fractured bedrock. In the plateau physiographic subdivisions, glacial till, colluviated glacial till, and colluvium are often very closely intermingled and difficult to separate at the scale of mapping. Where the colluvial action has been more pronounced, as in shallower deposits over steep bedrock, the content of angular gravelly and stony material is generally greater.

Texture is usually related to that of the local glacial till or is slightly coarser, depending on the amount of downslope movement that has occurred. Where bedrock is the main source of the colluvium, textures depend on the type of bedrock; coarse grained, acidic rock usually provide the coarsest textures.

Topography of the shallow deposits is controlled by the underlying bedrock and usually varies from steeply to extremely sloping. Glacial grooves are common and rock drumlins are scattered.

Most of the soil associations have been broadly defined according to the type of underlying bedrock. The soil associations mapped are: Averil, Bearpaw Ridge, Cluculz, Decker, Dezaiko, Dragon, Oona, Ormond, Pope, Skins, and Wendle.

Glaciofluvial Deposits

Glaciofluvial materials have been transported and deposited by meltwater flowing from, or in contact with, glacier ice. The deposits generally consist of non-bedded to poorly bedded and non-sorted to poorly sorted gravels and sands, although some they may be well sorted and stratified.

Glaciofluvial landforms are variable in surface form and pattern and can range from almost level to very steep or hilly. Ice-contact landforms include kames, kame terraces, eskers, esker trains, crevasse fillings and deltas. The soil associations mapped on these deposits are mainly Eena and Roaring, with some inclusions of Alix, Ramsey and Mapes. The Eena association occupies a large part of the Stuart River esker which extends southeast from the Stuart River to Prince George. Strata of the esker delta formed in glacial lake Prince George can be observed along the north side of the Nechako River. Similarly, the Roaring association is the main soil on the Bednesti esker which extends eastward from Cluculz Lake to Bednesti, Berman and Roaring lakes.

Proglacial landforms, which are generally well sorted and stratified, include outwash deposits and valley train terraces. Soil associations mapped on these landforms include Alix, Mapes and Ramsey and, less commonly, Bear Lake, Peta, Seebach and Toneko.

Valley train terraces along the Nechako and Fraser rivers, to the west and south of Prince George, are mapped as the Giscome and Saxton associations.

Glaciolacustrine Deposits

Glaciolacustrine deposits result from the erosion and sorting of glacial till and other materials by glacial meltwater streams and the subsequent redeposition of the finer textured components (fine sands to clay) in glacial lake basins. Subsequent drainage of the basins during the late stages of deglaciation exposed the lake bottom sediments.

Glaciolacustrine deposits occupy the three glacial lake basins in the Nechako Plain. The deposits ar predominantly clayey and silty, with inclusions of sand, and are usually well sorted and well stratified.

Glaciolacustrine landforms have variable topography ranging from almost level or undulating to gently to strongly rolling. The latter usually occurs where the deposits are shallow and conform to the topography of the underlying glacial till. In addition, steeply to extremely sloping topography occurs adjacent to the major rivers where erosion and entrenchment of the river channels has occurred. Kettles occur in scattered locations where depressions developed after residual blocks of buried ice melted within the glaciolacustrine deposits.

Soil associations which have developed on clayey glaciolacustrine deposits are Fort St. James, Pineview, and Vanderhoof. The Bowron association occurs on interbedded clayey and silty deposits that are transitional between deposits that are predominantly clayey and those that are predominantly silty. The Berman and Bednesti associations occur on predominantly silty deposits while the Knewstubb association has developed on deposits which consist of interbedded silty and sandy materials.

Gravelly and sandy glacial lake beach deposits occur around the margins and within the glacial lake basins. They are most evident around and within the Prince George lake basin but are also common along the north side of the Vanderhoof basin. They are of minor importance within the Fort St. James basin. Soil associations which have developed on these deposits are Gunniza and Kluk.

Fluvial Deposits

Fluvial (alluvial) deposits have been laid down by recent (present day) rivers and streams. The deposits are variable in texture and drainage and are moderately well to well sorted and stratified. The deposits occur as terraces, floodplains and fans.

The fluvial terraces are predominantly level to undulating and are often marked by shallow current scars or channels. Soil associations which occur on the higher lying, better drained terraces are the Fraser and Nechako. Low lying terraces and floodplains, subject to spring flooding and containing shallow water tables, have developed the McGregor and Stellako associations.

Fluvial fans have fan-like shapes and occur where stream gradients abruptly change (ie. steep mountain streams discharging onto broad, flat-floored valleys). Fans have a gradual slope from the upper apex to the lower fan apron. Within the map area fans occupy a minor acreage due to the generally subdued terrain. The soil associations developed on fans are Fontaniko, Tabor Lake and Spakwaniko.

Organic Deposits

Organic deposits are materials of organic composition which have accumulated in and around closed basins or in moisture-receiving positions within the landscape. The deposits are usually poorly to very poorly drained with depressional to very gently sloping topography. The soil associations mapped on organic deposits are Chief and Moxley.

ENVIRONMENTAL FEATURES

Climate

The climate of the area is controlled by continental airstreams, usually from the east in winter and southeast in summer, as well as Pacific disturbances moving in from the west. The continental airstreams provide clear, sunny weather marked by hot temperatures in the summer and cold temperatures in the winter. This is modified, however, by upper level cyclonic disturbances from the Pacific that provide cloud, precipitation, and cooler temperatures in the summer or warmer temperatures in the winter.

Climate stations located within the area include two long-term Atmospheric Environment Services (AES) stations, at Prince George Airport (elevation 2,218') and Aleza Lake (elevation 2,050') as well as 23 other short term climate stations ranging in elevation from 1,775' to 4,850'. In addition there are three long-term AES stations and 24 short term AES stations located outside but close to the area, from which information has been extrapolated. These stations range in elevations from 1,790' to 5,010'.

Appendix B gives long-term statistics from five AES stations in or near the map area. These are, in the west, Fort St. James and Vanderhoof; to the east, Prince George Airport and Aleza Lake; and to the south, Quesnel Airport. The data indicate that mean temperatures do not vary significantly although, there is a slight increase from north to south and west to east. Frost-free period is shortest at Vanderhoof, probably because the clear skies, as indicated by the low precipitation, result in more heat loss at night. Frost-free period increases to the south, at least within the Fraser River valley. Growing degree days generally reflect elevation with the highest number of degree days at the lower elevations.

Precipitation is lowest in the west, increasing to the east and also from south to north. Seasonal (May to September) precipitation ranges from 7.7" in the west to 13.2" in the east. These values increase slightly from south to north. Snowfall varies from 72" in the west to 147" in the east. Again these values decrease slightly from north to south. The maximum depth of snow on the ground seldom exceeds 36" except in the northeast where upwards of 48" may be found. Annual precipitation follows the same general pattern and ranges from 18.0" in the west to 36.7" in the east. The values given above are for elevations below approximately 2,600' and can be expected to increase at higher elevations. Data indicate that at 3,600', seasonal precipitation will increase about 2 to 3" over that at 2,600', and at 5,000', maximum snow depth varies from 60" in the west to over 100" in the northeast.

Vegetation

As with soil, climate is a dominant factor determining the general distribution of vegetation. The vegetation patterns can provide an insight into the range of climatic conditions over an area and thereby aide in the interpretation of the soil. The vegetation also reflects the suitability of the soil of growing plants. Soil mapping, when integrated* with vegetation mapping, will therefore produce a map that is an important aid in the management of vegetation and vegetation dependent resources.

A number of studies have addressed the vegetation patterns of the map area (Rowe, 1959; Krajina, 1965, 1969; Revel, 1972; van Barneveld, in Cotic, 1974; Harcombe, 1978; Annas et al, 1979; and Ceska, 1979). Concurrent with this soil survey Arlidge (in preparation) conducted a vegetation survey of the area. His findings are presented in a separate report but form the source for much of the vegetation-related information in this report.

The classification framework presented here is based on the more recent works by Harcombe (1978) and Ceska (1979) and has been applied to the information from the previous sources.

Since the completion of this study, additional vegetation studies have taken place, and additional information may be obtained from Comeau (in preparation) and from the Prince George Forest Region, Research Section (Ministry of Forests and Lands).

Subboreal Region (SB)

The Prince George - McLeod Lake map area is located mainly within the Subboreal Region (Figure 5) which is characterized by the occurrence of white spruce** and alpine fir at altitudes below 3,300'. Black spruce and tamarack are limited to specific sites. Black spruce may be encountered in acid bogs and on sites that are coarse-gravelly, very acidic and low in available nutrients. Harcombe (1978) suggests that under the latter conditions white spruce and alpine fir may tend to eventually out-compete the black spruce. Tamarack is limited to certain bogs and wet melt-water channels. Common seral species are lodgepole pine and trembling aspen. Lodgepole pine occurs on all soils but tends to dominate on well drained, acidic soils. On soils of higher base saturation, trembling aspen tends to dominate or, particularly where repeated or intensive disturbance has occurred, it may be exclusive. The proximity of the adjacent Interior Wet Belt Region is evident from a few occurrences of stands of western hemlock and some western red cedar near the eastern boundary of the map area. In these stands western hemlock is often intermixed with alpine fir and white spruce.

The climate of the area is complex, with considerable local variations. Reflecting these climatic variations, the Subboreal Region (SB) is divided into the Omineca Section (SB1), Prince George Section (SB2), Parsnip Section (SB3), and Willow River Section (SB4). Each section is defined by a characteristic sequence of zones and subzones (Table 1) on an altitudinal (vertical) transect. The zones and subzones of the higher altitudes (above 3,300') throughout the study area are similar (although subtle differences exist). Differences in the lower zone, the Subboreal white spruce - alpine fir zone, are expressed as subzones. Each section is characterized by an exclusive subzone. The general location of the various regions, sections, zones and subzones are shown in Figure 5.

Omineca Section (SB1)

This section reflects dry and cold climatic conditions. It occurs in the western portions of the map area (Figure 5). Its eastern boundary has not been determined.

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* Integrated here is not intended to mean represented in one map. Rather it refers to consideration of vegetation patterns and the knowledge that may be gleaned from them and to apply that knowledge to the concept of soil mapping.

** Plant names follow the conventions of Taylor and MacBryde (1977).

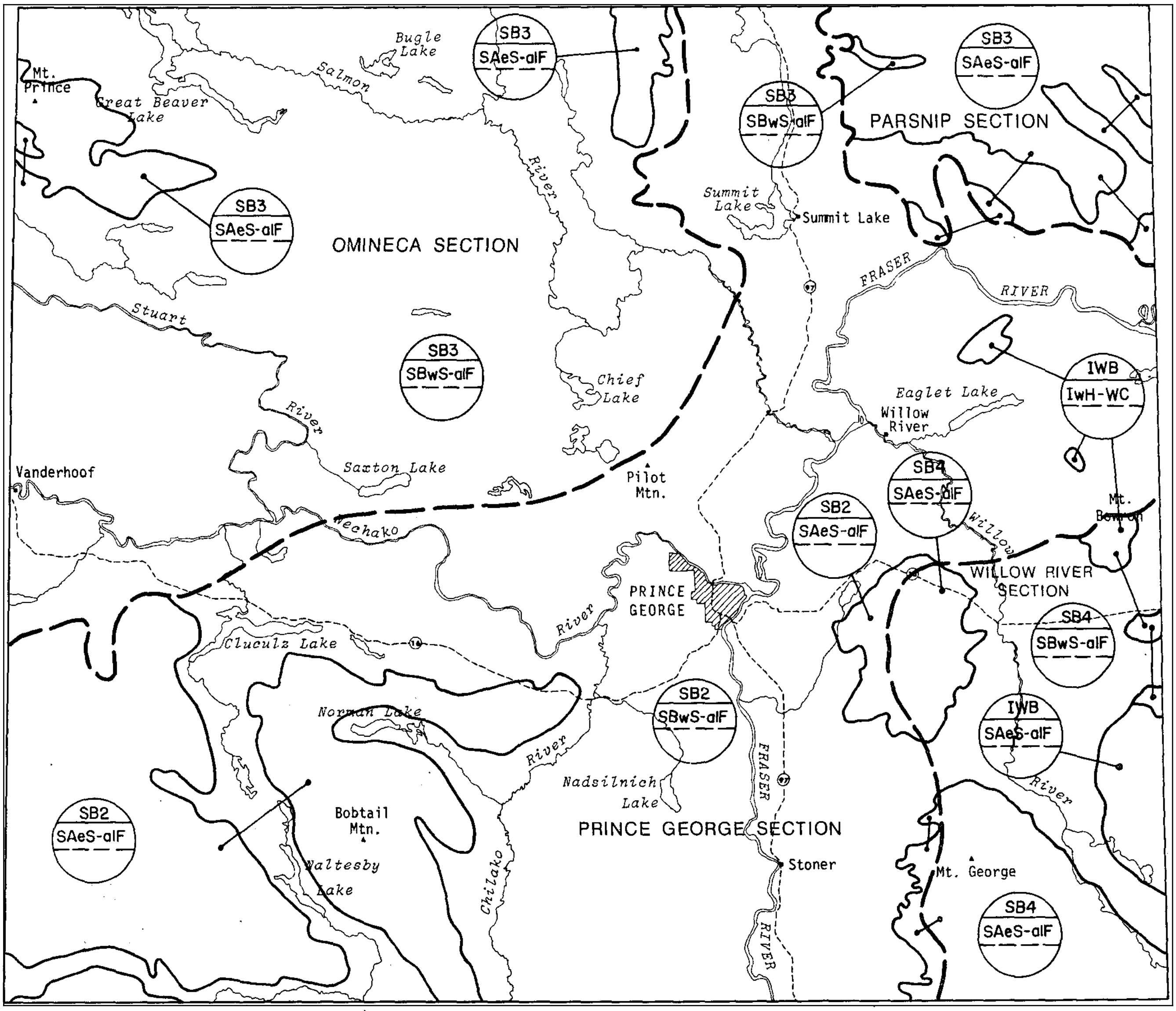


Figure 5. Vegetation Zonation of the Prince George - McLeod Lake Map Area. (See text for explanation of symbols)

Table 1 Vegetation zonation of the Subboreal region

Subboreal Region					
Omineca Section (SB1)			Prince George Section (SB2)		
Zone	Subzone	Altitudinal Limits (Ft.)	Zone	Subzone	Altitudinal Limits (Ft.)
Subboreal white spruce-alpine fir	white spruce	below 2900	Subboreal white spruce-alpine fir	Rocky Mountain Douglas-fir	below 3050
	white spruce hybrid	2900 - 3300		white spruce hybrid	3050 - 3950
Subalpine Engelmann spruce - alpine fir	forested	3300 - 5300	Subalpine Engelmann spruce - alpine fir	forested	3950 - 5300
	Krummholz	5300 - 5600		Krummholz	5300 - 5800
Alpine tundra		above 5600 - not represented in map area	Alpine tundra		above 5800 - not represented in map area

Subboreal Region					
Parsnip Section (SB3)			Willow River Section (SB4)		
Zone	Subzone	Altitudinal Limits (Ft.)	Zone	Subzone	Altitudinal Limits (Ft.)
Subboreal white spruce-alpine fir	common paper birch	below 2950	Subboreal white spruce-alpine fir	Rocky Mountain Douglas-fir - common paper birch	below 2950
	white spruce hybrid	2950 - 3650		white spruce hybrid	2950 - 3650
Subalpine Engelmann spruce - alpine fir	forested	3650 - 5450	Subalpine Engelmann spruce - alpine fir	forested	3650 - 5800
	Krummholz	5300 - 5800		Krummholz	
Alpine tundra		above 5800 - not represented in map area	Alpine tundra		above 5800 - not represented in map area

The Omineca Section is characterized by the sporadic occurrence of alpine fir in stands dominated by white spruce or more commonly lodgepole pine, trembling aspen and white spruce. Rocky Mountain Douglas-fir occurs sporadically and is restricted to dry south-facing, often shallow soils. Common paper birch does not occur. Lichens may become significant components of the forest floor where soil drainage is excessive or in open seral stands when soil nutrients are low.

The Subalpine Engelmann spruce - alpine fir zone of this section is dominated by lodgepole pine, with alpine fir and lesser amounts of Engelmann spruce regenerating. The understory of tree regeneration and Sitka alder may form dense thickets. The forest floor is relatively species-poor and the moss layers are only moderate in depth. Moisture deficiencies occur frequently during the growing season.

Alpine tundra is not encountered. In adjacent areas where the relief is more pronounced it is expected to occur above 5,600'. Altai's fescue, lichens and hardy succulents (stonecrop) will dominate with minor amounts of cassiope in areas of snow accumulation.

Prince George Section (SB2)

This section occurs in the central and southwestern portions of the map area (Figure 5). It reflects favorable summer heat conditions (Harcombe, 1978) and somewhat greater summer and winter precipitation than occur in the Omineca Section.

The Prince George Section is characterized by the occurrence of Rocky Mountain Douglas-fir as a seral species leading to a climax of white spruce and alpine fir. Trembling aspen, lodgepole pine and willows are also significant seral species.

The Subalpine Engelmann spruce - alpine fir zone of this section is dominated by lodgepole pine and alpine fir. Succession to a climax of predominantly alpine fir proceeds more rapidly than in the Omineca Section. The temperature regime is more favorable for vegetation growth and moisture deficits are moderate. Regeneration in this zone establishes readily and seral species are replaced in a relatively short time. The understory may be dense with willows, Sitka alder, white-flowered rhododendron and other shrubs. The forest floor vegetation is more diverse and richer in species than the Omineca Section, reflecting the more favorable conditions for plant regrowth.

At some of the highest elevations in this section (above 5,300') severe climatic conditions are indicated by the Krummholz subzone.

The Alpine tundra zone is not represented in this section.

Parsnip Section (SB3)

The Parsnip Section occurs in the north-central and north-eastern parts of the map area (Figure 5). It represents the wettest part of the Subboreal Region. Summer temperatures tend to be lower than those of the Prince George Section, due to cold air from higher altitudes settling in the valleys. Higher snowfall and more-mountainous relief are likely to result in a winter climate somewhat milder than those of the Prince George and Omineca sections. Moisture deficiencies are minor.

The Parsnip Section is characterized by the occurrence of common paper birch and the absence of Rocky Mountain Douglas-fir in all but very dry south-facing slopes (usually shallow and/or very coarse-textured soils) below 3,650'. The climax of the Subboreal white spruce-alpine fir zone is distinctly dominated by alpine fir, and the understory of both seral and climax stands is varied and species-rich. Lodgepole pine, some trembling aspen, willows and to some extent white spruce are dominant seral species. The moss carpet is usually medium in thickness. Depressions and low lying areas tend to receive excessive moisture giving rise to an abundance of wetlands (bogs, fens, marshes and swamps) on the major valley floors.

The Subalpine Engelmann spruce - alpine fir zone of this section is dominated by alpine fir and lodgepole pine. The cooler and wetter climate has limited the incidence of natural fires and moisture conditions are often favorable for re-establishment of alpine fir. Under the closed forest canopy white-flowered rhododendron and blueberries may abound and a diverse and abundant herbaceous cover is typical. On well-drained south facing slopes, Engelmann spruce may be more prevalent. Under influence of the higher precipitation, subalpine meadows occur frequently in the upper reaches of the forested subzone. American green alder, thin-leaf mountain alder and many herbs including false hellebore, Sitka valerian, cow parsnip and ferns may occur in snow melt seepage areas and avalanche tracks.

The treeless alpine tundra occurs widely in this section to the east of the map area. It occurs at altitudes in excess of 5,800'. It is expected that the alpine tundra will resemble that of the adjacent Interior Wet Belt (Ceska, 1979) with mountain heather, cassiope, alpine azalea and a variety of herbaceous plants inhabiting wetter meadows.

Willow River Section (SB4)

The Willow River Section, which occurs in the southeastern portion of the map area (Figure 5), represents the most favorable climatic conditions for plant growth within the study area. Favorable precipitation is combined with milder temperatures. This section is probably the most productive within the study area where sufficient moisture is available. Moisture deficiencies may be somewhat more pronounced than in the Parsnip Section, but are less severe than in the Prince George and the Omineca Sections.

The characteristic zone and subzone of the Willow River Section has been described by Annas *et al.* (1979) as the "SBS(c)" and occurs generally below 3,650'. This Rocky Mountain Douglas-fir - common paperbirch subzone of the Subboreal white spruce - alpine fir zone is unique in that birch and Rocky Mountain Douglas-fir occur in successional stages leading to a climax dominated by alpine fir, except on frequent nutrient-enriched seepage sites where white spruce is dominant. The understory may be dominated by a variety of low shrubs which often form a low but dense shrub layer. Under climax stands, dense crown canopies exclude light to the extent that the forest floor may become virtually devoid of herbs and shrubs. In these stands substantial amounts of arboreal lichens may occur. In more open stands the forest floor is often covered with thimbleberry and Canadian bunchberry and a wide variety of "rich site" herbs.

The Subalpine Engelmann spruce - alpine fir zone occurs between 3,650' and 5,800' altitude. The vegetation of this zone closely resembles that of the Parsnip Section.

Interior Wet Belt Region (IWB)

The Interior Wet Belt Region (IWB) impinges on the study area (Figure 5) at the eastern margins. Favorable precipitation and relatively mild temperatures in winter and cool temperatures in summer provide favorable conditions for western hemlock and western red cedar. Near the study area precipitation is high enough while evapotranspiration is sufficiently low that temperature becomes the controlling climatic factor for the occurrence of western red cedar and western hemlock. Under these conditions soils tend to become strongly acidic. These factor gradients combine to create an interface between the Subboreal white spruce - alpine fir zone and the Interior western hemlock - western red cedar zone. Information to describe the Interior western hemlock - western red cedar zone or the Subalpine Engelmann spruce zone in greater detail was not collected in this study. More detailed information is given in Meidinger et al. (1984).

Soil Development and Classification

The 1970 edition of the "The System of Soil Classification for Canada" was used for the soil survey of this map area. The system has six levels of soil classification: order, great group, subgroup, family, series and type. The first three categories are divided on the basis of major morphological differences in the soil profile and the latter three on the differences in the nature of the parent material and on the thickness and degree of development of the soil horizons.

The soil order is the highest level of classification. There are eight soil orders in the classification system; only the following six occur in the map area:

1. Luvisolic order: Soils that have downward movement and resultant accumulation of silicate clay within the soil profile. They predominantly occur within the dry to moist areas in the Subboreal Region.

2. Podzolic order: Soils with horizons in which high amounts of amorphous aluminum, iron and/or organic matter have accumulated. They mainly occur within the moist to wet areas in the Subboreal Region and in the Interior Wet Belt Region.

3. Brunisolic order: Soils with weakly developed horizons not meeting minimum requirements of other orders. They predominantly occur in the dry to moist areas in the Subboreal Region.

4. Regosolic order: Young soils with little or no horizon differentiation or development. They occur mainly on alluvial floodplains within the Subboreal Region.

5. Gleysolic order: Soils which are saturated with water for prolonged periods of the year. They occur within both the Subboreal and Interior Wet Belt Regions.

6. Organic order: Soils composed primarily of raw to decomposed plant residues (organic matter). They occur within both the Subboreal and Interior Wet Belt Regions.

Each soil order is further subdivided into great groups which have certain features in common pertaining to environment and development.

Great groups are further subdivided into subgroups which are separated according to soil horizon arrangement and characteristics within the soil profile. Subgroups were used for defining the soil associations found on each parent material and for identifying the various soils that have been separated on the soil map.

Figures 6 and 7 illustrate the relationship of soil development to soil texture and precipitation in the map area.

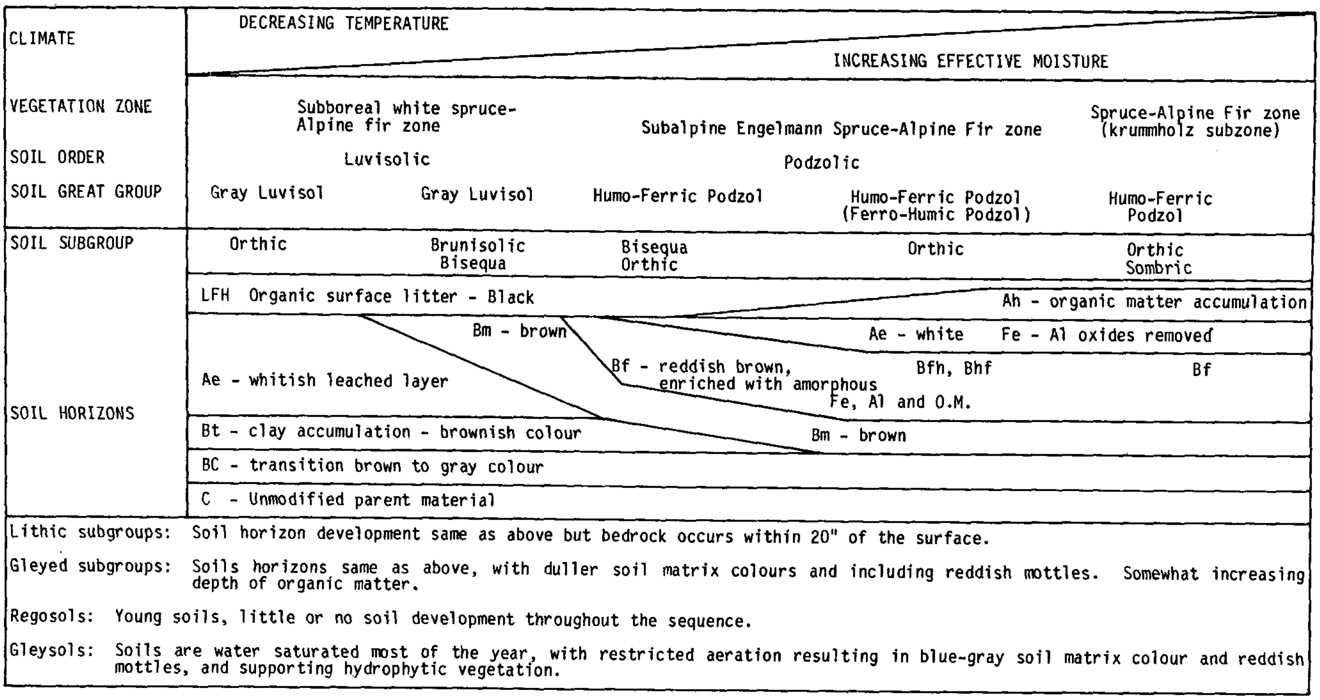


Figure 6. Morphologic development sequence for medium to fine textured soils

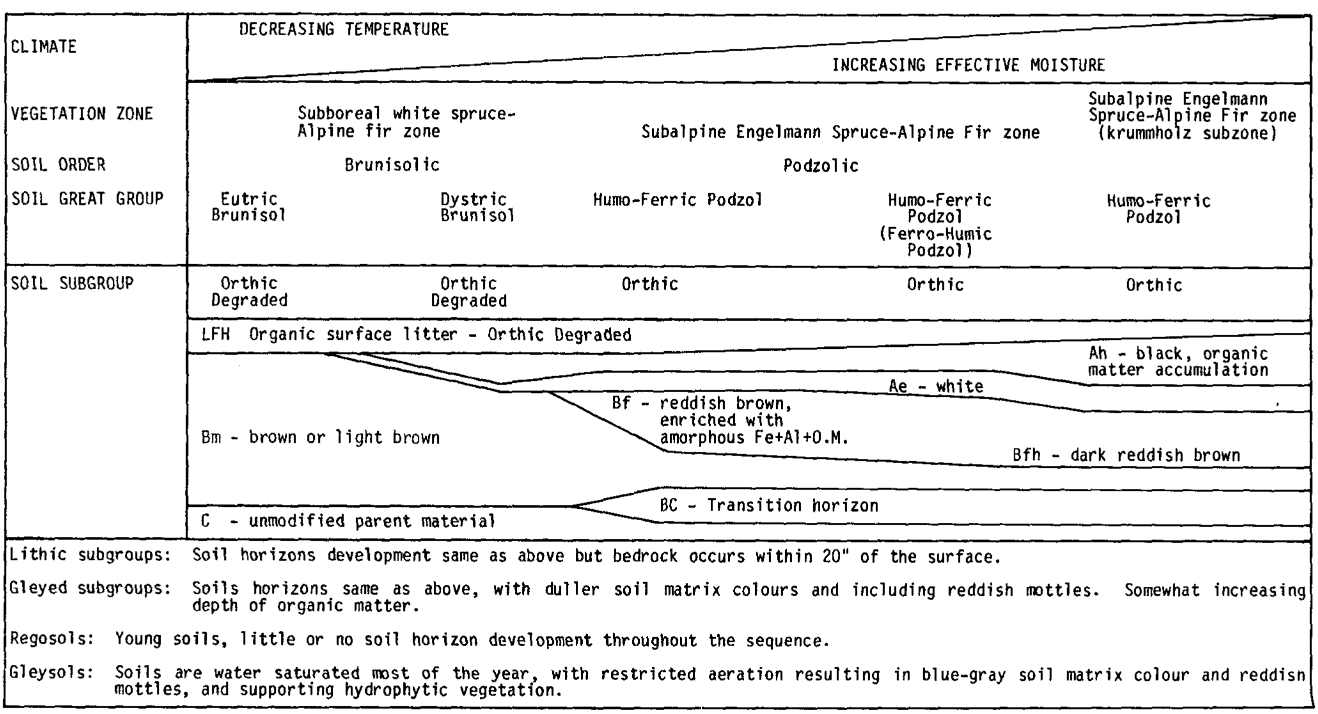


Figure 7. Morphologic development sequence for coarse to medium textured soils

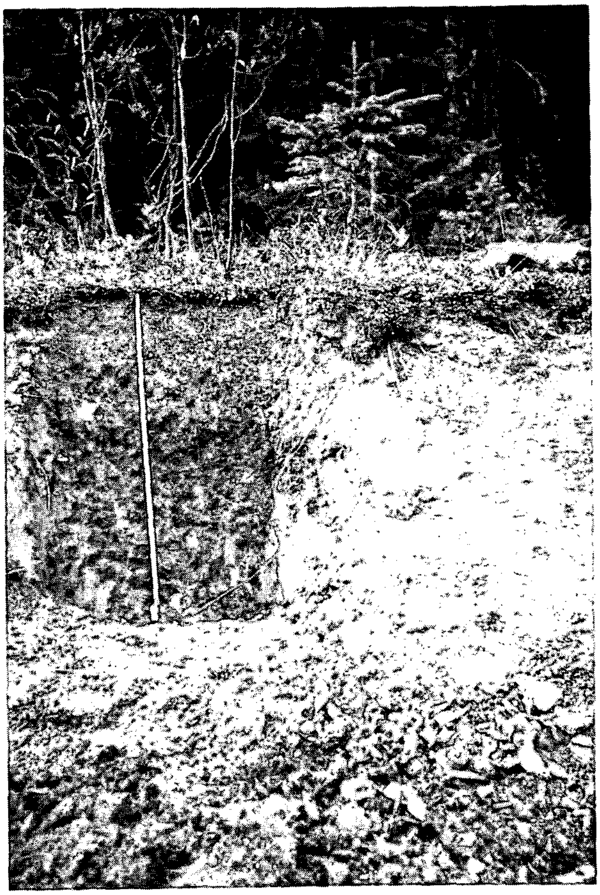


Plate 1. A profile of the clayey Pineview soils

The following briefly describe the soil orders and great groups occurring within the map area and the subgroups that occur within the various soil associations.

Luvisolic Order

Luvisolic soils are well or moderately well to imperfectly drained. They have organic surface horizons (LFH) which are underlain by eluvial (Ae) horizons and illuvial textural (Bt) horizons in which silicate clay is the main accumulation product (see Figures 6 and 7). They develop in moderately cool climates under boreal forest or mixed grassland-forest, generally in basic soil parent materials.

Orthic Gray Luvisol subgroup

These soils exhibit the central characteristics of the Gray Luvisol great group. The typical horizon sequence is: LFH, Ae, AB, Bt, BC, and C, with or without a Ck at depth.

The soils have organic LFH horizons which are generally less than 2" thick. The Ae horizon is grayish in color (value of 5.5 or higher and a chroma less than 3.0) and varies from less than 6" in thickness in fine textured soils to between 10 and 15" in thickness in the medium textured soils. The underlying AB, Bt, and BC horizons are grayish-brown to brownish in color with the BC grading to the C horizon. The latter occurs at variable depths from about 24 to 36".

Orthic Gray Luvisol soils in the map area occur mostly on basal till and clayey or silty glaciolacustrine deposits. In addition, minor areas occur on some higher lying, fluvial terraces.

These soils intergrade with and are transitional to the Brunisolic Gray Luvisol soils.

Brunisolic Gray Luvisol subgroup

These soils have the general characteristics of the Orthic Gray Luvisol subgroup except for the surface horizons. Increased leaching associated with an increase in precipitation results in these soils displaying the early stage of podzol development in the former Ae horizon of the Orthic Gray Luvisol profile.

The typical horizon sequence is: LFH, a thin Aej or Ae, Bm, a transitional Ae or AB, Bt, BC, and C, with or without a Ck at depth.

The soils have organic LFH horizons which are generally less than 2" thick. The thin or incipient Aej or Ae horizon is light gray in color and usually varies from 1/2 to 2" in thickness. The Bm horizon varies from yellowish-brown or dark yellowish-brown to brown, dark brown or strong brown in color (chromas of 3.0 or more) and from about 4 to 6" to as much as 15" in thickness. The underlying AB, Bt, and BC horizon grades to the C horizon; the latter occurs at depths between 30 and 48", which is somewhat deeper than in the Orthic Gray Luvisol soils on similar parent materials.

Intergrades and transitions to the Orthic and Bisequa Gray Luvisol soils and the Bisequa Humo-Ferric Podzol soils occur.

Brunisolic Gray Luvisol soils occur extensively on basal till and silty glaciolacustrine deposits within the map area.

Bisequa Gray Luvisol subgroup

These soils have characteristics which are similar to the Orthic Gray Luvisol and Brunisolic Gray Luvisol soils. The main difference in this subgroup is the formation of a podzolic sequence of horizons in the former Ae horizon of the Orthic Gray Luvisol profile.

The typical horizon sequence is: LFH, Ae, Bf, Bm, a transitional Ae or AB, Bt, and C, with or without a Ck at depth. In addition, the upper boundary of the Bt horizon is within 18" of the mineral soil surface.

The soils have organic LFH horizons which vary from 1 to 3" in thickness. The Ae horizon is light gray to whitish in color and is usually less than 3" thick. The Bf and Bm horizons vary in color from brown, dark brown or strong brown to reddish-brown (chromas of 3.0 or more) and in thickness from a minimum of 4 to as much as 12". The AB, Bt, and BC horizons are grayish-brown to brownish in color and are similar to those of the Orthic and Brunisolic Gray Luvisol soils developed on similar soil parent materials. The BC grades to the C horizon with the latter occurring at depths between about 24 and 36".

In the map area, Bisequa Gray Luvisol soils are mainly found on silty glaciolacustrine deposits and to a minor extent on glacial till.

Podzolic Order

Podzolic soils are well or moderately well to imperfectly drained. They have organic surface horizons (LFH) which are underlain by B horizons in which the dominant accumulation product is amorphous materal composed mainly of humified organic matter combined in varying degrees with iron and aluminum (see Figure 6 and 7). The soils mainly occur at the higher elevations where higher precipitation, cooler temperatures prevail and the vegetative cover is conducive to the production of acidic organic matter on the mineral soil surface.

The podzolic soils in the map area fall within the Ferro-Humic Podzol and Humo-Ferric Podzol great groups.

Orthic Ferro-Humic Podzol subgroup

These soils have podzolic B horizons in which organic matter, iron and aluminum are the main accumulation products (Bhf horizons). The upper 4" of the B horizon contains more than 10% organic matter and the oxalate-extractable iron and aluminum exceeds that of the C horizon by 0.8% or more. In addition, the ratio of organic matter to oxalate-extractable iron in the B horizon is less than 20.

The typical horizon sequence is: LFH, Ae, Bhf, Bfh, Bf, Bm, BC and C.

The soils have surface organic LFH horizons which usually vary from 2 to 4" in thickness. The Ae is light gray to whitish in color and usually varies from 1 to 3" in thickness. The Bhf and Bfh horizons are dark colored (value and chromas usually 3.0 or less when moist) and grade to Bf and Bf/Bm horizons that range from reddish-brown or dark reddish-brown to strong brown, dark brown or brown in color (chromas 3.0 or more). The combined thickness of the various B horizons varies from 10 to 15". Thickness of the BC and depth to the C horizon is related to slope, soil drainage and the depth to bedrock.

Orthic Ferro-Humic Podzol soils have only been classified as the secondary component in map complexes with Orthic Humo-Ferric Podzol soils. They occur on glacial till and shallow glacial till and/or colluvium over bedrock in the eastern part of the map area.

Orthic Humo-Ferric Podzol subgroup

These soils have podzolic B horizons in which organic matter, iron and aluminum are the main accumulation products (Bfh or Bf horizons). The upper 4" of the B horizon contains less than 10% organic matter and the oxalate-extractable iron and aluminum exceeds that of the C horizon by 0.8% or more. In addition, the ratio of organic matter to oxalate-extractable iron is less than 20.

The typical horizon sequence is: LFH, Ae, (Bfh), Bf, BC and C.

The soils have surface organic LFH horizons which are from 1 to 3" thick. The Ae is light gray to whitish in color and averages about 1 to 3" in thickness with minor inclusions as thick as 6". The thin Bfh, if present, is dark colored (value and chromas usually 3.0 or less when moist). The Bf and Bf/Bm horizons range from reddish-brown or dark reddish-brown to strong brown, dark brown or brown in color (chromas of 3.0 or more) and vary from about a minimum of 6" to as thick as 15". Variations in the depth to the BC and C horizons are related to depth to bedrock, coarseness of the soil textures, and the depth to gravelly and sandy subsoil.

Within the map area, Orthic Humo-Ferric Podzol soils occur on basal and ablation till, shallow glacial till and/or colluvium over bedrock, glaciofluvial gravels and sands and, to a minor extent, on fluvial fan and lacustrine beach deposits.

Bisequa Humo-Ferric Podzol subgroups

These soils have the general characteristics of Orthic Humo-Ferric Podzols in the upper horizons. They differ from Orthic Humo-Ferric Podzols by having a Bt horizon which has its upper boundary deeper than 18" from the mineral soil surface. This latter criteria differentiates these soils from Bisequa Gray Luvisol soils.

The typical horizon sequence is: LFH, Ae, (Bfh), Bf, Bm, AB, Bt, BC and C.

The soils have surface organic LFH horizons which vary from 1 to 3" in thickness. The Ae is light gray to whitish in color and is usually 1 to 3" thick. The thin Bfh, if present, is dark colored (value and chromas usually 3.0 or less when moist). The Bf or Bf/Bm horizons range from reddish-brown or dark reddish-brown to strong brown, dark brown or brown in color (chromas of 3.0 or more) and from a minimum of 6" thick to 18". The underlying AB, Bt and BC horizons are grayish-brown to brown and have textural and structural characteristics which are similar to the Brunisolic and Bisequa Gray Luvisol soils. The BC grades to the C horizon at depths varying from about 30 to 48".

These soils occur extensively on basal and ablation till deposits and, to a minor extent, on the finer glaciofluvial sand deposits within the map area.

Brunisolic Order

Brunisolic soils are well or moderately well to imperfectly drained. They have organic surface horizons (LFH) which are underlain by weakly (Aej) or strongly (Ae) developed eluvial horizons. The soils have brownish Bm horizons, which do not meet the specifications for podzolic Bf horizons or textural Bt horizons (see Figure 6 and 7).

The Brunisolic soils in the map area fall mainly within the Dystric Brunisol great group and to a minor extent, within the Eutric Brunisol great group. The main differentiating criteria between the two great groups is the pH (in 0.01M $CaCl_2$) of the Bm horizons and the kind of parent material on which they have developed. Dystric Brunisols have generally developed on acidic parent materials and have Bm horizons with a pH of 5.5 or lower. In contrast, Eutric Brunisols have developed on base-rich parent materials and have Bm horizons with a pH of 5.5 or higher. The soils are represented by the following subgroups:

Orthic Dystric Brunisol subgroup

The typical horizon sequence is: LFH, Bm, C and IIC.

The soils have surface organic LFH horizons which vary from 1/2 to 2" in thickness. A weak or incipient Aej is occasionally present. The underlying Bm horizons vary from yellowish-brown or dark yellowish brown to brown, dark brown or strong brown in color (chromas of 3.0 or more). They vary in total thickness between about 6" and 12". Variation in the thickness of the BC and depth to the C horizon is related to the depth to gravelly and sandy subsoils and the depth to bedrock.

Within the map area, Orthic Dystric Brunisol soils occur on ablation till, shallow glacial till and/or colluvium over bedrock, glaciofluvial gravels and sands and glaciolacustrine beach deposits.

Degraded Dystric Brunisol subgroup

The typical horizon sequence is: LFH, Ae, Bm, C and IIC.

The soils have surface organic LFH horizons varying from 1/2 to 2" in thickness. They have moderately to strongly developed Ae horizons which are light gray to whitish in color and 1 to 3" in thickness. The presence of the Ae horizon is generally the main criteria for differentiating these soils from the Orthic Dystric Brunisol subgroup. The underlying Bm horizons vary from yellowish-brown or dark yellowish brown to brown, dark brown or strong brown in color (chromas of 3.0 or more) and vary in total thickness from about 6" to 15". Variation in the thickness of the BC and depth to the C horizons is related to the depth to gravelly and sandy subsoil or the depth to bedrock.

Within the map area, Degraded Dystric Brunisol soils occur on ablation till, shallow glacial till and/or colluvium over bedrock, glaciofluvial gravels and sands, glaciolacustrine beaches and silts and, to a minor extent on fluvial fan deposits.

Orthic Eutric Brunisol subgroup

The typical horizon sequence is: LFH, Bm, BC, C or Ck, and IIC (or IICk).

These soils are similar to Orthic Dystric Brunisol soils in appearance and physical characteristics. They differ however in that the pH of the solum is above 5.5 and the parent material is usually calcareous.

Orthic Eutric Brunisol soils have only developed in shallow deposits of glacial till and/or colluvium over limestone bedrock and occupy a small acreage in the northwestern part of the map area.

Degraded Eutric Brunisol subgroup

The typical horizon sequence is: LFH, Aej or Ae, Bm (Btj), BC, C or Ck and IIC (or IICk).

These soils are similar to the Degraded Dystric Brunisol soils in appearance and physical characteristics. They differ however in that the pH of the solum is above 5.5 and the parent material is usually calcareous.

Degraded Eutric Brunisol soils have developed in shallow deposits of glacial till and/or colluvium over limestone bedrock, and on glaciolacustrine silts.

Regosolic Order

Regosolic soils are well or moderately well to imperfectly drained. They are relatively young soils in which horizon development is too weak to meet the requirements of any of the other soil orders. The soils usually have organic surface horizons (LFH) which are underlain by C or Ck horizons (a thin Ah horizon may also occur).

The soils in the map area which fall within the Regosol great group are represented by the following subgroup:

Orthic Regosol subgroup

The typical horizon sequence is: LFH, (Ah), C or Ck.

Orthic Regosol soils in the map area occur on fluvial (alluvial) deposits that can vary from fairly uniform in texture to extensively interstratified. Where the latter occurs the downward succession of C or Ck horizons have variable textures and thickness.

Gleysolic Order

Gleysolic soils are saturated with water and under reducing conditions either continuously or during prolonged periods of the year. Due to their poor to very poor drainage the soils have, within 20" of the mineral surface, matrix colors of low chroma varying from gray or dark gray to greenish-gray or bluish-gray. The soils usually also have distinct or prominent motties of high chroma. In addition, they may also have an organic surface layer less than 16" thick of mixed peat or up to 24" of fibric moss peat. Gleysolic soils have mainly developed under a high component of hydrophytic vegetation.

Gleysolic soils in the map area fall within the Humic Gleysol, Gleysol or Eluviated Gleysol great groups. Each of these great groups is represented by both Orthic and Rego subgroups.

Soils in the Humic Gleysol great group have an Ah surface horizon which is more than 3" thick, whereas soils in the Gleysol great group have either no Ah horizon or an Ah horizon which is less than 3" thick. Typical horizon sequence in the respective subgroups are:

Orthic Humic Gleysol subgroup - LFH and/or O, Ah, Bg, BC, Cg
Rego Humic Gleysol subgroup - LFH and/or O, Ah, Cg
Orthic Gleysol subgroup - LFH and/or O, Bg, BC, Cg
Rego Gleysol subgroup - LFH and/or O, Cg

The Orthic subgroups have structural B horizons while the Rego subgroups lack B horizons.

Soils in the Eluviated Gleysol great group have Aeg (leached) and Btg (clay accumulation) horizons. The main difference between the Humic and Low Humic subgroups is the presence (or absence) of an Ah horizon, as defined for the Humic Gleysol and Gleysol subgroups, respectively. Typical horizon sequence of the respective subgroups in the Eluviated Gleysol great group are:

Humic Eluviated Gleysol subgroup - LFH and/or O, Ah, Aeg, Btg, BC, Cg
Low Humic Eluviated Gleysol subgroup - LFH and/or O, Aeg, Btg, BC, Cg

At the scale of mapping, the soils of the Gleysolic order have not been mapped at the subgroup level due to their complexity and intermixing within any particular landform. As a result, where one, two or more of the subgroups occupy significant proportions of the various soil association components, their presence is indicated as "Gleysolics".

Gleysolic soils occur on practically all of the soil parent materials within the map area, usually in depressional or low lying, moisture accumulating locations.

Organic Order

Organic soils have developed in deposits consisting of dominantly organic material which is at least 16" deep (24" if the material is undecomposed). They occupy very poorly drained depressional areas and are saturated for most, or all, of the year.

Organic soils in the map area fall within the Fibrisol, Mesisol and Humisol great groups.

Soils in the Fibrisol great group are those in which the dominant organic layer(s) is relatively undecomposed. The soils contain large amounts of well preserved fiber that is easily identifiable as to botanical origin. The soils have very low bulk density and high saturated water-holding capacity.

Subgroups which have been identified include Fenno-Fibrisol and Mesic Fibrisol, with inclusions of Terric Fibrisol. Fenno-Fibrisols consist mainly of the undecomposed remains of fen vegetation (sedge, reeds, etc.), Mesic Fibrisols contain subdominant partially decomposed layers while Terric Fibrisols are less than 52" deep over mineral material.

Soils in the Mesisol great group are at a stage of decomposition intermediate between Fibrisols and Humisols. The material has intermediate amounts of fiber, medium bulk density, medium saturated water-holding capacity, and is partly altered both physically and biochemically.

Subgroups which have been identified are Typic Mesisol, Fibric Mesisol and Humic Mesisol, with inclusions of Terric Mesisol. Typic Mesisol consist dominantly of partially decomposed organic material at least 52" deep. Fibric Mesisols and Humic Mesisols respectively have subdominant undecomposed and well decomposed layers while Terric Mesisols are less than 52" deep over mineral materials.

Soils in the Humisol great groups are those in which the dominant organic layer(s) is highly decomposed. They contain low amounts of plant fiber, and have the highest bulk density and the lowest saturated water-holding capacity of organic soils. The organic material is relatively stable and changes very little with time, both chemically and physically.

Subgroups which have been identified include Typic Humisol, Mesic Humisol and Terric Humisol. Typic Humisols consist dominantly of well decomposed organic material, Mesic Humisols have partially decomposed subdominant layers while Terric Humisols are less than 52" deep.

Organic soils occur extensively within the map area and generally overlie basal till, ablation till or glaciolacustrine deposits. In addition, they occur in fluvial (alluvial) areas where the terric subgroups occupy significant parts of the map units.

Plate 2. Drumlinized glacial till typical of the terrain on which Deserters soils have developed.

PART II

DESCRIPTION OF THE SOIL ASSOCIATIONS AND THEIR ENVIRONMENT

MAPPING METHODOLOGY

The soil survey was conducted on a broad reconnaissance basis with the primary purpose of providing a data base for applying the Canada Land Inventory's Soil Capability for agriculture and forestry rating systems. The soil surveyors were faced with two major obstacles - the vastness of the area and little or no access to most of it. Consequently, it was necessary to rely heavily on air photo interpretation. To use the latter successfully in soil mapping, the soil surveyor had to become familiar with soil development, landforms, bedrock geology and vegetation in the accessible areas and then, by studying the air photographs, compare features of the accessible areas with similar features in the inaccessible ones. Within the accessible areas, soil surveyors travelled the existing roads with 4-wheel drive vehicles, examined road cuts and walked considerable distances along logging roads, trails, etc. in order to study soil profiles. Remote and inaccessible areas were spot-checked and mapped using helicopters.

The reliability of the mapping varies with access. A large part of the map area was only accessible by helicopter for spot-checking. An estimate of the accessibility and reliability of the mapping in the 16 - 1:50 000 base maps is shown in Figure 8. Over half of the map area had poor ground access and hence, likely, lower reliability.

The main characteristics recognized in the soil profiles were the horizon sequence and thickness, colour (Munsell classification), texture, structure, consistence, parent material, stoniness and drainage. Associated features such as topography (slope), aspect and vegetation were also recorded. As the mapping progressed, representative soil samples of the various soil subgroups were obtained and analysed in the laboratory. In addition, detailed soil profiles were described and sampled for laboratory analyses.

The mapping was done on air photos (scale 1:31 680) flown in 1963 for the Prince George Special Sales Area and in 1966 and 1967 for the remainder of the map area. Air photos flown in 1971 at a scale of 1:63 360, were used for overview purposes in the eastern quarter of the map area.

The soil and landform boundaries were transferred from the air photos to 1:50 000 base maps for final manuscript map preparation and symbolling. These maps were then reduced photographically to a 1:100 000 scale for publication.

DEVELOPMENT OF THE SOIL ASSOCIATIONS

The soils legend for the map area is based on the concept of a soil association. A soil association is a sequence of soils of about the same age, derived from similar parent material, and occurring under similar climatic conditions but having different characteristics due to variations in relief and in drainage.

In the map area, soils were initially stratified on the basis of landform and parent material characteristics. Combined with soil profile development, they formed the basic framework of the soil association. The effect of increasing precipitation progressively changes soil development and

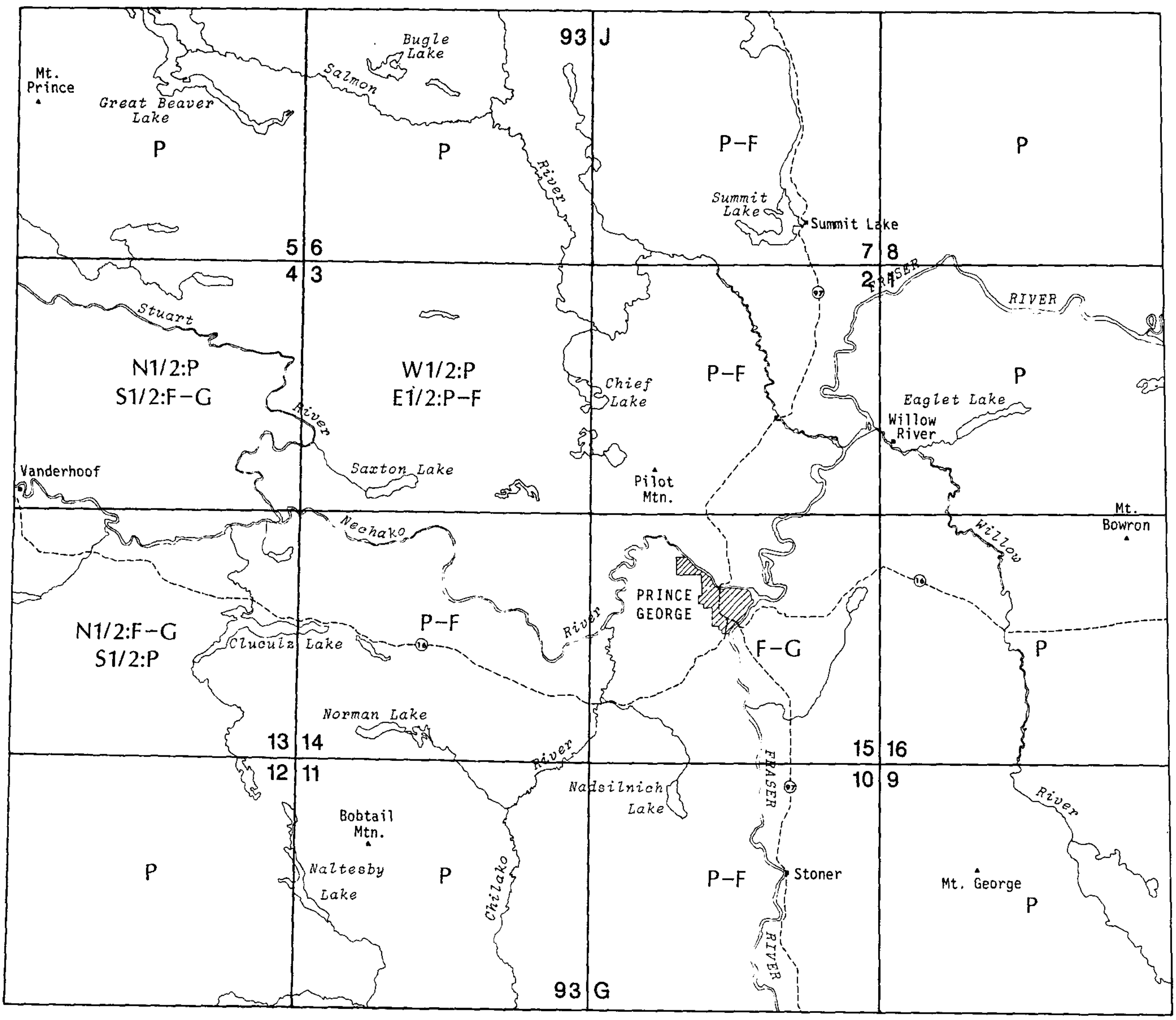


Figure 8. Accessibility and reliability of mapping. G - Good: several roads; considerable air photo interpretation - most reliable mapping. F - Fair: few roads; access by helicopter, extensive air photo interpretation. P - Poor: very few roads; access mainly by helicopter, extensive air photo interpretation - least reliable mapping.

classification on the various parent materials (see Figure 6 and 7). In other words, soils classified as Orthic Gray Luvisol in the Vanderhoof area become Brunisolic Gray Luvisol or Bisequa Humo-Ferric Podzol in the Prince George area on similar parent materials. Where such variation in climate, or soil depth, or soil moisture regime result in significant variations in profile development, new soil association components are defined.

Every soil association is given a local name such as Barrett, Crystal, Deserters, or Ramsey. Each has a defined range in soil characteristics which include colour, texture, structure, arrangement and thickness of horizons, depth and drainage. Each soil association name is assigned a unique one or two letter symbol (e.g. BA, CR, D, R) and individual components of the association are identified by numbers (e.g. BA2, CR3, D3).

The dominant soil(s) in a soil association component usually consists of one, or sometimes two, soil subgroups and drainage phases. Significant soils in a soil association component include soil subgroups of other soil great groups and/or drainage phases. The dominant soil subgroup(s) usually occupies 60% or more of a map unit area. A significant subgroup generally occupies at least 20%, but not more than 40% of a map unit area. Subgroups occupying less than 20% of a map unit area are normally not recognized except when they are strongly contrasting. Where the soil landscape is complex, the soil associations can contain more than two related or unrelated dominant subgroups in the map unit area.

Gleyed and lithic subgroups of the related dominant and significant soil subgroups can occur within the soil associations and are identified in the legend and soil descriptions in that manner.

Where it was not possible to separate the different soils due to the scale of mapping, a map unit complex of different soil association components occur. Their area in the map unit is expressed as a proportion (on a scale of 1 to 10) of the total area in the map unit and is indicated as a superscript (e.g. $BA_1^6 - CR_2^4$, $D_2^7 - R_2^3$).

The location and extent of shallow-to-bedrock soils at the higher elevations, which were relatively inaccessible, was greatly aided by the use of air photos and bedrock geology maps. The most important features were mode of origin and relative acidity or alkalinity. Where a mixture of two or more bedrock types occurred, the dominant bedrock prevailed in characterizing the soil association.

SOIL ASSOCIATION DESCRIPTIONS

The description of each soil association follows a standard format to facilitate comparison of the various soil associations. Included are sections on: general location and physiography; landform; parent material and soils; climate and vegetation; soil association components, including their subgroup combinations and soil drainage; and map complexes in which the soil association is dominant.

The cross-sectional diagram for each soil association generally indicates the physiographic relationship between landforms, soil development, landscape position, drainage and vegetation.

The key to soil development for each cross-sectional diagram is outlined in Table 2. The vegetation symbols indicate the most common species which occur. The key to the vegetation symbols are presented in Table 3.

Table 2 Key to Soil Classification Symbols Used in Soil Association Diagrams

BiHFP	- Bisequa Humo-Ferric Podzol
BiGL	- Bisequa Gray Luvisol
BrGL	- Brunisolic Gray Luvisol
DDB	- Degraded Dystric Brunisol
DEB	- Degraded Eutric Brunisol
DGL	- Dark Gray Luvisol
G	- Gleysolic
Gl	- Gleyed
GlGL	- Gleyed Gray Luvisol
GlHFP	- Gleyed Humo-Ferric Podzol
GlR	- Gleyed Regosol
Li	- Lithic
LiDB	- Lithic Dystric Brunisol
LiFHP	- Lithic Ferro-Humic Podzol
LiHFP	- Lithic Humo-Ferric Podzol
O	- Organic
ODB	- Orthic Dystric Brunisol
OEB	- Orthic Eutric Brunisol
OGL	- Orthic Gray Luvisol
OFHP	- Orthic Ferro-Humic Podzol
OHFP	- Orthic Humo-Ferric Podzol
OR	- Orthic Regosol
R	- Regosol
Subs	- Subgroups

Table 3 Key to Vegetation Symbols Used In Soil Association Diagrams

True Fir (Abies)		Aspen	
Spruce		Shrubs	
Lodgepole Pine		Herbs	
Hemlock		Sedges	
Western Red Cedar		Moist Mosses	
Birch		Dry Mosses	
Cottonwood		Lichen	

Information on the suitability or limitations of the soils for agricultural, engineering, forestry and recreational uses is outlined in Part III of this report.

ALIX SOIL ASSOCIATION (AX)

General Location and Physiography - The Alix soil association occurs in the west and southeast of the map area. It is located within the Nechako Plain and Fraser Basin physiographic regions, and to a minor extent, the lower elevations of the Nechako Plateau. Eleva- tions vary from about 2,500' and 3,000' with minor inclusions south of Sinkut Lake rising to 3,500'. The association dominates in 0.8% of the map area.

Landform - Alix soils have developed on gravelly glaciofluvial deposits that occur as outwash terraces, deltas, gravel-filled channels, eskers and kames. Kettled and hummocky surfaces are sometimes present. In addition, they occur on intermittent glaciofluvial deposits between drumlins or are scattered within glacial till landforms.

The topography is variable, ranging from nearly level or undulating on terraces, to rolling or hilly. In places strong to very steep slopes occur, usually on the sides of meltwater channels and terraces, or in complexes with basal till and/or esker landforms.

Parent Material and Soils - The glaciofluvial deposits (parent material) vary considerably in depth and composition. They are generally deep but can be as shallow as 5' over till. They predominantly consist of well to poorly sorted and stratified gravels and sandy gravels that are loose, porous, rapidly permeable and contain variable amounts of cobbles and stones.

The surface of the deposits generally consists of a gravelly, moderately coarse to coarse textured capping which varies in thickness from less than 1' to 2'. The textures of the capping are gravelly sandy loam or gravelly loamy sand and grade through gravelly loamy sand and gravelly sand to gravel at depth. Surface stoniness varies from slightly to exceedingly stony depending on the depth and texture of the capping.

The soils are classified as Orthic or Degraded Dystric Brunisols. They are rapidly drained and droughty due to the coarse textures and the loose, porous composition of the deposits. Poorly drained Gleysolic soils occasionally occur in the bottom of meltwater channels and kettle holes; these are usually underlain by basal till at shallow depth.

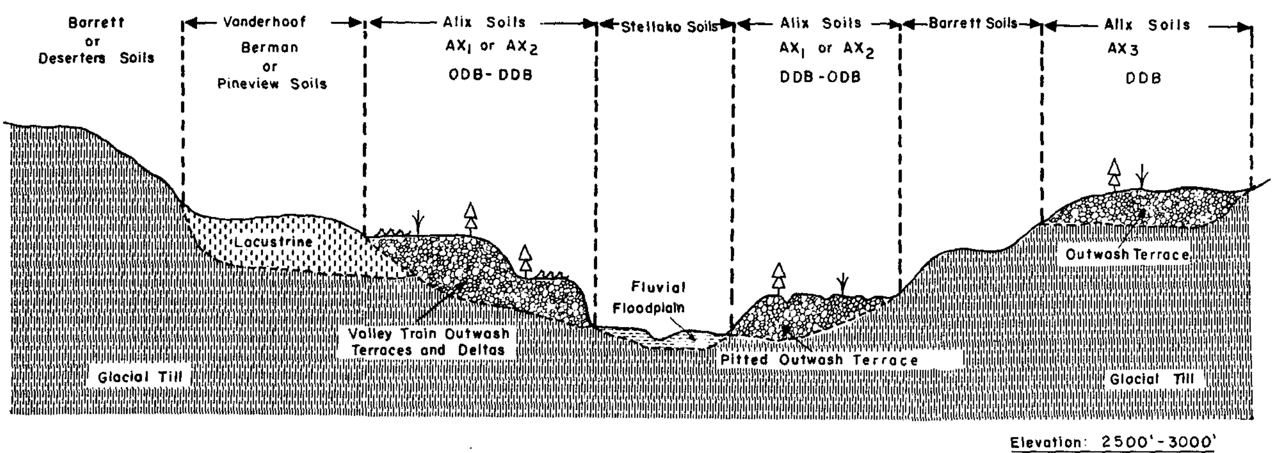
The Alix soils have developed on similar parent materials and landforms as the podzolic Ramsey soils but occur in drier environments.

Climate and Vegetation - The annual and May to September precipitations associated with the Alix soils are estimated to be in the range of 20" - 25" and 8" - 12", respectively. The average frost-free period is similar to that of the Barrett and Deserters soils, which is generally less than 60 days.

The Alix soils occur within the Subboreal white spruce - alpine fir zone and are characterized by a low productivity forest mainly composed of semi-open stands of lodgepole pine with minor white spruce, trembling aspen and Douglas-fir. The understory vegetation varies with the density of the forest canopy and is composed of a light shrub and herb cover adapted to coarse-textured soils. Fires have frequently occurred in these stands.

Soil Association Components - Three components of the Alix association are defined in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
AX1	Orthic Dystric Brunisol	Degraded Dystric Brunisol	rapid	Aej or Ae horizon is variable and often asent in regrowth lodgepole pine stands.
AX2	Degraded Dystric Brunisol	Orthic Dystric Brunisol	rapid	Generally higher in elevation than the AX1 component.
AX3	Degraded Dystric Brunisol	—	rapid	Occurs in the moister, southeastern part of the map area.



Map Complexes - The Alix-Deserters and Alix-Crystal map complexes occur along drainage channels within dominantly glacial till landscapes.

The Alix-Barrett map complex occurs in the vicinity of the Sinkut River and identifies the soils developed on the intermixed gravelly, coarse textured, glaciofluvial deposits and rolling basal till.

Map complexes with the Roaring and Berman associations occur on the esker-lacustrine complex extending southeast from Dahl Lake to the Chilako River. The deposits are kettled and dissected.

The Alix-Mapes map complex occurs at the south end of Naltesby Lake on the Butcher Flats where the gravelly Alix and sandy Mapes soils have developed in the meltwater channel which once drained into the adjoining glacial lake basin.

The Alix-Stellako and the Alix-Toneko map complexes occur on the terraces along the Willow River in the southeastern part of the map area.

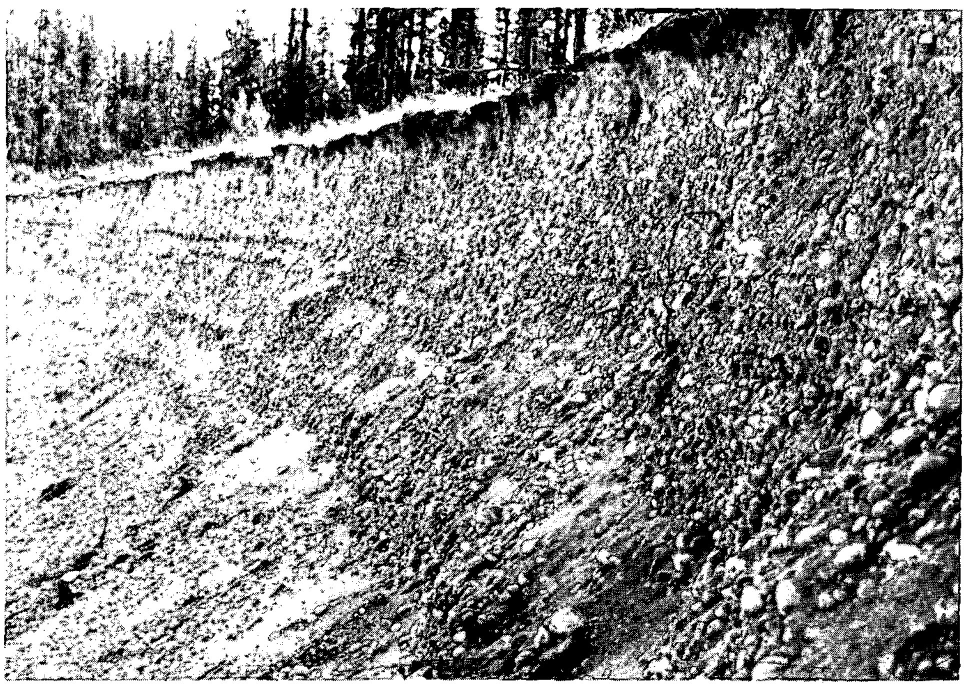


Plate 3. Glaciofluvial terrace deposits in the Crooked River meltwater channel on which Ramsey soils have developed. The Alix soils have developed on similar materials.

AVERIL SOIL ASSOCIATION (AL)

General Location and Physiography - The Averil soil association occurs in the McGregor Plateau and Fraser Basin physiographic regions in the northeastern part of the map area. The soils are associated with a northwest trending belt of sedimentary and metamorphosed sedimentary bedrock. Elevations vary from about 3,000' to 4,000'. The association is dominant in 2.3% of the map area, and occurs predominantly in map complexes with the Dominion association.

Landform - The Averil soils occur on bedrock apexes, ridges and steep slopes covered by a shallow mantle of glacial till and/or colluvium that is generally less than 5' thick. The landforms have characteristic northeast trending ridges and glacial grooves associated with rock and basal till drumlins.

Steep side slopes and sharp to rounded tops indicative of the underlying bedrock topography are evident. In general, the topography is steeply to extremely sloping or strongly rolling to very hilly.

Surface drainage conforms to the gradient of the underlying bedrock and to the northeastern trend of the depressions between the drumlin ridges.

Parent Material and Soils - The shallow to bedrock Averil soils are mainly associated with sedimentary and metamorphosed sedimentary bedrock, predominantly limestone and dolomite with inclusions of silty and shaly limestone, sandstone, calcareous siltstone, calcareous schist, quartzite, sandy dolomite and slate (Tipper and Muller, 1961). In the vicinity of the Crooked River the soils are also underlain by minor areas granitoid gneiss, schists, pegmatite and small bodies of granodiorite.

The parent material consists of glacial till and/or colluvium derived from glacial till and broken, weathered bedrock. It is generally less than 5' in depth over bedrock with gradations to 20" or less (lithic soils). The soils are moderately coarse to medium textured with gravelly sandy loam and gravelly loam being the dominant textures. Stoniness varies with the composition and origin of the bedrock and the glacial till. The permeability and compactness of the soil varies with depth over bedrock; the most shallow areas are least compact and most permeable.

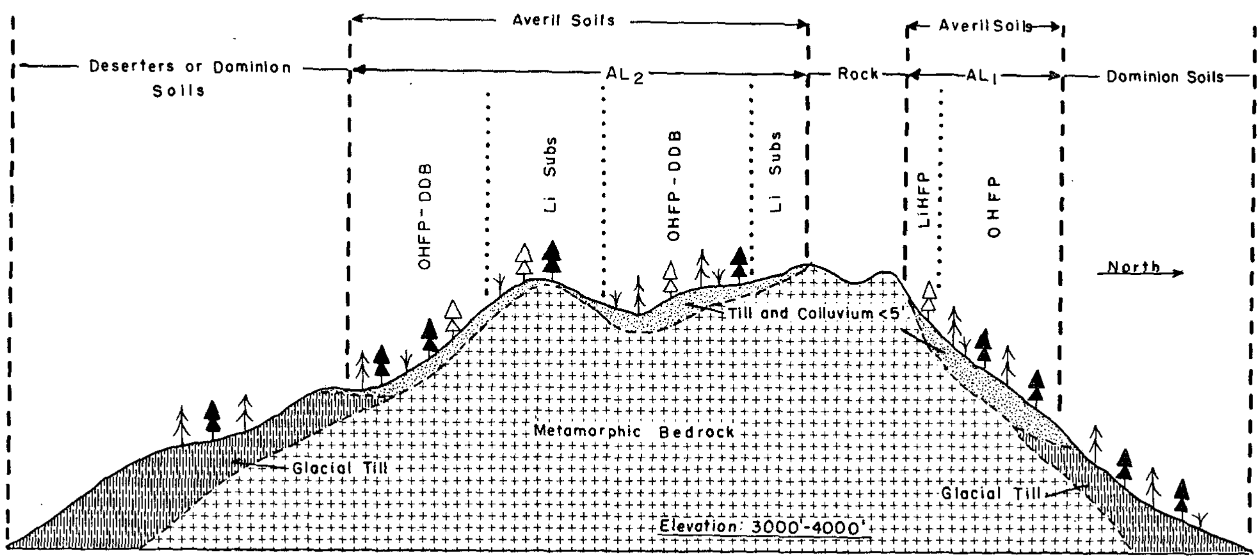
Soil drainage varies with the depth to bedrock and topography. The steeply sloping and convex, moisture shedding slopes have mostly Orthic Humo-Ferric Podzol soils which are well to moderately well drained. There are also significant inclusions of Degraded Dystric Brunisol and lithic soils which are well to rapidly drained. As the depth of glacial till thickens, the soils merge with the Dominion association. Small, poorly drained depressions, ponds or lakes occur only occasionally within Averil soil areas.

Climate and Vegetation - The Averil soils occur in an environment with high annual precipitation, estimated to be more than 35". The May to September precipitation is also estimated to be higher than the average for the map area. Frost-free period ranges from less than 30 to 50 days.

The soils occur at the upper elevations of the Subboreal white spruce - alpine fir and the Subalpine Engelmann spruce - alpine fir zones. The vegetation is generally composed of a decadent alpine fir and spruce forest. Devil's club occurs in large clumps or is scattered throughout with the density depending on the openness of the forest canopy. Shrubs, herbs and mosses are lush and abundant in the understory.

Soil Association Components - Two components of the Averil association were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
AL1	Orthic Humo-Ferric Podzol		well - moderately well	
		Lithic Humo-Ferric Podzol		Lithic soils occur where the depth to bedrock is 20" or less.
AL2	Orthic Humo-Ferric Podzol	Degraded Dystric Brunisol	well - moderately well	Degraded Dystric Brunisols mainly occur on south and west aspects.
		lithic subgroups	well - rapid	Lithic soils occur where the depth to bedrock is 20" or less.



Map Complexes - Most of the Averil soils occur as the dominant soil in map complexes with the Dominion soils. A minor acreage occurs where the soil is dominant in map complexes with the Deserters and Pineview soils. The Averil-Rock Outcrop map complex occurs on Mount Averil.

BARRETT SOIL ASSOCIATION (BA)

General Location and Physiography - The Barrett association occurs in the western half of the map area, generally within the Fraser Basin, Nechako Plain and the lower elevations on the Nechako Plateau physiographic regions. Elevations vary from about 2,500', the approximate upper limit of the glacial lake basins, to between 3,000' and 3,500', depending on aspect. The Barrett association is dominant in 6.2% of the map area.

Landform - The Barrett soils have developed in basal till deposits characterized over a large part of the map area by streamlined, parallel, cigar or egg-shaped ridges (drumlins) and intervening troughs (glacial grooves) which are typical patterns of a drumlinized till plain (Armstrong, 1948). The drumlins vary considerably in height, but average between 50 and 100', with some ranging up to 150' or more. Their heights vary from place to place but in any one location are usually quite uniform. The overall effect is a drumlinized topography which varies from gently rolling to hilly with slopes ranging from 6% to more than 30%.

Due to the variable action of the glacial ice, some parts of the map area are relatively featureless or exhibit a random pattern of ridges, humps and depressions of various shapes and sizes. The topography classes are similar to the drumlinized till plain but are generally more gradual and slopes tend to be longer.

On the Nechako Plateau the glacial till landforms conform to the topographic features of the underlying bedrock. Here the topography is generally steeply to very steeply sloping.

Surface drainage on the drumlinized till plain is poorly integrated. Numerous creeks drain into scattered small and large lakes, many of which have no drainage exits.

Parent Material and Soils - The unweathered basal till parent material is dark grayish brown in colour, weakly calcareous at depth, very compact, and has slow permeability and hard to very hard consistence.

The deposits are predominantly medium to moderately fine textured. Gravelly loam and gravelly clay loam are the dominant subsoil textures with gravelly sandy loam and gravelly loam being most common at the surface. Inclusions of sandy clay and light clay subsoils also occur. Gravel, cobbles and stones are distributed heterogenously throughout. Their surface distribution varies from slightly to very stony.

Soil drainage varies with topography. Most of the area has moisture shedding surfaces that result in a dominance of well to moderately well drained Orthic Gray Luvisol soils. Interspersed in the landscape, especially in the drumlinized topography, are numerous depressions, many of which are enclosed and receive surface run-off and seepage. These are are characterized by poorly to very poorly drained Gleysolic and Organic soils. Imperfectly drained soils (Gleyed Gray Luvisol) occur in lower slope locations where seepage accumulates, or adjacent to poorly drained soils. Depending on the topography and location, the extent of the imperfectly drained soils can vary from practically nil to between 20% and 40% of a map unit.

Small areas of shallow, coarse textured ablation till occurs over the basal till in some locations. This surface deposit resulted from the sorting action of run-off water as the glacier ice slowly melted. The deposits are scattered haphazardly in non-drumlinized till landscapes and were not mappable.

The Barrett soils occur on similar landforms and parent materials to those of the Deserters and Dominion soils, but are located in drier environments.

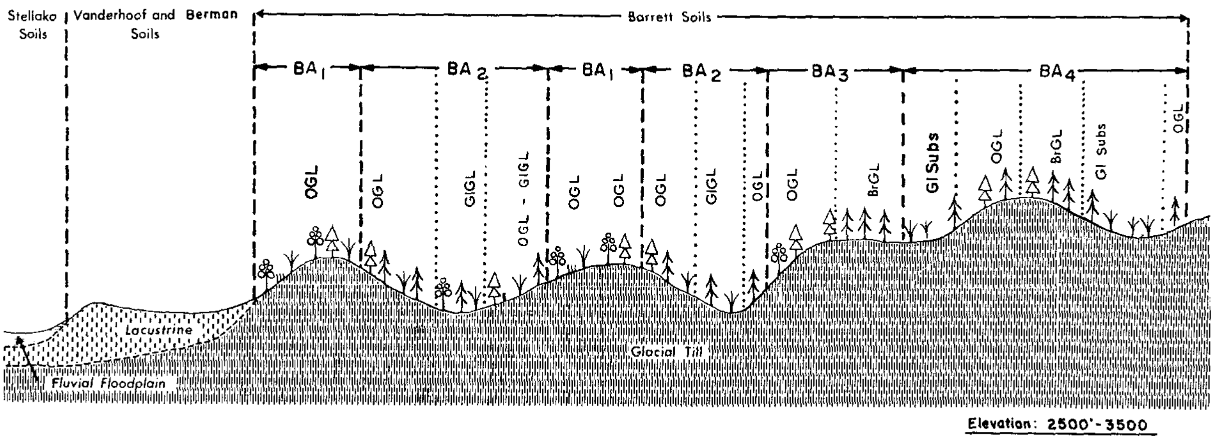
Climate and Vegetation - In general, the Barrett soils occur in the lower precipitation environments in the map area. Annual precipitation is generally in the range of 15" to 20". A gradual increase occurs towards the east, in the headwaters of the Chilako River in the southwest, and with increasing elevation. The frost-free period averages less than 60 days, but varies with elevation, aspect and location.

The soils occur within the Subboreal white spruce - alpine fir zone, with vegetation varying according to the precipitation pattern, soil drainage, aspect and fire history. White spruce and lodgepole pine are the dominant forest species along with scattered inclusions of Douglas-fir, aspen and birch. Willow is common where recent forest fires have occurred. The understory of shrubs, herbs and mosses varies with the maturity and density of the forest cover and is most abundant in imperfectly drained locations. Open to semi-open stands of lodgepole pine generally have a sparse shrub cover and the growth of herbs, and especially grasses, is suitable for forested range.

Areas of poorly to very poorly drained Gleysolic and Organic soils in the Barrett association support hydrophytic vegetation which varies from dense stands of willow, dwarf birch and sedges, to black spruce, stunted logepole pine and various mosses.

Soil Association Components - Four components were established in the map area for the Barrett association.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
BA1	Orthic Gray Luvisol		well - moderately well	Moisture shedding, drumlinized terrain
BA2	Orthic Gray Luvisol		well - moderately well	Similar to BA1 but with higher proportion of seepage and/or moisture receiving sites.
		Gleyed Gray Luvisol	imperfect	
BA3	Orthic Gray Luvisol	Brunisolic Gray Luvisol	well - moderately well	Transitional to the moister environment of the Deserters soils.
BA4	Orthic Gray Luvisol	Brunisolic Gray Luvisol	well - moderately well	Transitional to the moister environment of the Deserters soils.
		gleyed subgroups	imperfect	



All the above soil association components can include poorly to very poorly drained Gleysolic and Organic soils which generally occupy less than 10% to as much as 20% of the map units. Organic soils, where they can be separated at the scale of mapping, are mapped as the Chief and Moxley associations.

The BA3 and BA4 components represent transitional environments between the drier Barrett and the moister Deserters soils. In these areas the Orthic Gray Luvisol soils generally occur on southern and western aspects, whereas the Brunisolic Gray Luvisols occur on northern and eastern aspects, or become more common at higher elevations.

Map Complexes - The Barrett soils occur as the dominant soil in complexes with seven other associations.

During deglaciation variable shaped areas of basal till remained at or above the water level of associated glacial lakes. This association between glacial till and glaciolacustrine deposits has resulted in a complex pattern of Barrett soils being mapped with Berman, Vanderhoof, and Pineview associations. Where beach lines developed on basal till around the lake margins and resulting wave erosion removed the fines from the till, very coarse textured, gravelly, stony beach deposits were formed. The mixture of basal till and beach deposits have been mapped as the Barrett-Kluk complex.

Shallow deposits of glacial till over bedrock are scattered through the area and where these occur the soils are mapped as Barrett-Ormond or Barrett-Pope complexes. The Barrett-Crystal complex delineates a mixture of drumlinized and ablation till soils, with coarse textures associated with the latter.

BEAR LAKE SOIL ASSOCIATION (BE)

General Location and Physiography - The Bear Lake association occurs in the northeastern part of the map area where the soils are associated with the northward flowing Crooked River. Elevations vary from about 2,250' to 2,400'. Less than 0.1% of the map area is occupied by Bear Lake soils.

Landform - The sandy, terraced glaciofluvial parent material of the Bear Lake soils occur in the wide Crooked River glacial meltwater channel which resulted from the down-cutting action of a north-flowing glacial river. The channel is entrenched below the general level of the surrounding glacial till landforms and the glaciofluvial deposits occur as gently undulating to undulating outwash terraces. Deep to shallow kettles with moderately to steeply sloping sides occur in places and a few, isolated humps of gently to strongly rolling glacial till remain in the meltwater channel. The sandy terrace surfaces were partially wind eroded prior to the establishment of the vegetation and small dunes and drifts occur in places.

The deposits lack a surface drainage pattern. Small ponds, lakes and associated poorly drained soils occupy kettles and depressions. It is assumed that impervious basal till maintains the water table at the bottom of these depressions.

Parent Material and Soils - The sandy glaciofluvial deposits are predominantly deep, loose, porous, well sorted and rapidly permeable. Surface textures are mainly loamy sand or sand. Interstratified gravels and sands usually occur at depth. In a few areas basal till is encountered within 5' of the surface.

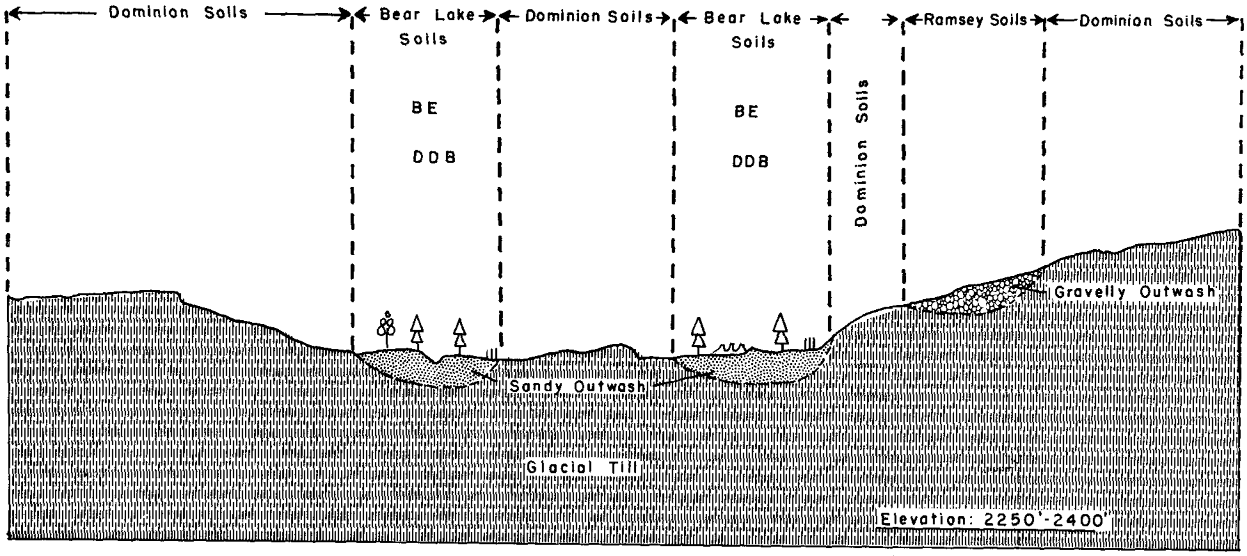
The soils are rapidly drained and classified as Degraded Dystric Brunisols. They occur in an environment that is moister than the similar sandy Saxton association, located along the Fraser and Chilako Rivers, and the Peta association, located along the Salmon River near Great Beaver lake.

Climate and Vegetation - The soils occur on the southern fringe of the moist northeastern environment. The average annual and May to September precipitations are 30" to 35", and greater than 11", respectively. The average frost-free period is about 50 to 60 days.

The soils occur within the Subboreal white spruce - alpine fir zone and support a low productivity forest due to their rapidly drained and droughtly characteristics. Lodgepole pine is the main forest species and grow in semi-open stands. Scattered white spruce and alpine fir regeneration occurs in places. The shrub and herb cover in the understory is scanty and a lichen ground cover is very noticeable.

Soil Association Components - Only one component of the Bear Lake Association has been identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
BE	Degraded Dystric Brunisol		rapid	Sandy, coarse textured soils.



Map Complexes - Bear Lake soils are not mapped as the dominant soil in map complexes with other soil associations. However, they do occur as the secondary soil in some map complexes with the Dominion and Ramsey associations.

BEARPAW RIDGE SOIL ASSOCATION (BR)

General Location and Physiography - The Bearpaw Ridge soil association mainly occurs in the northeast corner of the map area on the McGregor Plateau. More specifically, it occurs on the slopes of Mount Beauregard and in the vicinity of East and West Seebach creeks. Additional areas occur on the mountainous slopes, and to the northwest, of Spring Mountain, within the Fraser Plateau in the southeastern part of the map area. Elevations vary from about 3,000' to 4,500'. The soils dominate in 0.8% of the map area, primarily as the dominant soil in map complexes with the Captain Creek and Torpy River associations.

Landform - The landforms are characterized by steeply to extremely sloping mountainous topography often associated with bedrock apexes and ridges; slopes are often dissected. A shallow mantle of glacial till and/or colluvium, generally less than 5' thick overlies the bedrock.

Parent Material and Soils - The shallow to bedrock surficial deposits are underlain by sedimentary and metamorphosed sedimentary bedrock on the McGregor Plateau, and by sedimentary and volcanic bedrock in the vicinity of Spring Mountain (Tipper, 1961; Tipper and Muller, 1961).

The shallow mantle is mainly composed of glacial till and/or colluvium derived from mixed glacial till and weathered bedrock. The mantle is generally less than 5' in depth and grades to 20" or less (lithic soils), with minor localized exposures of bedrock occurring on apexes and steep slopes at the higher elevations.

The soils are predominantly moderately coarse to medium textured. Gravelly sandy loam and gravelly loam are the dominant textures with inclusions of sandy loam, loam and silt loam. Rockiness varies with the depth of the shallow mantle over bedrock. Stoniness varies with the composition of the associated glacial till and colluvium.

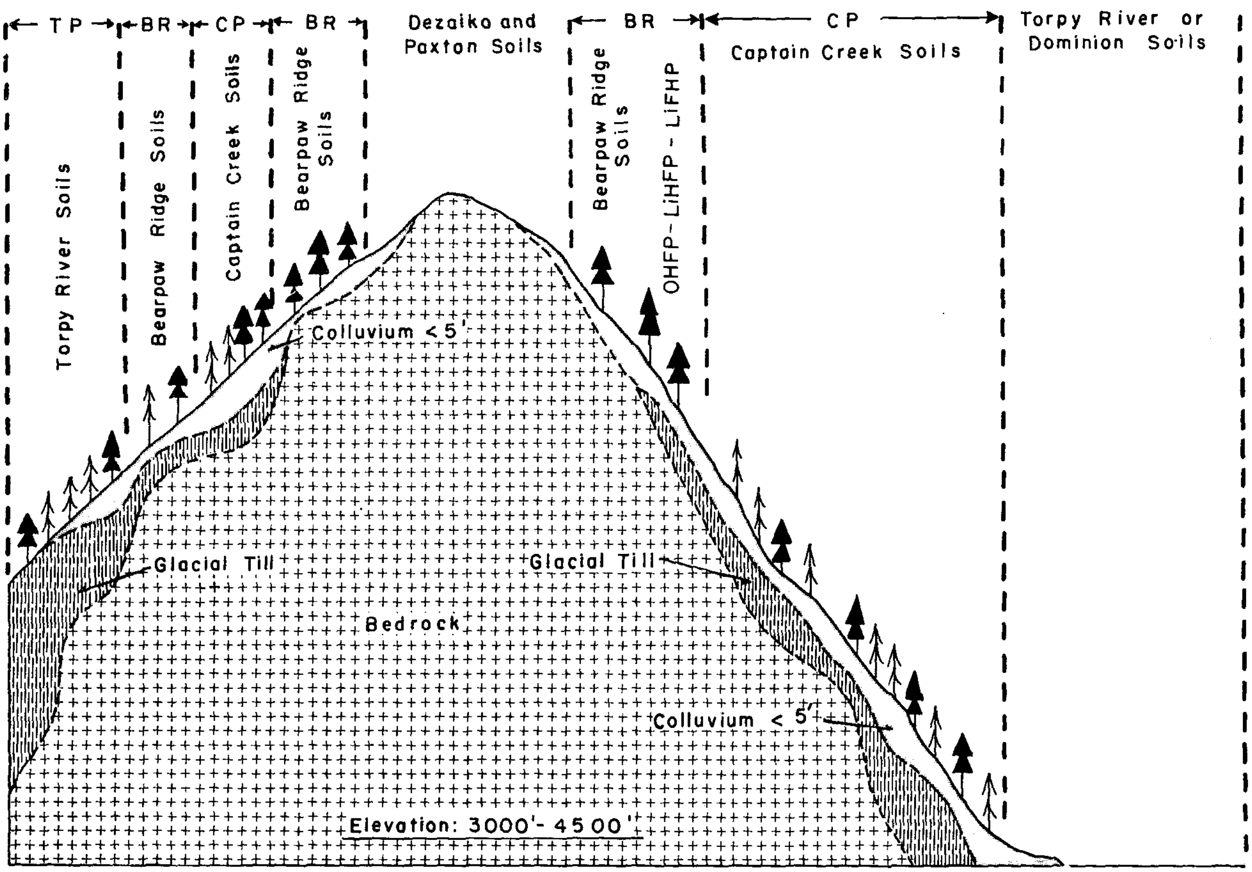
The moisture shedding, steep slopes are moderately well, well or rapidly drained with minor inclusions of imperfect drainage in seepage locations. The soils are classified as Orthic Humo-Ferric Podzols with significant inclusions of Lithic Humo-Ferric Podzols and Lithic Ferro-Humic Podzols. The Ferro-Humic Podzols occur on the most stable sites in mountainous topography.

Climate and Vegetation - The Bearpaw Ridge soils occur in the highest precipitation environments in the map area. They have cooler summer temperatures, higher winter snowfall and more cloud cover than most other soil associations in the area. Annual precipitation is estimated to be greater than 40".

The soils occur predominantly within the Subboreal Engelmann spruce - alpine fir zone; forest cover is mainly composed of Engelmann spruce and alpine fir. Shrub, herb and moss cover is variable, with a gradual increase in abundance and diversity as the soil depth thickens.

Soil Association Components - Only one component of the Bearpaw Ridge association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
BR	Orthic Humo-Ferric Podzol		well - moderately well	
		Lithic Humo-Ferric Podzol	well - rapid	
		Lithic Ferro-Humic Podzol	well - rapid	



Map Complexes - Bearpaw Ridge soils are mapped in complex with Captain Creek soils on steep mountain slopes where shallow deposits over bedrock and basal till greater than 5' thick both occur. Complexes with Torpy River soils occur on similar deposits but the topography is less severe and elevations are somewhat lower. The Bearpaw Ridge - Rock Outcrop map complex occurs on the extremely to very steep eastern slopes of Spring Mountain.

BEDNESTI SOIL ASSOCIATION

General Location and Physiography - The Bednesti soil association occurs in the Prince George glacial lake basin, which forms part of the Nechako Plain. The soils are mainly located in the central to east-central part of the map area, with additional acreage adjacent to the Salmon River Valley in the north-central part. Elevations range from 2,200' to about 2,600'. The Bednesti association is dominant over 2.4% of the map area.

Landform - The Bednesti soils have developed on silty glaciolacustrine landforms identifiable by their surface form and drainage patterns. Part of the area is characterized by gently undulating to gently rolling topography with scattered, shallow kettle holes. Most of the area is associated with deposition from the extensive Stuart River and Bednesti esker complexes which drained into the glacial lake basin from the west. Here the silty landforms are kettled at random, are variably dissected by erosion and are characterized by hummocky, rolling, hilly and strongly to very steeply sloping topography. Other parts with similar topography occur where the silty glaciolacustrine deposits are associated with, or overlay, drumlinized basal till. Areas dissected by erosion occur in close proximity to the deeply entrenched Fraser River.

Surface drainage of the silty landforms is generally good, as indicated by the dendritic drainage pattern composed of a variable density of moderately long creek channels and gullies. The gullies, whether occupied by active creeks or intermittent run-off, are generally U-shaped and steep-sided. The numerous kettle holes are often poorly drained and contain organic soils, ponds or small lakes.

Parent Material and Soils - The silty deposits are predominantly deep with inclusions of shallow deposits over glacial till, usually less than 10' thick, near the glacial lake margins. Silt loam or silty clay loam are the most common textures with the former occurring most frequently. The unweathered parent material is dark grayish brown to dark brown in color, stratified and varved, and calcareous at depth. It has moderate permeability and friable to firm consistence.

The Bednesti soils are dominantly well to moderately well drained and are classified as Bisequa or Brunisolic Gray Luvisol with significant imperfectly drained inclusions (gleyed subgroups). Minor areas of poorly drained Gleysolic and very poorly drained Organic soils occur in kettle holes and other small depressions.

Bednesti soils occur on parent materials similar to those of the Berman soils, but are located in a slightly moister environment. They also are often siltier than the Berman soils.

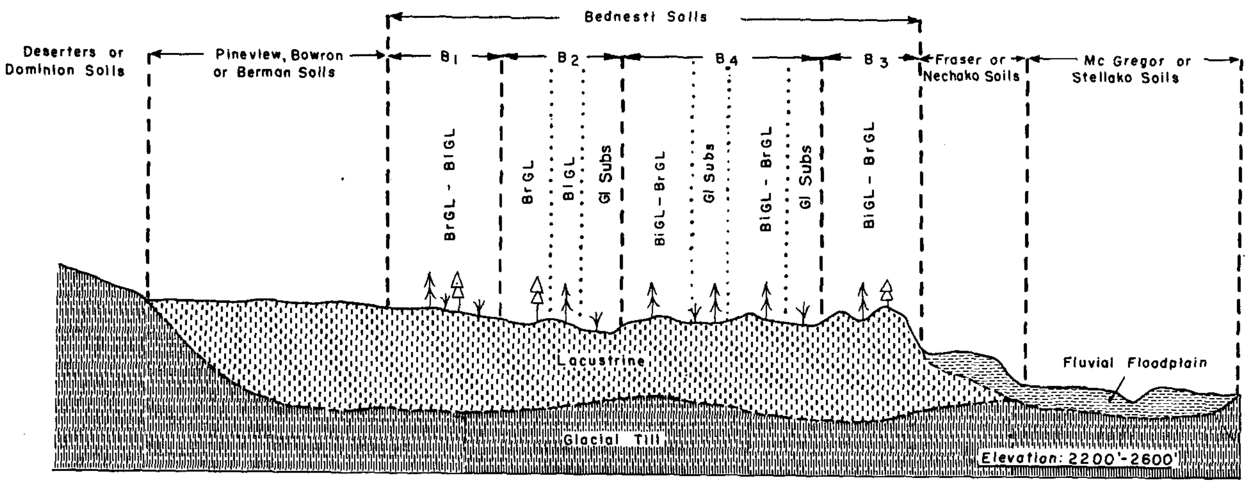
Climate and Vegetation - The annual precipitation in the eastern part of the acreage is estimated to be approximately 25" with a gradual reduction westward towards Bednesti and Saxton lakes in the central part of the map area. Field observations indicate a gradual transition, in the vicinity of these lakes, from the moister environment of the Prince George area to the drier environment of the Vanderhoof area.

The average frost-free season varies from 50 to 75 days with the latter occurring mainly towards the east. Frost pockets occur in places that vary according to the proximity to rivers, aspects, and topography, especially where the landscape is kettled.

The Bednesti soils provide good rooting conditions for all plants and the forest growth is lush and abundant. The association occurs within the Subboreal white spruce - alpine fir zone. White spruce and lodgepole pine are the dominant forest species with minor undergrowth of alpine fir. Douglas-fir occurs on drier, southern aspects in the western part of the area and birch, aspen, willow and alder are randomly scattered. Shrubs, herbs and various mosses grow abundantly in the understory but are most plentiful and luxuriant in areas of imperfectly drained soils (gleyed subgroups) where additional moisture is available during the growing season. Poorly and very poorly drained soils support black spruce, sedges, various mosses and other hydrophytic vegetation.

Soil Association Components - Four components were established for the Bednesti association in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
B1	Brunisolic Gray Luvisol	Bisequa Gray Luvisol	well - moderately well	Occurs mainly west of the Fraser River. Thickness of Bm or Bf surface horizons is variable due to erosion and close proximity to heavier textured lacustrine soils.
B2	Brunisolic Gray Luvisol	Bisequa Gray Luvisol	well - moderately well	Similar to B1 but with more inclusions of seepage and/or moisture receiving soils.
		gleyed subgroups	imperfect	
B3	Bisequa Gray Luvisol	Brunisolic Gray Luvisol	well - moderately well	Occurs mainly on slopes adjacent to the Bowron River.
B4	Bisequa Gray Luvisol	Brunisolic Gray Luvisol	well - moderately well	Occurs mainly east and south of the Fraser River.
		gleyed subgroups	imperfect	Similar to B3 but with more inclusions of seepage and/or moisture receiving soils.



Map Complexes - The Bednesti association occurs as the dominant soil in complexes with the Berman and Pineview associations which are also developed from glaciolacustrine deposits. The Bednesti-Berman complex generally occurs where the textures of the Berman soils are slightly heavier and have Orthic Gray Luvisol soil development. The Bednesti-Pineview complex occurs in the east-central part of the map area where there is a complex pattern of silty and clayey soils - the Pineview soils account for the latter.

The Bednesti-Berman-Eena complex is associated with the Stuart and Bednesti eskers where deposition resulted in complex topographic and textural soil patterns.

The Bednesti-Deserters complex occurs east of Taginchil Lake where discharge from the Stuart esker deposited silts at the higher levels of the glacial lake in close proximity to, and between, basal till drumlins.

The Bednesti-Seebach-Averil complex occurs in areas of intermixed glaciolacustrine silts, sandy glacial beach deposits and shallow to bedrock deposits. These formed in the glacial lake basin through erosion and/or deposition by wave action.

BERMAN SOIL ASSOCIATION (BN)

General Location and Physiography - The Berman association occurs on the Nechako Plain, within the Prince George, Vanderhoof and Fort St. James glacial lake basins. Most of the soils occur in a narrow zone through the middle of the map area adjacent to the Nechako River from Vanderhoof to Prince George, and in the Stuart River valley from the west side of the map area to Taginchil Lake. Additional areas occur adjacent to the Fraser River, the lower part of the Chilako River, north of the Salmon River, and west of Great Beaver Lake. Elevations vary from about 2,600' to as low as 2,000' adjacent to the rivers. The Berman association is dominant over 2.6% of the map area.

Landform - The Berman soils have developed on silty glaciolacustrine deposits, some of which are characterized by gently undulating to gently rolling topography. Others occur where small to large blocks of stranded glacial ice melted, resulting in variable densities, shapes, sizes and depths of kettle holes. Here the landforms are characterized by a topography which is hummocky, gently rolling to hilly, or moderately to very steeply sloping, and often dissected by erosion. Areas adjacent to the larger rivers are generally dissected by strongly to very steeply sloping gullies.

Surface drainage patterns are generally well developed and are similar to those of the Bednesti soils. Kettle holes often contain poorly drained mineral and/or organic soils, ponds or small lakes.

Parent Material and Soils - The silty deposits are predominantly deep with inclusions of shallower deposits over glacial till, usually less than 10' thick, near the glacial lake margins. The unweathered parent material is dark grayish brown to dark brown in color, stratified and varved, calcareous at depth, and has moderate permeability and friable to firm consistence. The deposits are generally similar in texture to those of the Bednesti soils, but have a greater proportion of moderately fine textures. Silty clay loam or silt loam are the dominant textures, with the former being most common.

Berman soils are dominantly well to moderately well drained and are mostly classified as Orthic Gray Luvisols with significant inclusions of imperfectly drained Gleyed Gray Luvisols. Poorly drained Gleysolic and very poorly drained Organic soils occur in depressions and kettle holes.

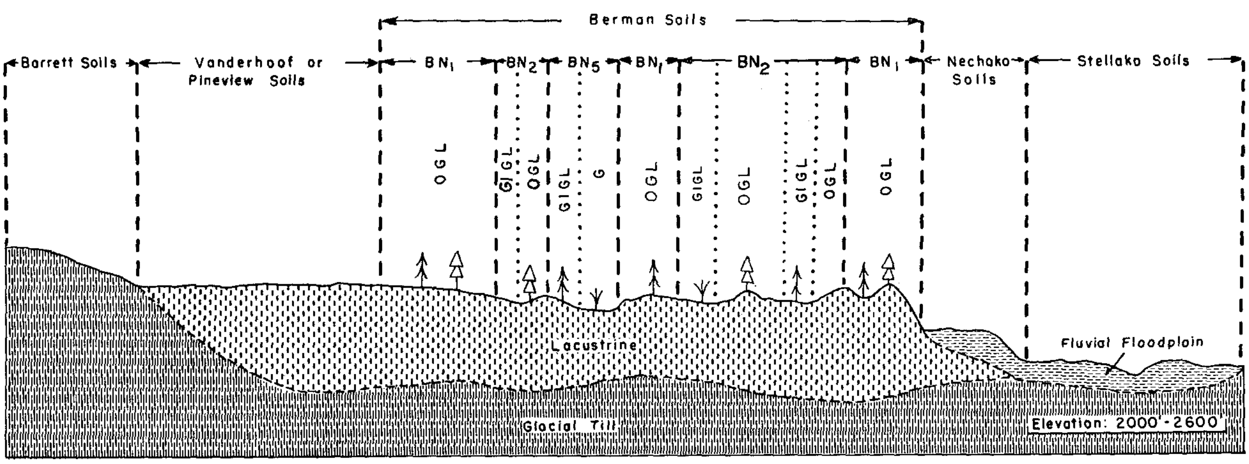
Climate and Vegetation - Average annual precipitation for the Berman association ranges from about 18" in the western portion of the map area to about 25" near Prince George. May to September similarly varies from about 8" to 11".

The frost-free period is slightly longer in the Prince George area than near Vanderhoof. The average frost-free season for the Berman association varies from 50 to 75 days, with the latter occurring mainly in the east. Frost pockets and micro-climates vary according to the proximity to rivers, aspect and topography, especially where kettled.

The soils occur within the Subboreal white spruce - subalpine fir zone; lodgepole pine and white spruce are the dominant forest species with good growth especially occurring on imperfectly drained soils. Douglas-fir, alpine fir, aspen, birch and willow occur sporadically or in clumps. Shrubs, herbs and mosses grow in various concentrations in the understory, depending on the history, density and age of the forest canopy, and soil drainage. The understory is generally more lush and abundant in imperfectly drained areas where additional moisture and seepge water is available. Hydrophytic plants, mosses, black spruce and stunted lodgepole pine occur on the associated poorly drained soils.

Soil Association Components - Seven components were established for the Berman association in the Nechako - Francois Lake map area to the west, but only three, BN1, BN2 and BN5, have been mapped in the Prince George - McLeod Lake map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
BN1	Orthic Gray Luvisol		well - moderately well	The most extensive component of the association.
BN2	Orthic Gray Luvisol		well - moderately well	Similar to BN1 but contains significant depressional areas.
		Gleyed Gray Luvisol	imperfect	
BN5	Gleysolic		poor	Wet, depressional areas.
		Gleyed Gray Luvisol	imperfect	



Map Complexes - The Berman association has been mapped as the dominant association in complexes with the Bednesti, Pineview, Knewstubb and Vanderhoof associations, which all have developed in glaciolacustrine deposits. Map complexes with the silty Bednesti and clayey Pineview soils occur mainly in the eastern part of the map area. The Berman-Bednesti complex is associated with deposition from the Stuart and Bednesti esker complexes and the Berman-Pineview complex occurs where erosion of the glacial lake clays (Pineview soils) has exposed the underlying moderately fine textured silty deposits. Map complexes with the silty to fine sandy Knewstubb and clayey Vanderhoof soils occur in the western part of the map area.

The Berman-Bednesti-Eena map complex occurs on intermixed deposits associated with the Stuart and Bednesti eskers.

Berman soils are also dominant in complexes with the Giscome, Saxton and Stellako associations along major rivers where there is a mixture of glaciolacustrine, glaciofluvial and fluvial (alluvial) landforms.

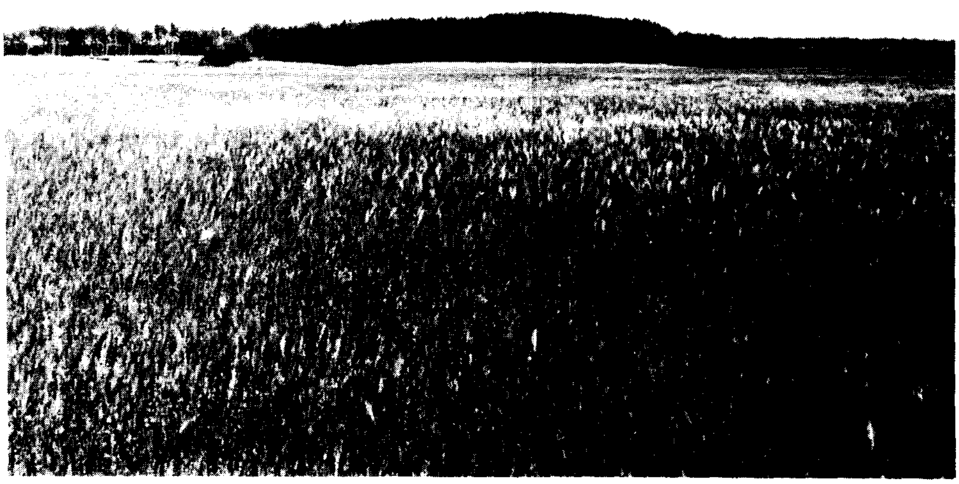


Plate 4. Barley being grown on Berman soils north of Vanderhoof.

BOWRON SOIL ASSOCIATION (BO)

General Location and Physiography - The Bowron soil association occurs in the Prince George glacial lake basin, which forms part of the Nechako Plain. The soils are located in the east-central part of the map area, mainly east and south of the Fraser River. Elevations vary from as low as 2,000' adjacent to the Fraser River to about 2,600'. The Bowron association is dominant over 1.1% of the total map area.

Landform - The Bowron soils have formed in silty to clayey glaciolacustrine landforms, most of which have gently to strongly rolling topography with gently undulating to undulating inclusions. Parts are kettled and hummocky. In addition, post-glacial dissection, especially near the Fraser and Willow rivers and in the Eaglet Lake-Hansard Lake area, has resulted in strongly to very steeply sloping topography.

The surface drainage is associated with a network of active and intermittent creeks. A few small ponds and lakes occur in kettle holes and depressions.

Parent Material and Soils - The Bowron soils are intermediate between the clayey soils of the Pineview association and the silty soils of the Bednesti and Berman associations.

The glaciolacustrine sediments are predominantly deep with shallow inclusions (usually less than 10' thick), over glacial till near the glacial lake margins. The deposits gradually grade from moderately fine and fine textures near the surface to silty textures at depth. Variations in surface and profile textures are usually related to the amount of post-glacial dissection, slope, and the proximity to lighter textured soils. The unweathered parent material is brownish to grayish in color, varved, calcareous at depth, and has slow to very slow permeability and firm to very firm consistence.

Soil development of the Bowron association depends on the texture of the surface deposits. Where surface horizons are finer textured (silty clay, clay), Orthic Gray Luvisols have developed and where surface layers are medium textured (silty clay loam, silt loam), Brunisolic Gray Luvisols are usual.

Bowron soils are dominantly classified as Brunisolic Gray Luvisol with significant inclusions of Orthic Gray Luvisol. In addition, significant inclusions of imperfectly drained, Gleyed Gray Luvisols occur on lower slopes and in seepage receiving locations. Poorly drained Gleysolics and very poorly drained Organics usually occupy depressions, kettles and swales.

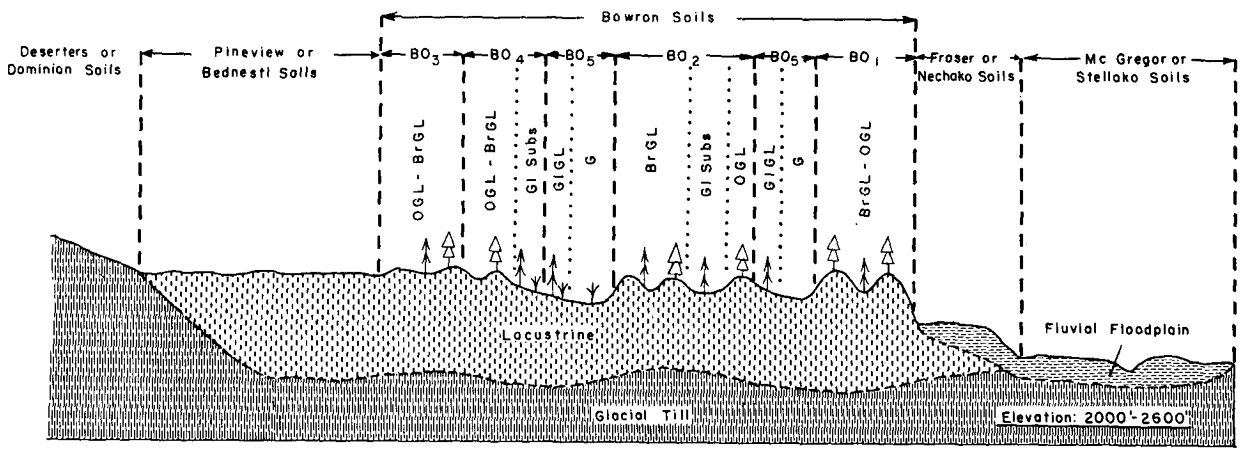
Climate and Vegetation - The frost-free period of the Bowron soils is predominantly between 60 and 75 days. The average May to September and annual precipitations are in the range 10" - 14" and 25" - 40", respectively.

The soils occur within the Subboreal white spruce - subalpine fir zone; the forest cover consists of dense stands of white spruce and lodgepole pine. Alpine fir occurs in the understory and aspen and willow occur in scattered locations. The understory of shrubs, herbs and mosses is abundant, but varies with the density of the forest cover, soil drainage and aspect.

Areas of poorly and very poorly drained soils support willow, aspen and hydrophytic plants with occasional variation to spruce and lodgepole pine.

Soil Association Components - Five components of the Bowron soils were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
B01	Brunisolic Gray Luvisol	Orthic Gray Luvisol	well - moderately well	Occurs mainly on steeply sloping topography along rivers and creeks.
B02	Brunisolic Gray Luvisol	Orthic Gray Luvisol gleyed subgroups	well - moderately well imperfect	Occurs mainly on undulating topography in the Taspai Creek area where a significant proportion of imperfect drainage occurs.
B03	Orthic Gray Luvisol	Brunisolic Gray Luvisol	well - moderately well	Widespread component associated mainly with Pineview soils (P2 component) on rolling or sloping topography.
B04	Orthic Gray Luvisol	Brunisolic Gray Luvisol gleyed subgroups	well - moderately well imperfect	Associated mainly with Pineview soils (P2 and P3 components) on rolling or sloping topography where a significant proportion of imperfectly drained soils occur.
B05	Gleysolic	gleyed subgroups	poor imperfect	Predominance of poorly drained soils.



Map Complexes - The Bowron soils occur mainly as the dominant soil in map complexes with Pineview soils (P1, P2, P3 and P5 components) where the glaciolacustrine sediments are variable in texture.

The Bowron-Decker and Decker-Bowron map complexes occur near the west end of Eaglet Lake where shallow to bedrock deposits with irregular topography rise above the lacustrine deposits.

Plate 5. Logging on Bednesti soils north of Tabor Mountain.

CAPTAIN CREEK SOIL ASSOCIATION (CT)

General Location and Physiography - The Captain Creek soil association occurs on the McGregor Plateau in the northeast corner of the map area, mainly on the slopes of Mount Beauregard and adjacent mountainous terrain. Elevations vary from about 3,000' to 4,500'. The association predominates on 0.2% of the total map area, principally as the dominant soil in map complexes with the Bearpaw Ridge soils.

Landform - The landform is characterized by steeply to extremely sloping mountain topography. Slopes are covered with a mixture of gravelly and stony glacial till, colluvium and weathered bedrock, generally more than 5' thick. The slopes are often dissected by a network of gullies and channels, which vary in size and depth in relation to the slope gradient.

Parent Material and Soils - The glacial till was deposited to variable depths over the steeply sloping, pre-existing bedrock controlled topography. Subsequently a significant proportion of colluvium, composed of gravity modified glacial till and weathered bedrock fragments, covered, or was mixed with the original glacial till. The underlying bedrock is either of sedimentary or metamorphosed sedimentary origin.

The unweathered parent material (mainly glacial till) is grayish-brown, olive gray or olive brown in color, weakly calcareous at depth, very compact, and has slow permeability, and hard to very hard consistence.

The deposits are predominantly moderately coarse to medium textured with inclusions of moderately fine textures. Gravelly sandy loam, gravelly loam and gravelly clay loam are the dominant subsoil textures with gravelly sandy loam, gravelly loam and gravelly silt loam being most common at the surface. The deposits have a variable cobble and stone content.

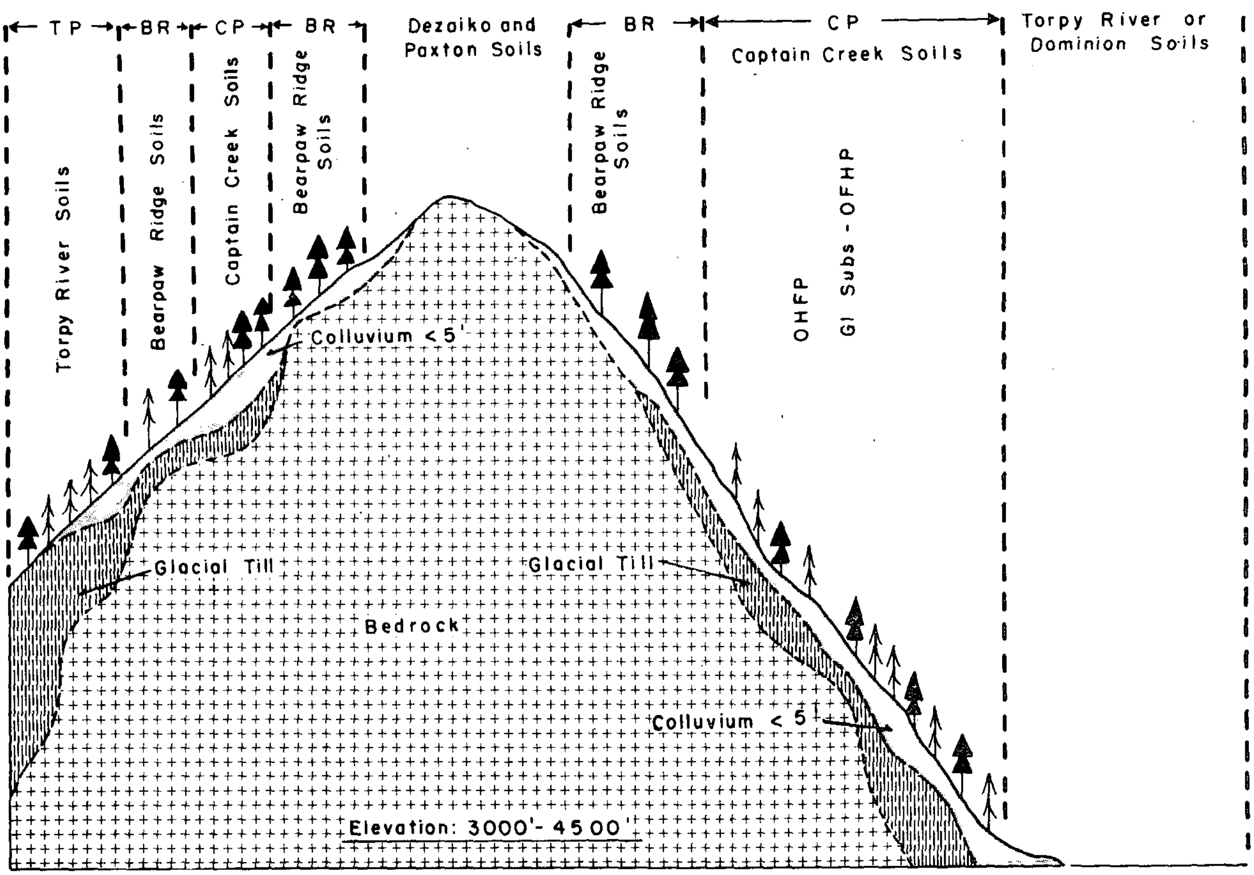
The Captain Creek soils are mostly Orthic Humo-Ferric Podzols and occur on moderately well to well drained, moisture shedding slopes. Moderately well drained Orthic Ferro-Humic Podzols also occur and occupy more stable locations within the previous. Gleyed subgroups occupy moisture receiving (seepage) locations. Minor inclusions of shallow to bedrock and lithic soils are usually found where the Captain Creek soils grade to the Bearpaw Ridge soils.

Climate and Vegetation - Captain Creek soils occur in the highest precipitation environments in the map area and have cooler summer temperatures, higher winter snowfall and more cloud cover than most of the other soil associations. Annual precipitation is estimated to be greater than 45".

The soils occur in both the Subalpine Engelmann spruce - alpine fir and Subboreal white spruce - alpine fir zones. The forest is usually composed of Engelmann or white spruce and alpine fir. The understory shrubs, herbs and mosses are generally lush and abundant and vary with the age and density of the forest cover, aspect and elevation.

Soil Association Components - Only one component was established in the map area for the Captain Creek association.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
CT	Orthic Humo-Ferric Podzol	Orthic Ferro-Humic Podzol	moderately well - well	
		gleyed subgroups	imperfect	



Map Complexes - Captain Creek soils have been mapped as the dominant soil in map complexes with Bearpaw Ridge soils in areas where these glacial till derived and shallow to bedrock soils are closely intermingled on mountain slopes.

CHIEF SOIL ASSOCIATION (CF)

General Location and Physiography - The Chief soil assocation is scattered throughout the map area at elevations between about 2,000' and 4,500'. The soils are dominant on 1.3% of the map area.

Landform - The Chief soils have formed in organic deposits accumulated in depressional and low topographic locations where run-off and seepage water either collects or drainage is restricted. The deposits mainly occur in depressions within glacial till, glaciolacustrine and glaciofluvial deposits, or in oxbows and channels along major rivers and creeks. The deposits vary in shape and range in size from an acre to more than a hundred acres. They often merge with open water in ponds or small lakes. The topography varies from depressional or nearly level to very gently sloping or undulating.

Surface drainage of the deposits is variable; in some areas drainage outlets are not present while, in others, well defined drainage channel is apparent. Drainage restrictions are often due to the action of beavers.

Parent Material and Soils - The organic deposits are mainly composed of sedges, reeds and associated hydrophytic vegetation, and vary from relatively undecomposed to highly decomposed. The degree of composition is related to drainage conditions; those areas with more or less permanently high water tables are least decomposed. Where the water table is lower or is lowered periodically, decomposition progresses more rapidly and the organic deposits are in intermediate or highly decomposed stages. With variation in both accumulation and decomposition, deposits can be fairly uniform or vary considerably both in vertical section and between sites.

The organic deposits vary in depth from about 20" to 10' or more, and sometimes contain thin layers of mineral material. Undecomposed small tree trunks are also sometimes present within the deposits.

Since soil mapping was at a reconnaissance level, it was not possible to classify in detail all the variety within the organic deposits. The soils were separated into two practical groups which could be indentified on aerial photographs. The two groups consist of the non-forested organic soils which were mapped as the Chief association and the forested organic soils which were mapped as the Moxley association.

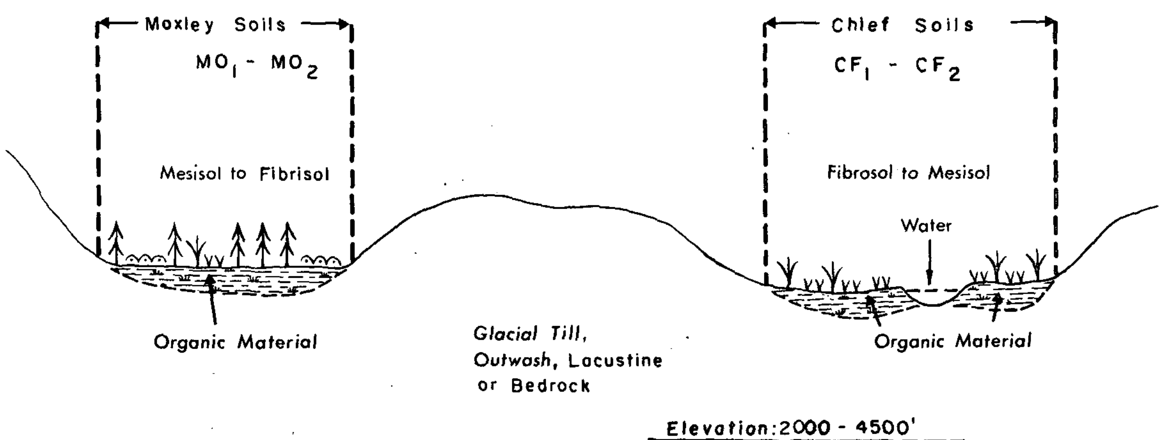
Chief soils are characterized by a dominance of very poorly drained Fenno-Fibrisols and Typic Mesisols. In addition, significant inclusions of Fibric Mesisols, Humic Mesisols and terric subgroups (less than 52" in depth) also occur. A few Typic Humisols were observed in the western part of the map area where the soils have been drained for crop production.

Climate and Vegetation - The Chief soils have variable frost-free periods and precipitation patterns due to their wide distribution and elevation range in the map area. Because they are usually located in depressional topographic locations, the soils often have somewhat lower frost-free periods than the adjacent mineral soils.

Chief soils occur within both the Subboreal and Subalpine vegetation zones. They generally do not support coniferous and most deciduous forest vegetation due to their high water tables. The vegetation is predominantly sedges, reeds and related hydrophytic vegetation, sometimes with dwarf birch and stunted willow. With a slight lowering of the water table, dwarf birch disappear, willows increase in size and black spruce and lodgepole pine, characteristic of the Moxley soils, begin to appear. In many organic map units, the perimeter is forested with the middle or remainder in open sedge meadow.

Soil Association Components - Two components were established in the map area for the Chief association.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
CF1	Fenno-Fibrisol	Fibric Mesisol Terric subgroups	very poor very poor	Usually occurs in areas with poor or non-existant surface drainage.
CF2	Typic Mesisol	Humic Mesisol Terric subgroups	very poor very poor	Usually occurs where surface drainage is moderately established.



Map Complexes - Chief soils are mapped in complexes with Moxley soils where their respective non-forested and forested vegetation patterns were determined from aerial photographs.

The Chief-Stellako and the Chief-McGregor map complexes occur along floodplains. The Chief-Pineview map complex occurs on glaciolacustrine deposits in the eastern part of the map.

CLUCULZ SOIL ASSOCIATION (CZ)

General Location and Physiography - The Cluculz soil association occurs on the Nechako Plateau in the southwestern part of the map area, near and on Bobtail and Sinkut mountains. Elevations range from about 4,000' to 4,900'. The association dominates in 0.6% of the map area, mainly as the dominant soil in map complexes with the Twain association.

Landform - The landform is characterized by steeply to extremely sloping, mountainous topography associated with bedrock apexes, ridges and steep slopes on Bobtail and Sinkut mountains. The bedrock is covered with a thin mantle of glacial till and/or colluvium. Surface drainage patterns vary in density and usually conform to the underlying bedrock.

Parent Material and Soils - The shallow mantle of soil parent material is mainly composed of glacial till and/or colluvium derived from glacial till and broken, weathered bedrock. It is generally less than 5' in depth and grades to 20" or less (lithic soils), with localized exposures of bedrock occurring on steeper slopes at the higher elevations. The underlying bedrock is mainly ultrabasic serpentinized peridotite and serpentinite (Tipper, 1961).

Soils are moderately coarse to medium textured with gravelly sandy loam and gravelly loam being the dominant textures. Rockiness varies with the depth of the shallow mantle. Stoniness varies with the composition of the glacial till and/or colluvium. Permeability and compactness vary with the depth over bedrock and the slope gradient, as the soil mantle can grade from very compact glacial till to loose colluvium.

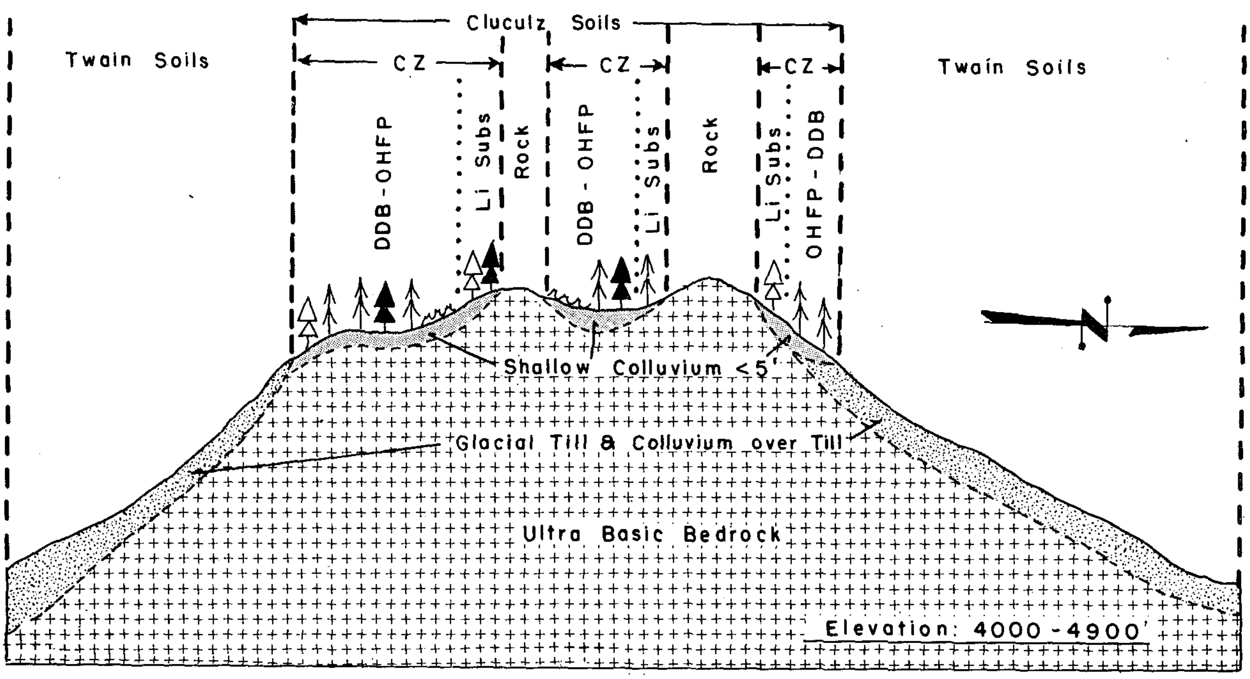
The soils predominantly occur on moisture shedding, steep slopes and are well drained. They are classified as Degraded Dystric Brunisol with significant inclusions of Orthic Humo-Ferric Podzol and rapidly drained Lithic subgroups.

Climate and Vegetation - The Cluculz soils occur in environments that are moister than many of the lower elevation soil associations. Associated with the higher elevations are cooler summer temperatures, higher winter snowfall and more cloud cover. Data is unavailable for the average annual precipitation but it is estimated to be between 25" and 35".

The soils occur within the Subalpine Engelmann spruce - alpine fir zone. They have a sparse to semi-open forest cover mainly composed of alpine fir, with a variable content of Engelmann spruce and lodgepole pine, which is often wind damaged at the higher elevations. The amount of understory shrubs, herbs, mosses and lichens varies with the completeness of the forest cover, aspect, and depth to bedrock. A gradual increase occurs as the soil mantle thickens to over 20" and the forest canopy opens.

Soil Association Components - Only one component of the Cluculz association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
CZ	Degraded Dystric Brunisol	Orthic Humo-Ferric Podzol lithic subgroups	well - moderately well well - rapid	Lithic soils occur where the depth to bedrock is 20" or less, usually on the steepest slopes or at the highest elevations.



Map Complexes - Most of the Cluculz soils occur as the dominant soils in map complexes with the Twain soils, which occur where the soil mantle thickens to over 5'. Other complexes are with the Rock Outcrop land type.

COBB SOIL ASSOCIATION (CB)

General Location and Physiography - The Cobb soil association occurs in the southern half of the map area, mostly in the Fraser Basin and commonly on the Nechako and Fraser plateaus. Elevations range between 2,800' and 3,800'. The soils are dominant on 1.7% of the map area, principally in map complexes dominated by Cobb soils.

Landform - The ablation till landforms have variable topography and poorly organized surface form characterized by irregular, hummocky, kettled, ridge and swale patterns with low relief. The topography is predominantly gently to strongly rolling, often with short, abrupt slopes. Inclusions of undulating to gently rolling topography occur west of Eulatazella Lake.

The surface drainage is poorly integrated and the few creeks are usually short. Scattered small ponds and lakes, and numerous poorly drained depressions are present.

Drumlinized till is often closely associated or intermixed with the ablation till. Gradual gradations to, or mixtures with, glaciofluvial deposits also occur.

Parent Material and Soils - The ablation deposits vary in thickness from about 3' to 20' over basal till. The parent material is brownish to grayish in color, weakly calcareous at depth, and moderately to rapidly permeable. The consistence grades from hard where the materials are semi-compact, to loose.

Textures are coarser than those of the underlying or closely associated basal till. They are generally moderately coarse to coarse with gravelly sandy loam or gravelly loamy sand being dominant. Very coarse textured layers occur in places due to variable sorting by water. Stoniness varies from moderately to exceedingly stony with large stones and small boulders occurring in places.

The soils are classified as well drained Orthic and Bisequa Humo-Ferric Podzols with minor to significant inclusions to imperfectly drained, gleyed subgroups occurring on lower slopes and adjacent to poorly drained locations. Seepage often occurs along the contact between the ablation and basal till or moves laterally within the deposits where variable textured strata occur. Small areas of poorly drained Gleysolic and very poorly drained Organic soils are scattered through the map units and occur in kettles, depressions, and along creeks.

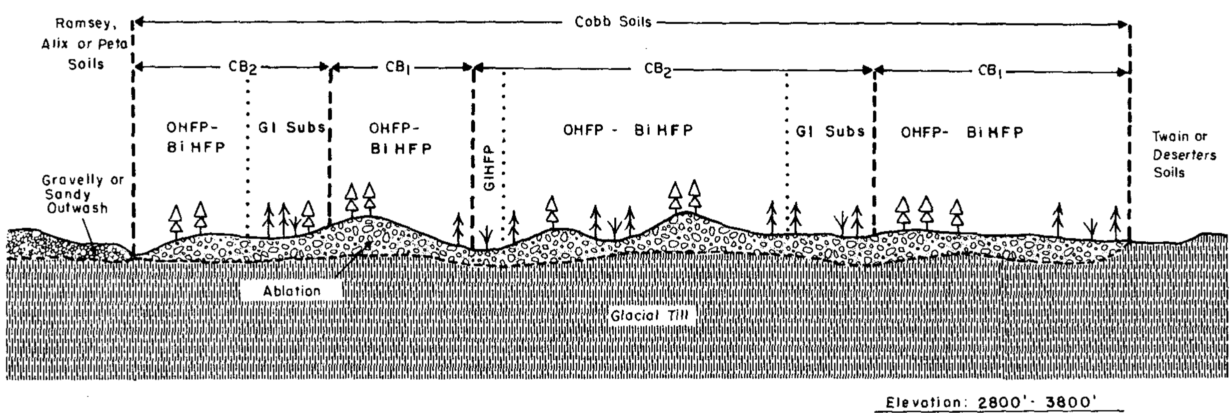
The Crystal association has similar landforms and parent material as the Cobb soils but generally occurs at higher elevations and/or in higher precipitation environments.

Climate and Vegetation - The average annual, and May to September precipitations for the Cobb soils are in the range of 20" to 30", and 10" to 16", respectively. The variable frost-free period depends on elevation, aspect and location, but generally is less than 60 days. In certain locations frosts can occur in any month of the year.

The soils occur within the Subboreal white spruce - alpine fir zone and the lower elevations of the Subalpine Engelmann spruce - alpine fir zone. The forest cover is predominantly lodgepole pine and white spruce with variable components of alpine fir. A large part of the acreage has been burned and the regrowth is mainly dense lodgepole pine. The understory of shrubs, herbs and mosses is variable. The low moisture holding capacity of the coarse textured soils is partially compensated by higher precipitation and/or seepage in some lower lying positions.

Soil Association Components - Two components of the Cobb association were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
CB1	Orthic Humo-Ferric Podzol	Bisequa Humo-Ferric Podzol	well	Bisequa Humo-Ferric Podzol soils occur where the clay content in the sub-soil increases slightly.
CB2	Orthic Humo-Ferric Podzol	Bisequa Humo-Ferric Podzol	well	Similar to the CB1 but contains more seepage and/or depressional sites.
		gleyed subgroups	imperfect	



Map Complexes - The Cobb association is mapped as the dominant soil in complexes with the Deserters, Dominion, Dunkley and Ramsey associations and as a significant soil in map complexes with the Crystal soils.

The Cobb-Ramsey complex occurs where ablation till is associated, or intermixed, with gravelly glaciofluvial deposits. Complexes with the Deserters and Dominion soils occur where the ablation deposits do not completely cover the underlying basal till. These complexes are often identified where isolated drumlins occur within the ablation deposits. The Cobb-Dunkley map complex occurs in the Willow River area where the map units have landforms characteristic of the Cobb soils but have inclusions of the finer textured Dunkley soils.

Chief and Moxley organic soils frequently occur in depressions within the Cobb map units.

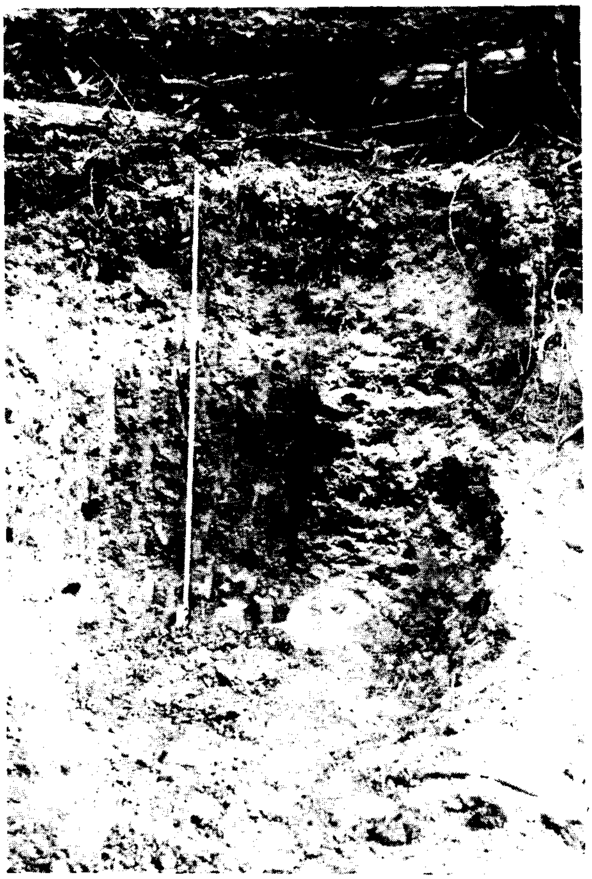


Plate 6. Representative profile of the Brunisolic Gray Luvisol Deserters soils.

CRYSTAL SOIL ASSOCIATION (CR)

General Location and Physiography - The Crystal association occurs in the southwest portion of the map area at elevations between about 2,500' and 3,300'. It mostly occurs within the Fraser Basin, with minor areas occurring on the lower elevations of the Nechako Plateau. The soils are dominant over 3.7% of the map area, primarily in map complexes in which the Crystal soils are dominant.

Landform - The landforms consist of ablation till characterized by irregular, hummocky, kettled, ridge and swale patterns with low relief. The topography varies from gently to strongly rolling with short, abrupt slopes.

Surface drainage is poorly integrated. Scattered, small creeks drain into ponds, small lakes or poorly drained depressions; many of these depressions do not have drainage exits.

The ablation deposits frequently mask the surface features of the underlying drumlinized basal till. Gradations to, or mixtures with, glaciofluvial deposits also occur.

Parent Material and Soils - The ablation deposits have variable thickness, gnerally between 3' and 20', and overlie medium to moderately fine textured basal till. The soil parent material is usually brownish to grayish in color, weakly calcareous at depth, and moderately to rapidly permeable. Consistence varies from hard in semi-compact deposits, to loose.

Considerable textural variation occurs within the deposits due to their origin and the processes by which they were deposited. They are generally moderately coarse to very coarse textured with gravelly sandy loam or gravelly loamy sand being the dominant textures. Partial sorting by water has often resulted in poorly stratified, till-like mixtures ranging from sand and gravelly sand to gravelly loam. Stoniness varies from moderately to exceedingly stony with large stones and small borders occurring in places.

The soils are classified as well drained Orthic and Degraded Dystric Brunisols with minor to significant inclusions of imperfectly drained, gleyed subgroups on lower slopes or adjacent to depressions. Seepage moisture moves laterally within the variable textured strata or along the contact between the ablation and basal till. Poorly drained Gleysolic and very poorly drained Organic soils occur in scattered kettles and depressions, and along creeks and are minor inclusions within the Crystal association.

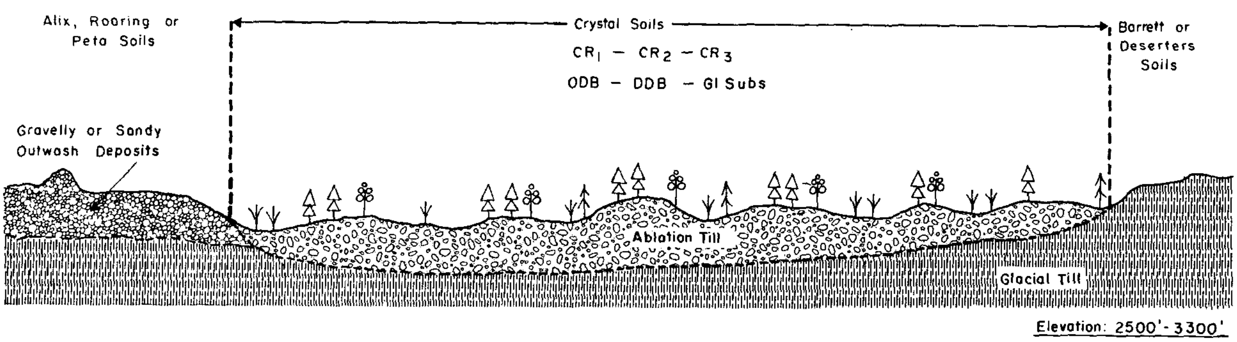
The Crystal and Cobb associations both have similar landforms and parent material but the former generally occurs in lower precipitation areas and at lower elevations. Crystal soils also occur at higher elevations on exposed southern or western aspects.

Climate and Vegetation - The average annual precipitation is estimated to be between 15" and 20", the average frost-free period is less than 60 days.

Crystal soils occur within the Subboreal white spruce - alpine fir zone. Much of the area has been burned by forest fires and the cover is mainly a regrowth of lodgepole pine, white spruce and minor alpine fir and Douglas-fir of different ages, densities and successional stages. The understory of willow, shrubs, herbs and mosses varies with the density of the forest canopy, aspect and soil drainage. Some areas of Crystal soils have open to semi-open forest with a good cover of pinegrass in the understory and are suitable for grazing.

Soil Association Components - Three components of the Crystal association have been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
CR1	Orthic Dystric Brunisol	Degraded Dystric Brunisol	well	Occurs mainly in the extreme western part of the map area.
CR2	Degraded Dystric Brunisol	Orthic Dystric Brunisol	well	Occurs in moister environments than CR1.
CR3	Degraded Dystric Brunisol	Orthic Dystric Brunisol gleyed subgroups	well imperfect	Similar to the CR2 but with more seepage and/or depressional sites.



Map Complexes - The Crystal association is mapped as the dominant soil in complexes with Barrett and Deserters soils, which have developed on heavier textured basal till. The Crystal-Barrett complex occurs in drier environments than does the Crystal-Deserters complex.

The Crystal-Cobb-Deserters complex occurs on intermixed ablation and basal till landforms which vary in elevation, aspect, soil texture and drainage. The Crystal-Pineview and Crystal-Kluk complexes occur along the margins of the Vanderhoof glacial lake basin. The Crystal-Mapes complex represents the soils on intermixed ablation till and sandy glaciofluvial deposits.

The Chief and Moxley soils frequently occur within areas dominated by Crystal soils. These organic soils are mapped as separate map units where the scale of mapping allows.

DECKER SOIL ASSOCIATION (DR)

General Location and Physiography - The Decker soil association mainly occurs in the southern half of the map area and occupies hill and mountain tops within the Nechako and Fraser plateaus, and the Fraser Basin. Elevations vary from about 2,600' to 4,000', with a few map units extending higher. The Decker soils predominate in 0.7% of the map area.

Landform - The surface form is characterized by steep to extreme slopes associated with bedrock of variable origin and composition. Typical landforms are glacial grooved, rounded to sharp apexes and ridges with steep sides covered by a shallow mantle of glacial till and/or colluvium derived from glacial till and broken, weathered bedrock.

Parent Material and Soils - The shallow glacial till/colluvium mantle is generally less than 5' deep and grades to 20" or less (lithic soils). Localized exposures of bedrock occur on apexes and steep slopes at the higher elevations. The underlying bedrock is of mixed origin.

The soils are moderately coarse to medium textured with gravelly sandy loam and gravelly loam being dominant. Stoniness depends on the composition of the associated glacial till and/or colluvium and rockiness varies with depth over bedrock. The soils have variable permeability and compactness depending on the thickness of the glacial till, and on the consolidation of the deposits on the steeper slopes.

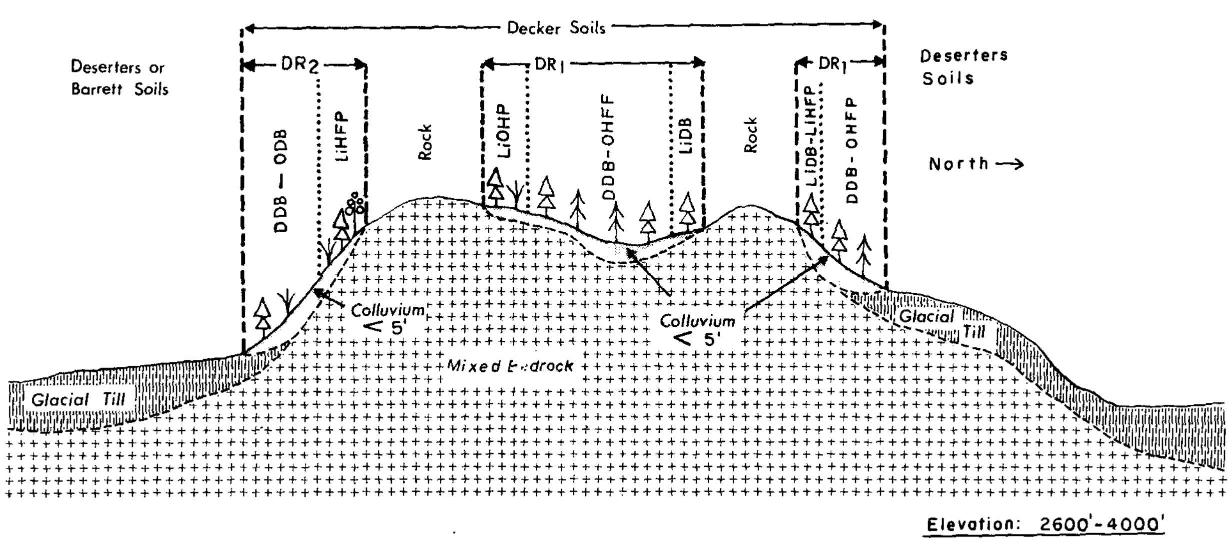
The soils on these steep, moisture shedding landforms are mostly classified as well to rapidly drained, Degraded Dystric Brunisols. Significant inclusions of Orthic Humo-Ferric Podzols occur at the moister, higher elevations while Orthic Dystric Brunisols also occur in the driest areas. Lithic subgroup inclusions occur throughout.

Climate and Vegetation - The Decker soils occur in the drier to moister transitional environment that occurs across the southern half of the map area. Annual precipitation is estimated to be between 25" and 35"; frost-free period is less than 60 days.

The soils occur in the Subboreal white spruce - alpine fir zone. The forest cover, which is extremely variable in density, is mainly composed of spruce, lodgepole pine and alpine fir. The understory of shrubs, herbs, mosses and lichens varies with the density of forest cover, aspect and depth to bedrock. A gradual increase in abundance occurs as the soil mantle thickens to 20" or more.

Soil Association Components - Two components were established for the Decker association in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
DR1	Degraded Dystric Brunisol	Orthic Humo-Ferric Podzol	well	Occurs in the moister and/or higher elevation areas east of the Fraser River.
		Lithic subgroups	well - rapid	
DR2	Degraded Dystric Brunisol	Orthic Dystric Brunisol	well	Occurs west of the Fraser River, mainly in association with Deserters soils. Orthic Dystric Brunisols usually occupy south and/or west aspects.
		Lithic subgroups	well - rapid	



Map Complexes - The Decker-Deserters map complex occur where bedrock covered by shallow deposits protrudes above the general level of the basal till landforms.

The Decker-Bednesti and Decker-Bowron map complexes occur near Eaglet Lake where bedrock covered by shallow deposits rises above the glaciolacustrine sediments.

The Decker-Rock Outcrop complex is mapped where Decker soils and exposed bedrock are interspersed on steep topography east of the Chilako River.

DESERTERS SOIL ASSOCIATION (D)

General Location and Physiography - The Deserters soil association is widespread in the map area and occurs on both the Nechako and Fraser plateaus, on the Nechako Plain and in the Fraser Basin. Elevations vary from about 2,800' and 3,800' in the west to between 2,450' and 4,000' in the central and eastern parts. The Deserters association is dominant on 28.5% of the map area, and is the most extensive soil.

Landform - The Deserters association, like the Barrett association, occurs on landforms composed of basal till that has been deposited and molded by glacial ice. Most of the Deserters soil area is characterized by drumlinized basal till landforms which consist of streamlined, parallel, cigar or egg-shaped ridges and intervening troughs (glacial grooves). The drumlins vary in height from less than 50' to greater than 150', but can be quite uniform in any particular location. The topography is predominantly moderately rolling to hilly with minor inclusions of gently rolling. Some drumlins have very steeply sloping sides with slopes in excess of 30%.

Some non-drumlinized glacial till also occurs and is characterized by a haphazard pattern of ridges, humps and depressions of varying shape and size. Other areas are bedrock-controlled and the basal till conforms to the topography of the underlying bedrock. The resulting topography is characterized by rolling, hilly and strongly to very steeply sloping topography with long grades.

Surface drainage of the basal till plain is poorly integrated. Numerous creeks drain into small and large lakes and depressions, many of which have no outlets.

Parent Material and Soils - The basal till parent material is dark grayish brown in color, weakly calcareous at depth, very compact, and has slow permeability and hard to very hard consistence.

The till is predominantly medium to moderately fine textured; gravelly loam or gravelly clay loam are the dominant subsoil textures with gravelly sandy loam or gravelly loam being most common at the surface. Occasionally the subsoils are gravelly sandy clay or light clay. Considerable variation in both surface and subsoil gravel, cobble and stone content occurs. The highest surface contents are on the tops of drumlins and decreases somewhat in the lower slopes and in the intervening depressions due to erosion and down-slope movement of fine material prior to vegetation establishment.

Shallow, coarse textured ablation till intermittantly occurs on, or between, drumlins, adjacent to depressions, or randomly scattered over non-drumlinized areas. These small ablation surfaces are not usually discernable on aerial photographs and were not differentiated at the scale of mapping.

The Deserters soils are characterized by dominantly moisture shedding sites on which have developed well to moderately well drained Brunisolic Gray Luvisols. Numerous small depressions, many of which are enclosed, receive run-off and seepage and are characterized by poorly to very poorly drained Gleysolic and Organic soils. The depth to the water table in these sites varies with the amount of run-off and beaver activity. Soils on lower slopes often receive seepage that improves the soil moisture status during the growing season. Soils in these positions are imperfectly drained (gleyed subgroups) and, depending on the nature of the topography, can occupy from almost none to 40% of the landscape.

Climate and Vegetation - In general, Deserters soils occur in a transitional precipitation environment between the drier climate of the Barrett soils and the moister climate of the Dominion soils. A large area of the Deserters soils occur in the vicinity of Prince George where the average annual, and May to September precipitation is about 24" and 11", respectively. Annual precipitation for the entire range of Deserters soils is estimated to vary from 20" to over 30" at the higher elevations on the Sinkut Hills, Bobtail Mountain, and Mount Prince. There is a gradual increase in precipitation from west to east across the map area.

The frost-free period is also variable due to differences in elevation, aspect, location, and air drainage. Generally though, the average frost-free period is less than 60 days.

The Deserters soils mostly occur in the Subboreal white spruce - alpine fir zone. Variable precipitation, soil drainage, aspect and fire history has resulted in a complexity of vegetation. Most of the acreage supports pure stands of white spruce or mixed white spruce - lodgepole pine forest. Areas with a recent fire history have stands of almost pure lodgepole pine, mixed lodgepole pine and aspen, or small areas of almost pure aspen. Some alpine fir occurs at the higher elevations, and is more common in the eastern, higher precipitation part of the map area. Douglas-fir, birch and willow are found in scattered locations, with the Douglas-fir usually restricted to drier, south or west aspects. Shrub and herb layers are generally more abundant in the understory than on the Barrett soils and are more lush and luxuriant where associated with imperfectly drained soils or on shaded, northern aspects.

Poorly and very poorly drained soils in depressions and seepage areas or along creek channels support vegetation which varies from stunted lodgepole pine, black spruce and associated mosses to communities of willow, dwarf birch and sedges.

Soil Association Components - Six components of the Deserters association were established in the map area.

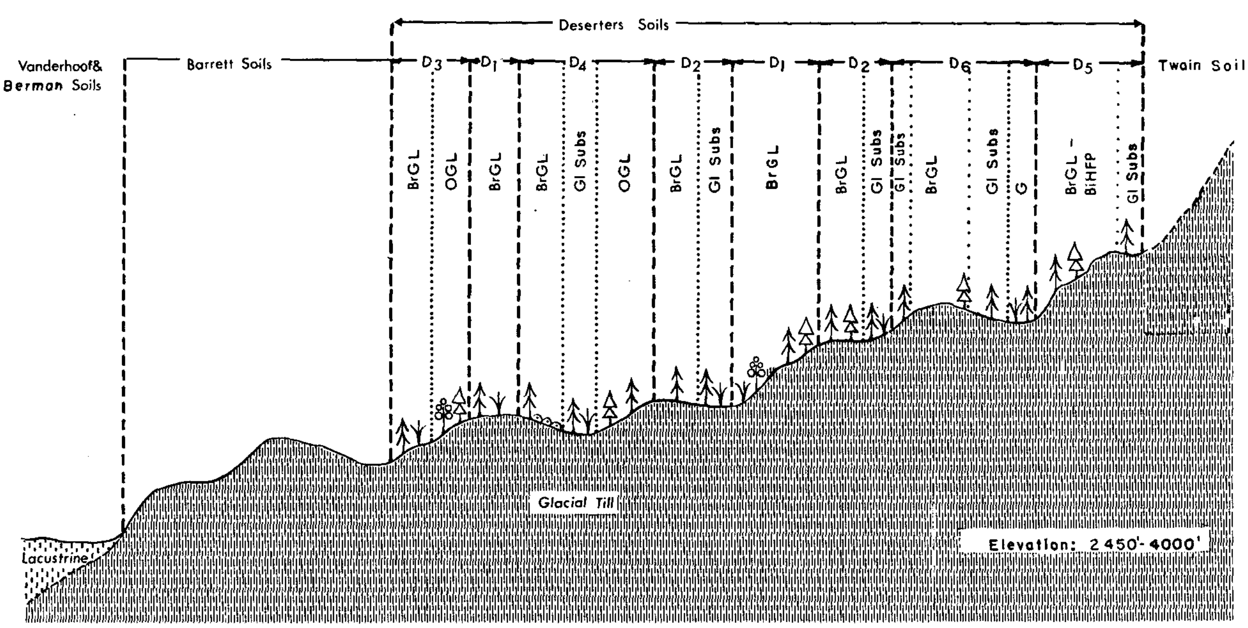
Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
D1	Brunisolic Gray Luvisol		well - moderately well	Moisture shedding drumlinized terrain.
D2	Brunisolic Gray Luvisol		well - moderately well	Similar to the D1 but with higher proportion of seepage and/or moisture receiving sites.
		gleyed subgroups	imperfect	
D3	Brunisolic Gray Luvisol	Orthic Gray Luvisol	well - moderately well	Transitional to the Barrett association (BA3 and BA4 components); Orthic Gray Luvisols occur on south or west aspects.

(continued)

(Continued)

D4	Brunisolic Gray Luvisol	Orthic Gray Luvisol	well - moderately well	Similar to D3 but with a higher proportion of seepage and/or moisture receiving sites.
		gleyed subgroups	imperfect	
D5	Brunisolic Gray Luvisol	Bisequa Humo-Ferric Podzol	well - moderately well	Transitional to the moister Dominion association; gleyed soils become more common in the higher precipitation, eastern areas.
		gleyed subgroups	imperfect	
D6	gleyed subgroups		imperfect	Usually occurs in depressional or lower slope positions, often in association with Chief or Moxley soils.
		Brunisolic Gray Luvisol	well - moderately well	
		Gleysolic	poor	

All the above components contain inclusions of poorly to very poorly drained Gleysolic and/or organic soils which generally occupy less than 10%, but occasionally as much as 20%, of the map units. These soils are mapped as the Chief, Moxley or Stellako associations where they can be delineated at the scale of mapping.



Map Complexes - Map units with inclusions of shallow to bedrock soils have been mapped as the Deserters-Decker complex; a few areas were assigned to the Oona-Deserters or Ormond- Deserters complexes. Where there is a mixture of basal and ablation till, map complexes with the Crystal and Cobb associations occur. The Deserters-Cobb complex usually occurs in the higher elevation and precipitation areas. The characteristic surface pattern of ablation till and its coarse soil textures differentiates the Crystal and Cobb soils from the Deserters soils.

The coarse textured, glaciofluvial soils of the Alix and Ramsey associations are often closely associated with basal till. The two parent materials are often intermixed and difficult to separate at the scale of mapping, but where the glaciofluvial deposits are estimated to occupy 10% or more of the map unit, Deserters-Alix or Deserters-Ramsey complexes are mapped. The latter occurs in the higher elevations and/or precipitation areas.

Around former glacial lakes, wave-washing of the glacial till removed the fines and left extensive areas of gravelly and some sandy beaches which form the parent material of the Gunniza and Kluk associations. These beach deposits are intermixed with basal till. The Deserters-Kluk map complex occurs in the central part of the map area and the Deserters-Gunniza map complex occurs in the eastern part under higher precipitation. Well defined beach lines identifying the various levels of the glacial lake occur south-west of Prince George and north-east of the Hart Highway-Salmon River crossing.

Lacustrine material of varying depth was deposited over basal till in the glacial lakes. Where shallow deposits on rolling topography have been subsequently eroded, a complex pattern of soil materials (lacustrine and till) and soil development has occurred. Here the silty Bednesti and clayey Pineview soils are mapped in complexes with the Deserters soils. Where sandy deposits from large glacial streams are closely associated with basal till, the Deserters-Eena complex occurs.

Extensive areas of organic soils are distributed throughout the glacial till plain, especially in drumlinized topography. Where organic areas not large enough to differentiate at the scale of mapping occur, Deserters-Chief or Deserters-Moxley complexes are mapped. Similarly, the poorly drained soils of the Stellako association, occurring on narrow floodplains along creeks, are also mapped in complex with the Deserters soils.

DEZAIKO SOIL ASSOCIATION (DZ)

General Location and Physiography - The Dezaiko soil association is found in two portions of the map area; in the northeast corner, on the highest slopes of Mount Beauregard and adjacent summits, and in the east central part on the upper slopes of Spring Mountain. Elevations vary from approximately 4,400' to about 5,100' in the Mount Beauregard area and to 5,645' on Spring Mountain. Dezaiko soils occur above the general level of the Bearpaw Ridge and Captain Creek soils and are dominant in 0.1% of the map area.

Landform - The surface form is characterized by steep to very steep mountain slopes associated with bedrock apexes and ridges. Small inclusions of moderately to strongly sloping topography also occur. The slopes are covered by a shallow mantle mainly composed of colluvium derived from glacial till and broken, weathered bedrock, and glacial till.

Parent Material and Soils - The shallow mantle is generally less than 5' in depth and grades to 20" or less (lithic soils) in some areas. Localized exposures of bedrock occur at the higher elevations. The surface mantle is underlain by sedimentary and metamorphosed sedimentary bedrock in the Mount Beauregard vicinity and by sedimentary and volcanic bedrock on Spring Mountain (Tipper, 1961; Tipper and Muller, 1961).

The soils are predominantly moderately coarse to medium textured; gravelly sandy loam or gravelly loam dominate. Stoniness and rockiness varies inversely with the depth of the soil mantle over bedrock.

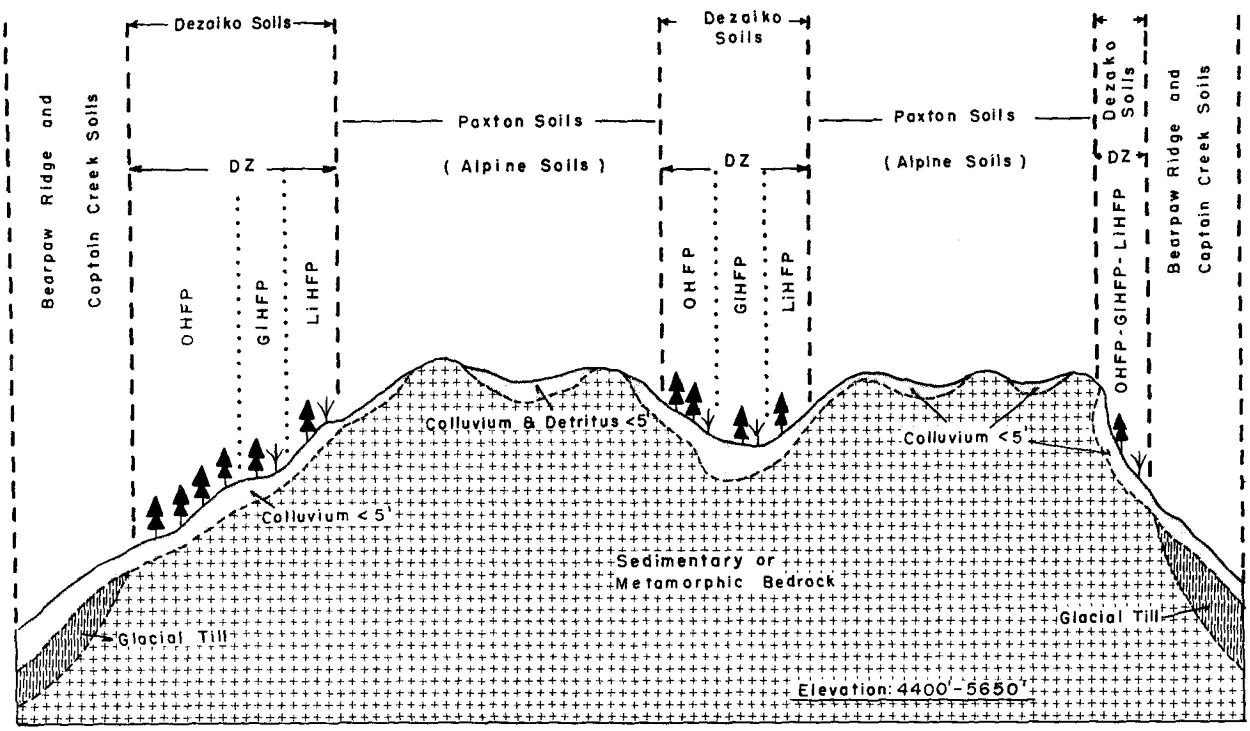
The soils are mostly moderately well drained Orthic Humic Podzols but range to rapidly drained Lithic Humo-Ferric Podzols. Significant inclusions of imperfectly drained, Gleyed Humo-Ferric Podzols also occur in lower slope, seepage locations.

Climate and Vegetation - The Dezaiko soils occur at the highest elevations in the map area and have higher annual precipitation, higher winter snowfall, cooler summer temperatures, and more cloud cover than soils at lower elevations. Annual precipitation is estimated to be greater than 40".

Dezaiko soils occur in the upper part of the Subalpine Engelmann spruce - alpine fir zone; Engelmann spruce and alpine fir are the dominant forest species with Krummholz conditions occurring above 5,000' elevation.

Soil Association Components - Only one component of the Dezaiko association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
DZ	Orthic Humo-Ferric Podzol		moderately well - well	
		Lithic Humo-Ferric Podzol	well - rapid	
		Gleyed Humo-Ferric Podzol	imperfect	



The Paxton soils indicated on the cross-section were not mapped in the Prince George - McLeod Lake map area but are common in the high mountains further to the east.

Map Complexes - The Dezaiko soils were not mapped in complexes with other soil associations.

DOMINION SOIL ASSOCIATION (DO)

General Location and Physiography - The Dominion soil association is mainly located in the northeast portion of the map area and occurs in the eastern part of the Fraser Basin and on the McGregor Plateau. Elevations range between about 2,450' and 4,000'. The association dominates in 7.3% of the map area.

Landform - The Dominion soils occur on drumlinized basal till landforms with relative thickness and surface forms and patterns similar to those of the Barrett and Deserters soils. Some areas, especially on the McGregor Plateau, are bedrock-controlled and the till conforms to the features of the underlying bedrock.

The topography is dominantly strongly rolling to hilly with inclusions of steep and very steep slopes occurring on the height of land west of Crooked River, south of Coffee Pot Mountain, and on the McGregor Plateau.

Surface drainage is poorly integrated on the drumlinized landscape and the bedrock-controlled terrain. Numerous small creeks drain into depressions and small lakes, many of which have no outlets. Within the area of Dominion soils, Summit Lake, one of the larger lakes in the map area, is drained by the northward-flowing Crooked River.

Parent Material and Soils - The unweathered basal till parent material is grayish-brown to olive gray or olive brown in color, weakly calcareous at depth, very compact, and has slow permeability and hard to very hard consistence.

The deposits are predominantly medium to moderately fine textured with variations to moderately coarse textures at the surface. Gravelly loam or gravelly clay loam are the dominant subsoil textures with gravelly sandy loam or gravelly loam being most common at the surface. Inclusions of gravelly sandy loam, gravelly sandy clay or light clay subsoils also occasionally occur. Stoniness is variable, ranging from slightly to very stony at the surface.

Small areas of coarse textured, ablation till are sometimes located adjacent to poorly drained depressions, small lakes and associated creek drainages. They also occur as intermittent sandy or gravelly deposits between and/or on drumlins. These deposits could not be separated at the scale of mapping and are included as part of the basal till landscape.

On the predominantly moisture shedding, drumlinized or steep topography, the soils are classified as moderately well to well drained Bisequa or Orthic Humo-Ferric Podzols. Where increased precipitation, including higher snowfall, provides a source of seepage on, or at the base of slopes, there is improved moisture status during the growing season. Soils in these positions are classified as imperfectly drained gleyed subgroups and can occupy frm 20 to 40% of a map unit. Numerous depressions and drainage channels receiving seepage or run-off are characterized by poorly to very poorly drained Gleysolic or Organic soils. The water tables in these areas varies with the amount of spring run-off, seepage and beaver activity.

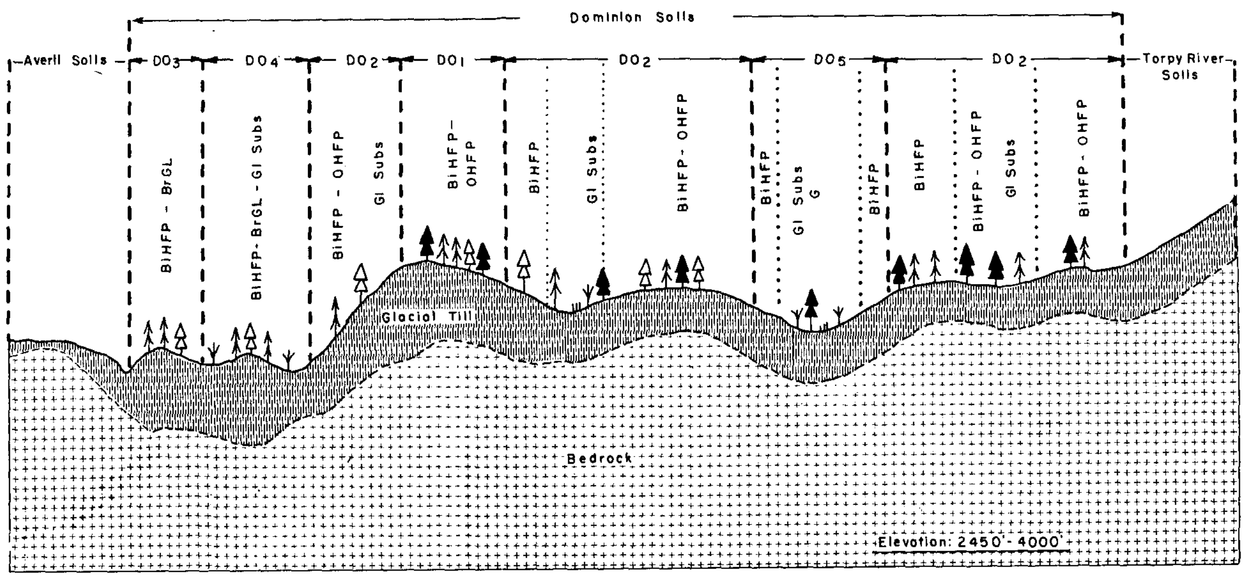
Climate and Vegetation - The Dominion soils occur in the moister portion of the map area with average annual precipitation estimated to be about 30" to 35" and average May to September precipitation to be higher than 12". Precipitation gradually increases eastward with closer proximity to the McGregor Plateau and Rocky Mountains. The average frost-free period is generally less than 60 days, but this can locally vary somewhat depending on elevation, aspect and air drainage.

The soils predominately occur within the wetter sections of the Subboreal white spruce - alpine fir zone. The vegetation is lush and abundant with mostly decadent spruce and alpine fir forming the the forest cover. Young spruce, alpine fir, scattered birch, and an abundance of Devil's club occur in the understory. Shrubs, herbs and mosses are plentiful and exhibit good growth, especially on imperfectly drained soils. Black spruce, stunted lodgepole pine, willow, mosses and various other hydrophytic vegetation are found in the poorly to very poorly drained areas.

Soil Association Components - Five components of the Dominion association were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
D01	Bisequa Humo-Ferric Podzol	Orthic Humo-Ferric Podzol	moderately well - well	Mostly occurs on medium textured basal till; associated Orthic Humo-ferric Podzols occur on moderately coarse textured inclusions.
D02	Bisequa Humo-Ferric Podzol	Orthic Humo-Ferric Podzol gleyed subgroups	moderately well - well imperfect	Similar to D01, except a higher proportion of seepage or moisture-receiving sites occur.
D03	Bisequa Humo-Ferric Podzol	Brunisolic Gray Luvisol	moderately well - well	Transitional to the Deserters (D5 component) soils.
D04	Bisequa Humo-Ferric Podzol	Brunisolic Gray Luvisol gleyed subgroups	moderately well - well imperfect	Similar to D03, except a higher proportion of seepage or moisture-receiving sites occur.
D05	gleyed subgroups	 Bisequa Humo-Ferric Podzol Gleysolic	imperfect moderately well - well poor	Dominantly seepage and moisture-receiving areas.

The above components may include poorly to very poorly drained Gleysolic or Organic soils which generally occupy less than 10% or, occasionally, as much as 20% of the map unit aras. These could not be differentiated at the scale of mapping.



Map Complexes - The Dominion-Bear Lake and Dominion-Ramsay map complexes occur where glaciofluvial deposits are closely intermingled with basal till. They are mapped in the Crooked River meltwater channel and above the current level of Caine Creek.

The Dominion-Moxley and Dominion-Chief map complexes occur where organic soils occupy 20% or more of the map unit areas. The poorly drained floodplain soils of the Stellako association, also occur in a few map complexes with the Dominion soils.

The Dominion-Pineview complex occurs in the vicinity of glacial lake shorelines where the clayey glaciolacustrine sediments are intermingled with or thinly cover, the glacial till deposits.

Map units containing a proportion of shallow to bedrock soils have been mapped as complexes with the Averil, Bearpaw Ridge or Wendle associations.

DRAGON SOIL ASSOCIATION (DN)

General Location and Physiography - The Dragon soil association occurs in the southern half of the map area at higher elevations on the Nechako and the Fraser Plateaus. Elevations vary from about 3,500' to 4,800'. The soils predominate in 0.3% of the map area, primarily in complexes with Dominion and Twain soils.

Landform - The surface form is characterized by steep to extreme slopes associated with acidic plutonic bedrock mainly composed of granodiorite, quartz diorite, quartz monzonite, monzonite and granite (Tipper 1959-60). Glacially grooved, domed summits, apexes and ridges with steep side slopes are typical. The shallow mantle is composed of glacial till and/or colluvium derived from glacial till and broken, weathered bedrock.

Surface drainage patterns are usually dendritic with variable density and generally conform to the topography of the underlying plutonic bedrock.

Parent Material and Soils - The mantle is generally less than 5' thick and grades to 20" or less (lithic soils), with localized exposures of bedrock occurring on apexes and steep slopes at the higher elevations.

The soils are predominantly moderately coarse to medium textured with gravelly sandy loam or gravelly loam being the dominant textures. Stoniness varies with the composition of the associated glacial till and/or colluvium and rockiness depends on the thickness of the shallow mantle. The soils are variably compact and permeable depending on the amount of down-slope movement which has occurred on the steeper slopes and also on the thickness of hard, compact glacial till (if present) over bedrock.

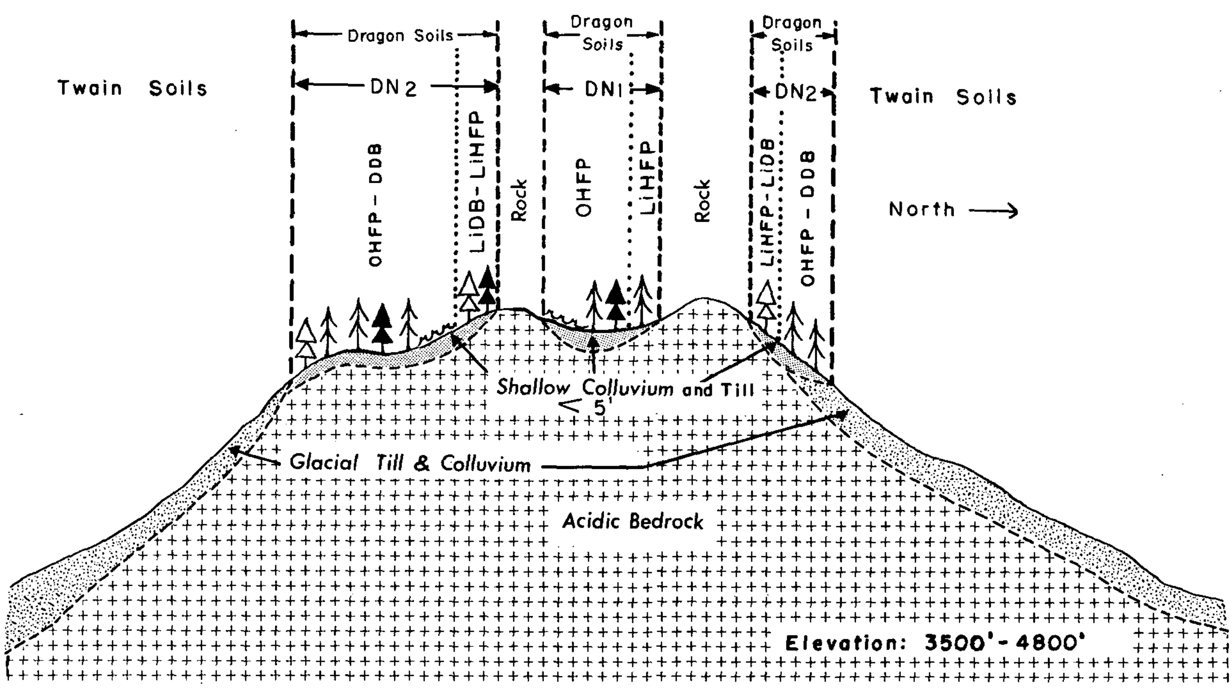
The steeply sloping, shallow to bedrock landforms are characterized by mostly moisture shedding, well drained soils classified as Orthic Humo-Ferric Podzols with significant inclusions of Degraded Dystric Brunisols. Substantial rapidly drained lithic subgroups also occur where the bedrock rises to within 20" of the surface.

Climate and Vegetation - The Dragon soils occur at higher elevations and in moister environments than do the Decker soils. They have cooler summer temperatures, higher winter snowfall and more cloud cover. Average annual precipitation is estimated to vary from about 25" to 35". Frost-free period is in the range of 30 to 40 days. In the map area, the DN2 component of the Dragon association and the DR1 component of the Decker association occur in fairly similar environments.

The soils occur in the Subboreal Engelmann spruce - alpine fir zone. The forest cover, which is very variable in density, is mainly composed of Engelmann spruce, lodgepole pine and alpine fir. The understory of shrubs, herbs, mosses, and lichens varies with the density of the forest cover, aspect and depth to bedrock. The understory generally becomes more vigorous as the soil mantle thickens to 20" or more.

Soil Association Components - Two components of the Dragon association were defined in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
DN1	Orthic Humo-Ferric Podzol		well	Usually occurs in the moister areas and/or at higher elevations of the associations' range.
		Lithic Humo-Ferric Podzol	well - rapid	
DN2	Orthic Humo-Ferric Podzol	Degraded Dystric Brunisol	well	Usually occurs at the drier, lower elevations. Degraded Dystric Brunisols occur on south and/or west aspects.
		lithic subgroups	well - rapid	



Map Complexes - The Dragon-Twain and Twain-Dragon map complexes occur on steep, bedrock controlled slopes overlain by variable depths of basal till. The Dragon-Rock Outcrop map complex is mapped on the steep topography of Sinkut Mountain where exposed bedrock is common.

DUNKLEY SOIL ASSOCIATION (DU)

General Location and Physiography - The Dunkley association occurs in the southeastern part of the map area within the Fraser Basin and on the lower elevations of the Fraser Plateau. The soils are mapped in the Willow River drainage east of the Mount George highland and south and southwest of Spring Mountain. Elevations vary from about 3,000' to 3,700'. The Dunkley association is dominant over 1.6% of the map area.

Landform - The Dunkley soils occur on non-drumlinized, rather featureless glacial till landforms that are mainly gently to strongly rolling. Parts have irregular, hummocky, ridge and swale topography containing occasional, shallow meltwater channels. The surface forms are similar to those of ablation till.

The surface drainage is poorly integrated with only a few creeks providing drainage into the Willow River, Wansa Creek and some small lakes. Numerous, poorly to very poorly drained depressions occur which often have no drainage outlets.

Parent Material and Soils - The unweathered basal till parent material is grayish-brown to olive gray or olive brown in color, weakly calcareous at depth, very compact, and has slow permeability and hard to very hard consistence.

The thick deposits, similar in texture to the Deserters and Dominion soils, are predominantly medium to moderately fine textured. Gravelly loam or gravelly clay loam are the dominant subsoil textures with gravelly sandy loam or gravelly loam being most common at the surface. Stoniness is variable within the deposits and at the surface ranges from slightly to very stony.

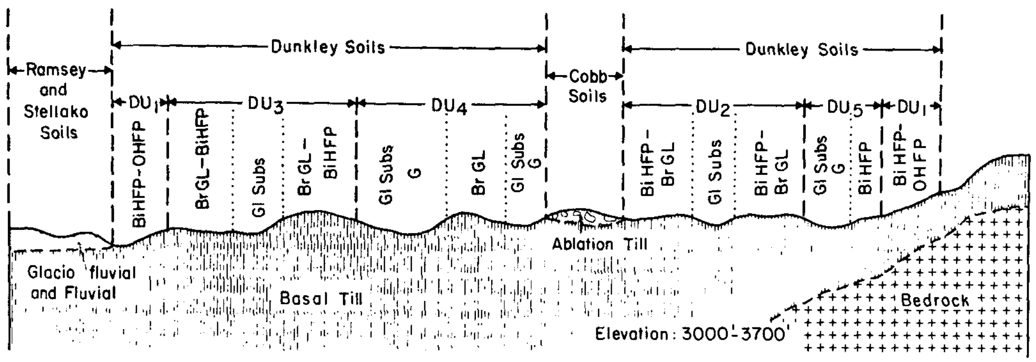
The soils are characteristically moisture shedding, moderately well to well drained Bisequa Humo-Ferric Podzols. Brunisolic Gray Luvisols and Orthic Humo-Ferric Podzols also occur in significant proportions. Soils near the base of slopes receive seepage thereby improving their moisture status during the growing season. These soils are classified as imperfectly drained (gleyed subgroups) and can occupy up to 40% of some map units. The numerous depressions and drainage channels receiving seepage and run-off contain poorly to very poorly drained Gleysolic and Organic soils.

Climate and Vegetation - The Dunkley soils occur in some of the moister precipitation environments within the map area. The average annual and May to September precipitations are estimated to be in the range of 30" to 40", and 12" to 15", respectively. The frost-free period varies from 30 to 50 days.

The soils occur within the Subboreal white spruce - alpine fir zone; the forest cover is mainly white spruce, lodgepole pine and alpine fir. The ground cover is lush and abundant and most plants exhibit good growth forms. Stunted lodgepole pine, black spruce, willow, mosses and other hydrophytic vegetation are found on the poorly to very poorly drained soils.

Soil Association Components - Five components of the Dunkley association were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
DU1	Bisequa Humo-Ferric Podzol	Orthic Humo-Ferric Podzol	moderately well - well	Orthic Humo-Ferric Podzols occur where the basal till is coarser textured than usual.
DU2	Bisequa Humo-Ferric Podzol	Brunisolic Gray Luvisol gleyed subgroups	moderately well - well imperfect	Presence of Bf or Bm surface horizons is variable; significant proportion of seepage receiving sites.
DU3	Brunisolic Gray Luvisol	Bisequa Humo-Ferric Podzol gleyed subgroups	moderately well - well imperfect	Presence of Bf or Bm surface horizons is variable; significant proportion of seepage receiving sites.
DU4	gleyed subgroups	Brunisolic Gray Luvisol Gleysolic	imperfect moderately well - well poor	Usually occurs in depressional to gently rolling areas receiving high amounts of seepage and run-off.
DU5	gleyed subgroups	Bisequa Humo-Ferric Podzol Gleysolic	imperfect moderately well - well poor	Usually occurs in depressional to gently rolling areas receiving high amounts of seepge and run-off.



Map Complexes - The Dunkley-Cobb map complex occurs where Dunkley soils are intermixed with the coarse textured Cobb soils developed from ablation till. The Dunkley-Ramsay map complex usually occurs in channelled glacial till deposits containing some glaciofluvial materials. Map complexes with the Dragon soils occur where shallow-to-bedrock areas occur within the basal till landscape.

A small area of Dunkley-Fontaniko complex occurs at the head of Wansa Creek where the basal till is intermittantly overlain by fluvial fan deposits.

EENA SOIL ASSOCIATION (E)

General Location and Physiography - The Eena soil association is mainly found in the triangular area bounded by Prince George in the east and Bednesti, Saxton and Shamrock lakes in the west. The soils occur on the Stuart River and Bednesti esker complexes within the Nechako Plain. Elevations vary from about 2,100' to 2,700'. Eena soils predominate over 1.9% of the map area, mostly in map complexes.

Landform - The Eena soils have formed on sandy glaciofluvial deposits that may be individual eskers, compound eskers, esker deltas and crevasse fillings. Most of the deposits are composed of steep-sided, wandering ridges of various heights with deep, elongated or circular depressions and kettles between. Many of the depressions and kettles are poorly drained and often contain small lakes, ponds, and/or organic deposits.

The topography varies considerably from gently undulating or undulating on the esker delta deposits to rolling and hilly sinuous ridges with steep to extremely steep sides. The esker complexes frequently have several wandering ridges in close proximity. Gently undulating, undulating and gently rolling topography usually has fewer kettles and poorly drained depressions than the esker complex terrain.

Parent Material and Soils - The glaciofluvial deposits consist of deep, interstratified sands and silts with inclusions of gravel. Textures can vary considerably, especially on the steep ridges where slumping and downslope movement has occurred. At, or near the surface, the deposits are mainly composed of loose, porous, sandy material of variable thickness. Surface textures are mainly sandy loam, loamy sand or sand, which are mostly gravel free; gravelly soils on similar landforms are usually mapped as the Roaring assocation.

The soils are mostly classified as Degraded Dystric Brunisols with significant areas of Orthic Dystric Brunisols and Brunisolic Gray Luvisols. The latter occurs where the usually sandy capping contains some fine sandy loam, or silt loam, in the upper 4' to 6'.

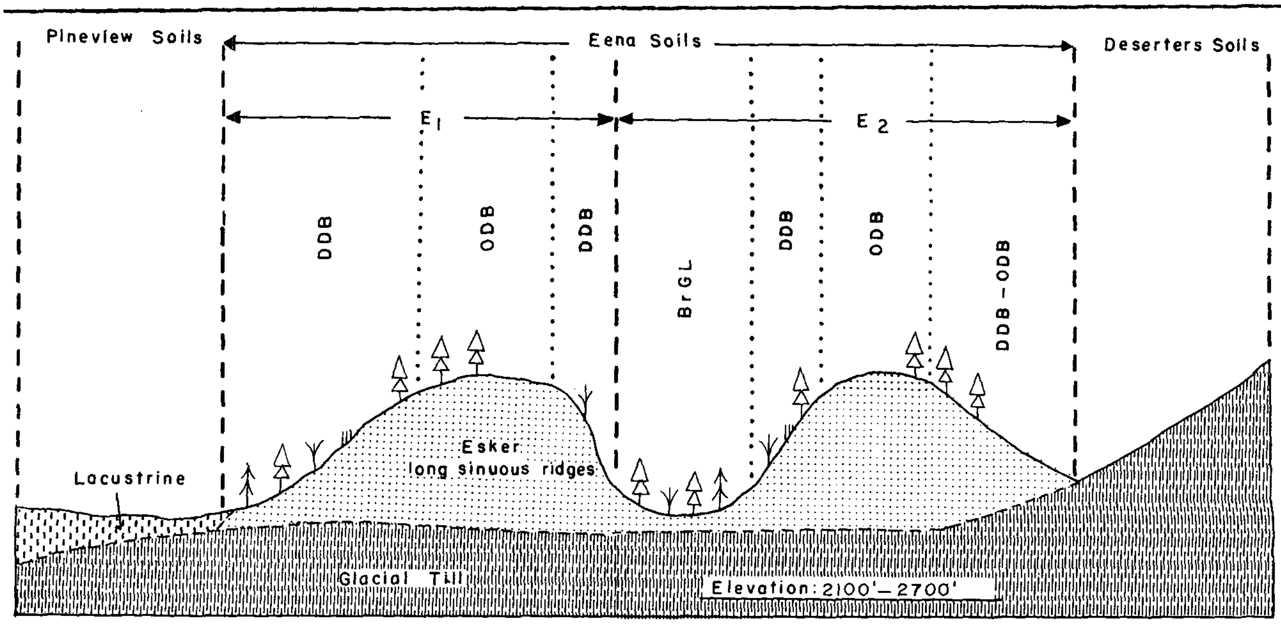
Eena soils are mainly rapidly drained with some variation to well or moderately well drained. Minor, unmappable inclusions of Gleysolic or Organic soils occur in some depressions and kettles; others contain small ponds and lakes.

Climate and Vegetation - The average frost-free period depends on the specific location and topography and can range from 30 to 75 days. The shorter periods occur in depressions susceptible to frost pooling. The annual, and May to September precipitations range from 20" to 25", and 8" to 12", respectively.

The soils occur within the Subboreal white spruce - alpine fir zone. Due to their dry, sandy characteristics they support a low productivity forest mainly composed of lodgepole pine and white spruce with scattered Douglas-fir, alpine fir, birch and aspen. The understory varies with aspect, slope, and density of the forest canopy.

<u>**Soil Association Components**</u> - Four components of the Eena association are defined in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
E1	Degraded Dystric Brunisol	Orthic Dystric Brunisol	rapid	Occurs on gently sloping to undulating topography.
E2	Degraded Dystric Brunisol	Orthic Dystric Brunisol	rapid	Orthic Dystric Brunisols occur on steep slopes where the surface has been disturbed and/or on south or west aspects. Brunisolic Gray Luvisols have loamy subsoil textures.
		Brunisolic Gray Luvisol	well - moderately well	
E3	Brunisolic Gray Luvisol	Bisequa Humo-Ferric Podzol	well - moderately well	Occurs on lower slopes and bottoms of kettles.
E4	Orthic Humo-Ferric Podzol		rapid - well	Occurs in the moister, eastern part of the map area.
		Bisequa Humo-Ferric Podzol	well - moderately well	



The E3 and E4 components are not depicted in the cross-section since they occur in a very restricted portion of the map area. The E3 component occurs northwest of Prince George in a Berman-Knewstubb-Eena map complex. The E4 component occurs in a Bednesti-Eena map complex south of Hansard Lake along the east border of the map area.

Map Complexes - Where the surface capping and soil profiles gradually become more gravelly, the soils are mapped as complexes with the Roaring soils. Similarly, where the capping and soil profiles grade to fine sandy loam and silty textures, the soils are mapped as complexes with the Knewstubb, Berman or Bednesti soils.

The Eena-Pineview complex is mapped north of Prince George where relatively shallow, sandy esker-delta deposits overlie or are intermixed with the clayey glaciolacustrine deposits supporting the Pineview association. Eena-Deserters or Deserters-Eena complexes are mapped where sandy glaciofluvial deposition has occurred between the drumlins, or is intermixed with the basal till in complex patterns.

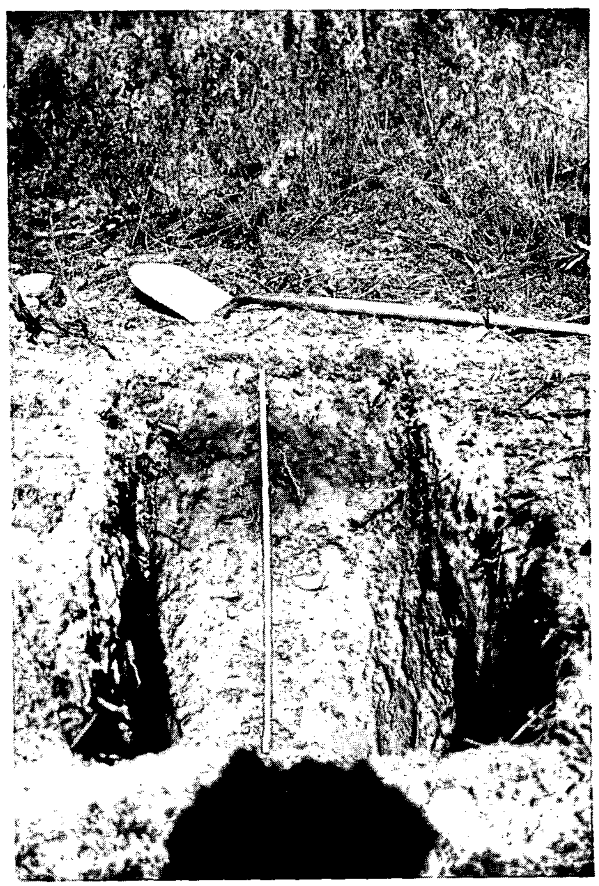


Plate 7. Representative profile of the Bisequa Humo-Ferric Podzol Dominion soils.

FONTANIKO SOIL ASSOCIATION (FN)

General Location and Physiography - The Fontaniko soil association occupies a few small areas south of Spring Mountain in the southeastern part of the map area. The soils occur in the transition between the Fraser Basin and the Fraser Plateau at elevations between 2,800' and 3,500'. The association occupies about 300 acres of the map area.

Landform - The Fontaniko soils occur on fluvial (alluvial) fan landforms. The deposits were eroded from adjoining glacial till highlands by post-glacial streams and redeposited at lower elevations in the form of fans.

The topography grades from strongly sloping near the fan apexes to moderately sloping on the fan aprons.

Parent Material and Soils - The fluvial fan parent material is interstratified, and grades from unsorted, stony, very coarse to moderately coarse textured (gravelly loamy sand or gravelly sandy loam) at the fan apexes to partially sorted, moderately coarse to medium textured (gravelly sandy loam or gravelly loam) on the fan aprons.

The soils are mostly well drained Orthic Humo-Ferric Podzols with significant inclusions of Degraded Dystric Brunisols. In addition, significant inclusions of imperfectly drained, gleyed soils occur on the seepage receiving, lower fan aprons.

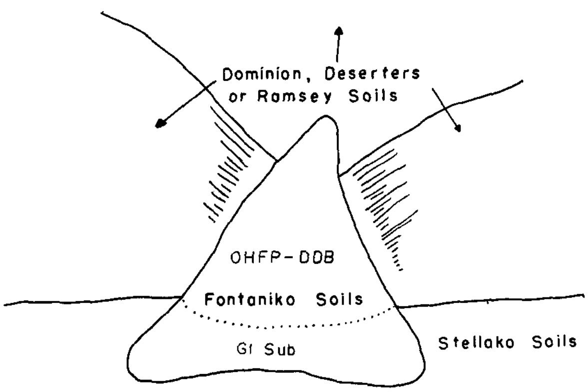
The Fontaniko soils have developed on parent materials that are similar to those of the Tabor Lake and Spanwaniko soils. They however occur in an environment that is intermediate in precipitation between the two latter soils.

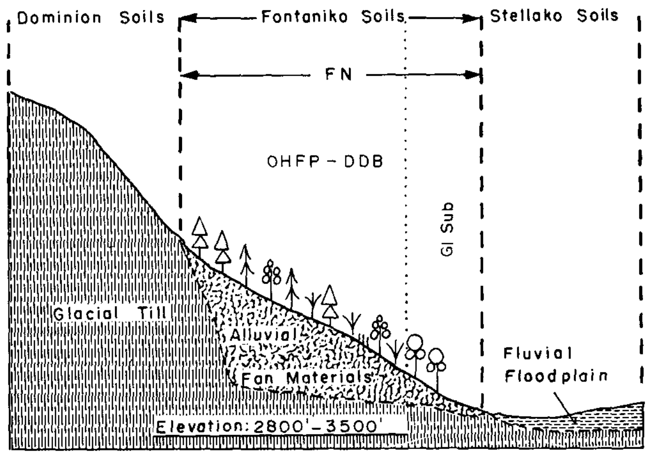
Climate and Vegetation - The Fontaniko soils occur in a moderately high precipitation environment where the average annual precipitation is estimated to be between 35" and 40". The average frost-free season varies from 30 to 50 days.

The soils, occurring within the Subboreal white spruce - alpine fir zone, support a mixed forest of white spruce, alpine fir and lodgepole pine that has a variable understory.

Soil Association Component - Only one component of the Fontaniko association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
FN	Orthic Humo-Ferric Podzol	Degraded Dystric Brunisol	well	Fontaniko soils only occur in the eastern part of the map
		gleyed subgroups	imperfect	area.





Map Complexes - The Fontaniko soils have not been mapped as the dominant soil in map complexes with other soils. However, the soil occurs as the secondary component of a map complex with the Dunkley soils.

Plate 8. Drumlinized glacial till typical of the terrain on which Dominion soils have developed.

FORT ST. JAMES SOIL ASSOCIATION (FJ)

General Location and Physiography - The Fort St. James soil association occurs along the west boundary of the map area on the north side of the Stuart River. The soils are confined to the Fort St. James glacial lake basin and range in elevation from about 2,400' and 2,600'. The soils dominate in 0.6% of the map area.

Landform - The Fort St. James soils have developed on mostly deep, clayey glaciolacustrine landforms characterized by gently undulating to undulating surface topography. Some relatively shallow deposits over glacial till occur adjacent to the glacial lake margin.

The area is drained by the Necoslie River which originates from the west ends of Gordon and Margaret lakes. Due to the heavy (clayey) soil textures and the relative flatness of the topography, the surface drainage is restricted and poorly integrated.

Parent Material and Soils - The glaciolacustrine parent material is silty at depth, gradually grading to very fine textures near the surface. Surface textures are heavy clay and were observed in new highway exposures to be continuous to depths of about 8', with interstratified clayey and silty material extending to 15'. The surface 2" to 6" have been somewhat modified by leaching and may be clay or silty clay.

The unweathered parent material is brownish to grayish in color, varved, calcareous at depth, has very slow permeability and very firm consistence.

The Fort St. James soils have restricted drainage and very poor rooting depth. They are classified as moderately well drained Orthic Gray Luvisols with significant inclusions of imperfectly drained Gleyed Gray Luvisols. Small, unmappable areas of poorly drained Gleysolic or very poorly drained Organic soils are scattered throughout.

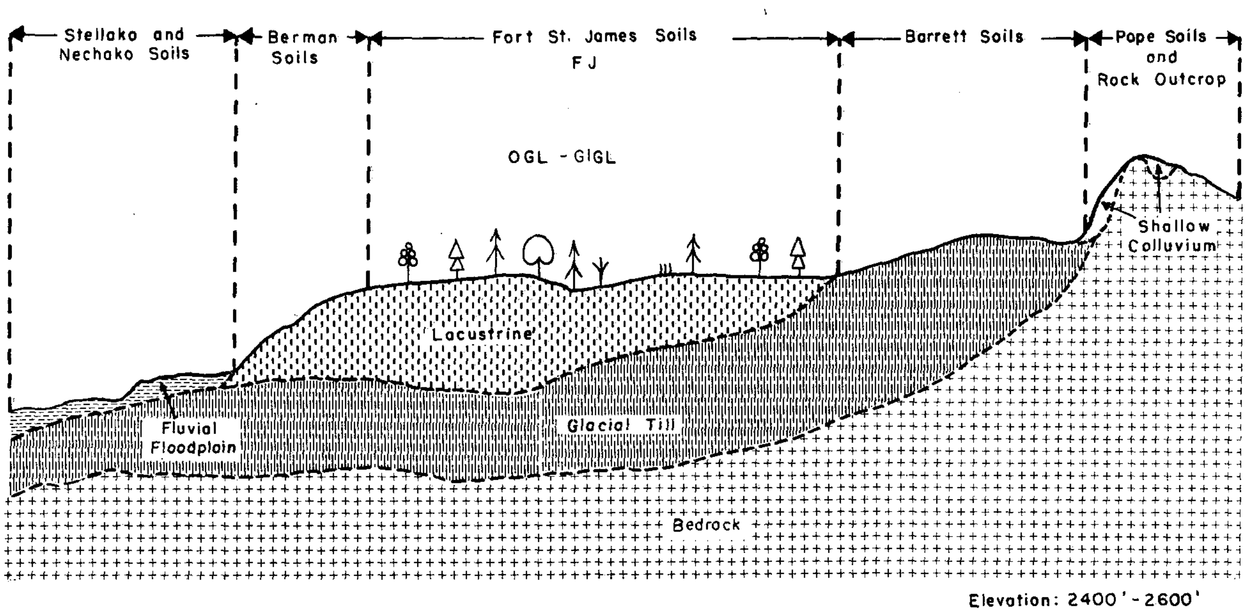
The Fort St. James soils have developed on similar parent materials and landforms as the Pineview soils, but occur in a more northern environment. They also generally have a somewhat higher clay content.

Climate and Vegetation - The average annual and May to September precipitations on the Fort St. James soils are about 15" to 20", and 7" to 9", respectively. The average frost-free period is generally less than 60 days.

The soils occur within the Subboreal white spruce - alpine fir zone. The forest cover is predominantly white spruce or white spruce - lodgepole pine mixtures. Aspen, birch and willow occur in isolated stands or intermixed with the conifers. The scattered poorly to very poorly drained areas support willow, aspen, various hydrophytic plants and mosses with some black and white spruce, and lodgepole pine.

Soil Association Components - Only one component of the Fort St. James association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
FJ	Orthic Gray Luvisol		moderately well	Very heavy textured soils, a significant proportion of which are imperfectly drained.
		Gleyed Gray Luvisol	imperfect	



Map Complexes - The Fort St. James association has not been mapped in complexes with other associations.

FRASER SOIL ASSOCIATION (F)

General Location and Physiography - The Fraser soil association is located in the eastern part of the map area within the Nechako Plain. It mainly occurs on terraces along the Fraser River and to a minor extent, on terraces along the lower Willow River. Elevations vary from approximately 1,800' to 2,200'. The Fraser soils are dominant over 0.6% of the map area.

Landform - The Fraser soils occur on fluvial (alluvial) terraces along the larger rivers which are predominantly above general spring flood levels. They lie from 10' to 100' or more above the usual river levels.

The topography varies from nearly level or gently undulating to undulating. Current scars, due to former river meanders, occur in places on the surface of the terraces.

Parent Material and Soils - A silty capping on the terraces forms the parent material of the Fraser soils. The capping, varying in depth from 2' to more than 4' is predominantly medium to moderately fine textured. Silt loam or silty clay loam are the main surface and subsoil textures with inclusions of loam and clay loam and, occasionally, fine sandy loam.

The deposits underlying the capping usually grade from sandy loam to loamy sand and then to sand with depth. Interstratified bands and layers of finer textured material sometimes occur. The lowest lying terraces are sometimes imperfectly drained due to lateral seepage and/or water table fluctuations during the spring freshet season.

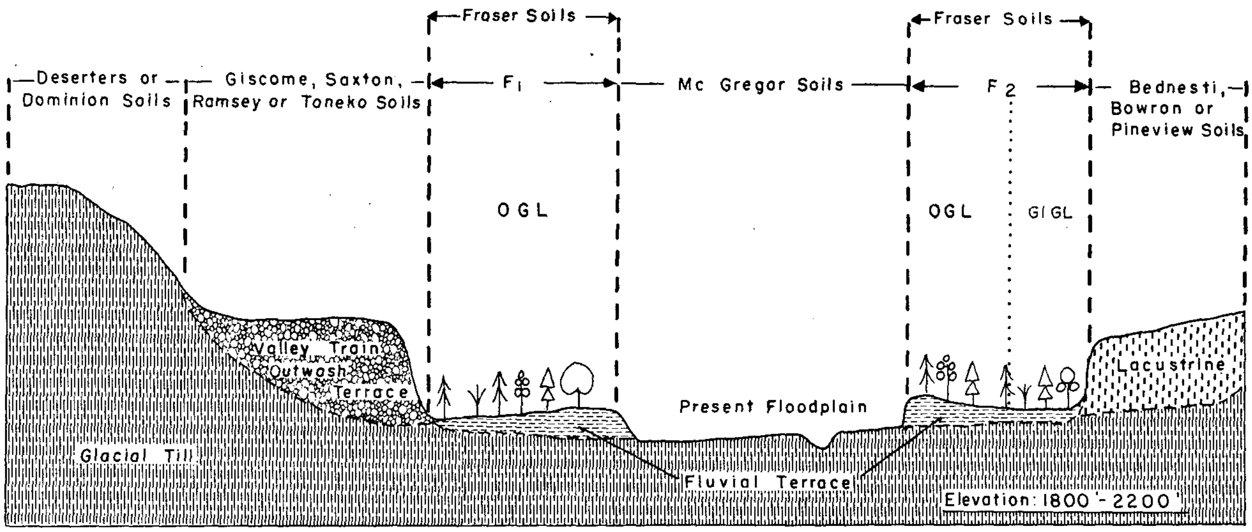
Fraser soils are mostly well or moderately well drained and are classified as Orthic Gray Luvisols. Where soil drainage is imperfect Gleyed Gray Luvisols occur.

Climate and Vegetation - The average annual, and May to September precipitations for the Fraser soils are about 25" to 38"; and 11" to 14", respectively. The soils mostly occur in relatively mild climatic locations along the Fraser River where the frost-free period ranges from 75 to 90 days. In the lower Willow River valley and in a few areas along the Fraser River the frost-free period decreases to between 60 and 75 days.

The soils all occur within the Subboreal white spruce - alpine fir zone and support a mixed forest composed of white spruce, lodgepole pine, alpine fir, trembling aspen, birch and cottonwood. The shrub and herb layer varies with the age and density of the forest cover. A more vigorous understory occurs on the imperfectly drained soils.

Soil Association Components - Two components of the Fraser association have been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
F1	Orthic Gray Luvisol		well - moderately well	Occurs mainly on the higher lying river terraces.
F2	Orthic Gray Luvisol		well - moderately well	Occurs mainly on lower river terraces or in complexes with the McGregor soils.
		Gleyed Gray Luvisol	imperfect	



Map Complexes - The Fraser soils only occur as the dominant soil in map complexes with the McGregor soils.

GISCOME SOIL ASSOCIATION (GI)

General Location and Physiography - The Giscome soil association is located in the Fraser Basin, mainly along the Fraser River between the general vicinity of Prince George and the southern boundary of the map area. Additional areas occur west of Prince George along the Nechako River and along the north-south section of the Stuart River. Elevations vary from about 1,800' to 2,200'. The Giscome soils are dominant in 1.2% of the map area.

Landform - The landforms consist of mostly gravelly, fluvial and glaciofluvial valley train terraces which were deposited below the general level of the glaciolacustrine deposits by the down-cutting action of the Fraser and Nechako rivers and, to a lesser extent, the Stuart River.

The topography is predominantly gently undulating to undulating with minor areas of kettled and gently rolling landscapes. Where more than one terrace level occurs, the escarpment slope to the lower terrace or terraces is usually steep to very steep.

Small isolated fans, usually composed of mixed glacial till, glaciolacustrine and/or glaciofluvial material eroded from upslope, have been deposited over the terraces in places.

Parent Material and Soils - The parent material is predominantly deep, stratified, cobbly, gravelly and sandy outwash overlain with a shallow, gravelly, coarse textured capping. Surface textures are mainly gravelly loamy sand or gravelly sandy loam with inclusions of gravelly sand. Where the capping thickens and consists of non-gravelly, sandy deposits, the soils are mapped as the Saxton soils. Due to the variable deposition by the rivers in forming the terraces, the Giscome and Saxton soils are often closely associated or intermixerd.

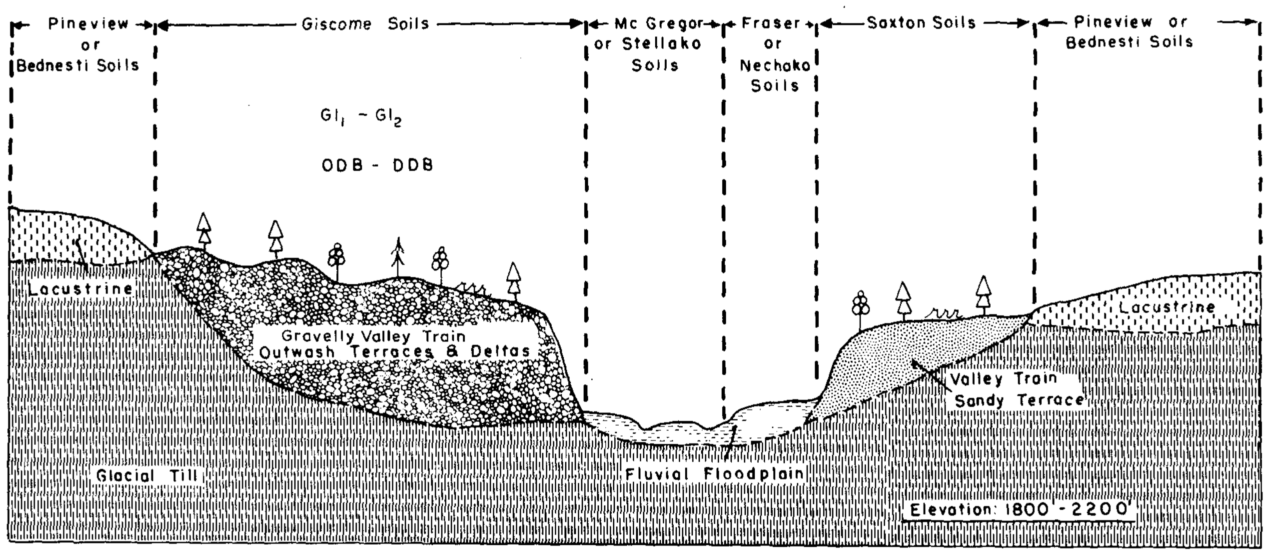
The soils are rapidly drained, rapidly permeable, porous and droughty due to there loose, gravelly and sandy composition. They are classified as Orthic and Degraded Dystric Brunisols.

Climate and Vegetation - The average annual, and May to September precipitations for most of the Giscome soils are comparable to that for Prince George Airport (25" and 13", respectively). The precipitation gradually decreases westward towards the Nechako-Stuart river junction and southward to the southern boundary of the map area.

The soils all occur within the Subboreal white spruce - alpine fir zone. A large proportion of the area has been burned by forest fires and the regrowth is composed of open stands of aspen and thick stands of lodgepole pine. White spruce is interspersed in places or occurs as scattered regrowth under the lodgepole pine canopy. The light ground cover is mainly composed of shrubs and herbs which are adapted to the droughty, coarse textured soils.

Soil Association Components - Two components of the Giscome association were separated in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
GI1	Orthic Dystric Brunisol	Degraded Dystric Brunisol	rapid	Ae or Aej horizons are intermittent.
GI2	Degraded Dystric Brunisol		rapid	Minor area occurring in a moister environment near the Giscome Canyon.



Map Complexes - The Giscome-Saxton complex occupies most of the areas which are mapped in complexes. These two soils are closely related. On other river terrace deposits, the Giscome-Fraser map complex sometimes occurs adjacent to the Fraser River and the Giscome-Stellako complex occurs along portions of the Nechako River.

The Giscome-Berman map complex occurs adjacent to dissected and kettled glaciolacustrine deposits which have been terraced by the Nechako River.

GUNNIZA SOIL ASSOCIATION (GU)

General Location and Physiography - The Gunniza soil association is found along the margins of, and as islands in the Prince George glacial lake basin, which occurs within the Nechako Plain. Elevations vary from about 2,450' to 2,600'. The soils are dominant over 1.1% of the map area.

Landform - The landforms consist of sandy, gravelly and stony glaciolacustrine beach deposits located along the margins of the Prince George glacial lake basin. Their surfaces usually conform to the underlying basal till terrain. The deposits are usually between 1' and 10' thick with minor inclusions as deep as 20'.

The deposits are usually deepest on northern and eastern shorelines of the glacial lake basin which received the most exposure from the prevailing southerly and westerly winds. Similarly, the deposits are sometimes more sandy on the southern and western shorelines where there was more protection from these prevailing winds.

The topography is variable, ranging from gently to strongly rolling or moderately to steeply sloping, with minor areas of very steep slopes on drumlin sides. Beach lines, indicative of successive lake levels, are evident in various locations.

Surface drainage is generally excessive, except for those areas associated with rolling glacial till. Here drainage and seepage water collects in depressions where the beach deposits are shallow over glacial till. Depressions with no drainage outlets are poorly to very poorly drained. Deeply percolated water usually spreads laterally on the underlying impervious glacial till and emerges as seeps at lower elevations on the glaciolacustrine deposits.

Parent Material and Soils - The beach deposits (parent material) are loose, porous, rapidly permeable and vary in depth from 1' to 10', with inclusions as deep as 20', over basal till. Subsoil textures vary from well sorted gravel or gravelly sand to gravelly loamy sand. Some interstratified well sorted sand or loamy sand may also occur. In some areas a shallow capping of loess-like fines, probably blown from the adjoining glacial till, imparts a gravelly loamy sand or gravelly coarse sandy loam surface texture. Cobbles, stones and small boulders are scattered through the deposits and over the surface, with their concentrations depending on the content in the original glacial till.

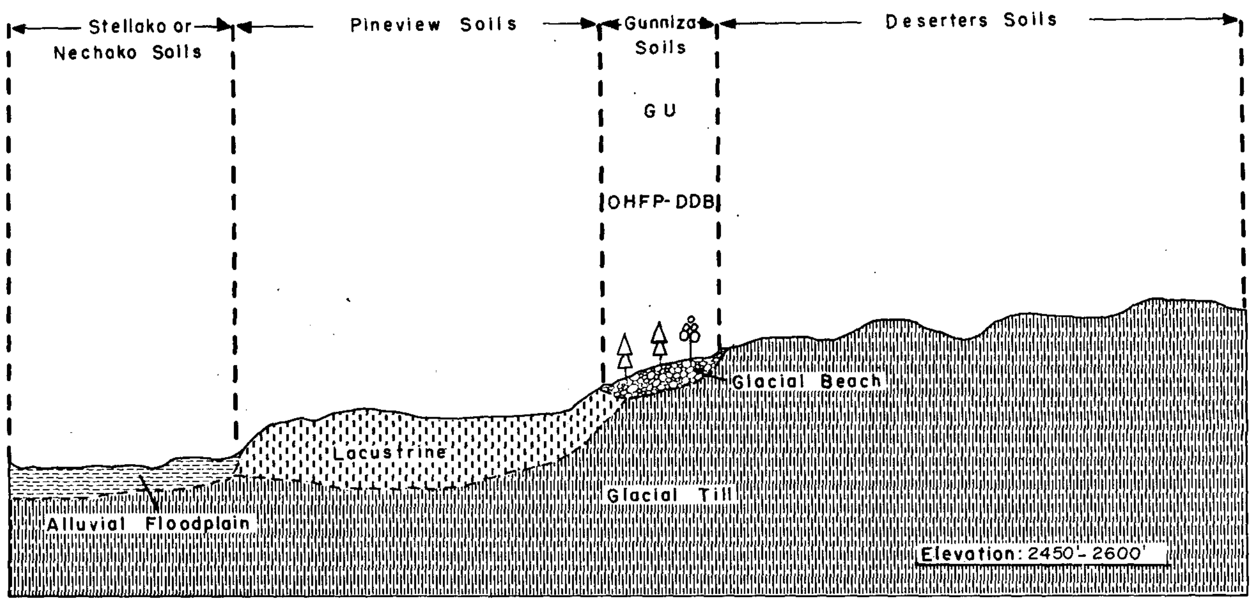
Gunniza soils have developed on similar landforms and parent materials to those of the Kluk soils, but occur in a moister environment. The soils are rapidly drained and classed as Orthic Humo-Ferric Podzols with significant inclusions of Degraded Dystric Brunisols. A few, small areas with imperfect drainage occur adjacent to depressions or where the beach deposits are shallow and seepage flows along the surface of the underlying glacial till.

Climate and Vegetation - The average annual, and May to September precipitations are similar to those at Prince George Airport (25" and 11", respectively). The average frost-free period is less than 60 to 75 days, but varies somewhat with location and aspect.

The soils occur in the Subboreal white spruce - alpine fir zone. The forest cover generally reflects the droughty nature of the soils and mature stands are predominantly open to semi-open mixtures of lodgepole pine and white spruce. The latter appears to grow well where its roots can penetrate to the underlying glacial till. Deciduous vegetation, mainly composed of aspen and willow, occurs on burned over sites. The understory shrubs, herbs and mosses consist of species adapted to the dry site conditions.

Soil Association Components - Only one component of the Gunniza association was established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
GU	Orthic Humo-Ferric Podzol	Degraded Dystric Brunisol	rapid	Droughty, gravelly soils. Variable depth of Ae horizon depends on the surface texture.



Map Complexes - The Gunniza association occurs as the dominant soil in map complexes with the Deserters soils along the margins and on islands in the Prince George glacial lake basin. A minor area of Gunniza-Dominion complex located in a similar landscape position also occurs.

The Gunniza-Pineview complex occurs where slight changes in elevation have resulted in intermingled beach and clayey glacial lake deposits.

KLUK SOIL ASSOCIATION (KK)

General Locationand Physiography - The Kluk soil association occurs within the Nechako Plain and is found along the margins, and on islands in the Vanderhoof and the western parts of the Prince George glacial lake basins. Elevations vary from about 2,450' to 2,600'. The soils predominate in 0.3% of the map area.

Landform - The landforms consist of gravelly and sandy, stony glaciolacustrine beach deposits. They are similar to those of the Gunniza association except that the topography is more gentle and varies from gently to moderately rolling. The deposits are generally also somewhat shallower, usually between 1' and 5' thick, over basal till although minor inclusions up to 10' thick also occur.

Parent Material and Soils - The parent material, as in the Gunniza soils, is porous and rapidly permeable and subsoil textures vary from well sorted gravel or gravelly sand to gravelly loamy sand. Some interstratified, sandy layers may also occur. Surfaces are usually gravelly loamy sand, gravelly coarse sandy loam, or gravelly sand. Variable amounts of cobbles, stones and boulders are present, their amounts depending on the concentrations in the original glacial till.

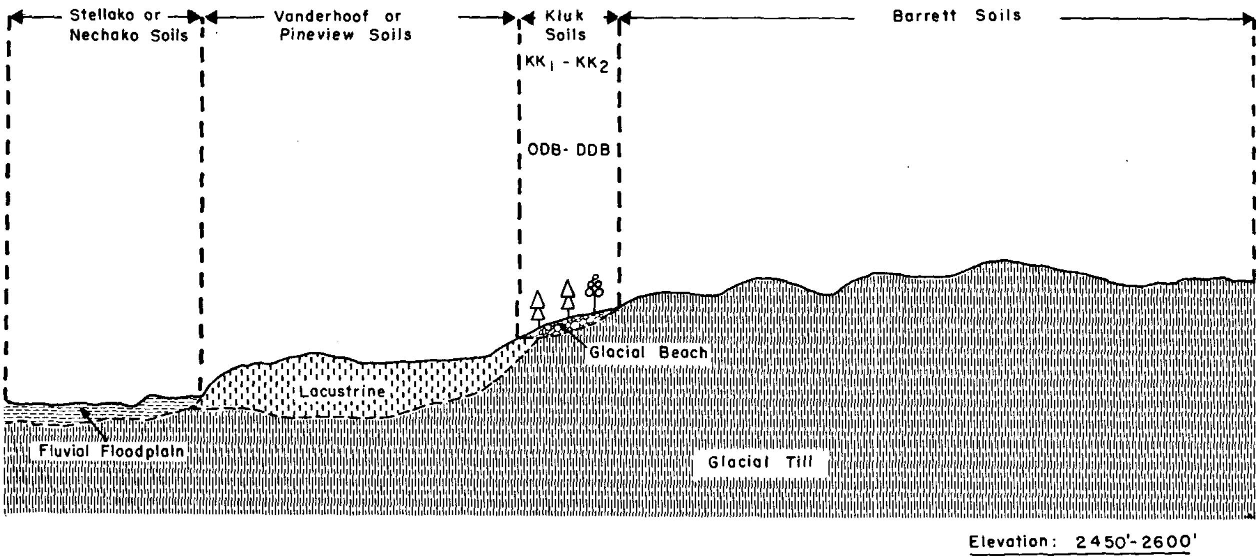
The Kluk soils generally occur in drier environments than do the Gunniza soils. They are rapidly drained and are classed as Orthic and Degraded Dystric Brunisols. Imperfect drainage sometimes occurs where the deposits are shallow over glacial till, or adjacent to depressions.

Climate and Vegetation - Most of the acreage occurs in the western half of the map area where average annual precipitation is in the range of 18" and 22". The frost-free period is generally less than 60 days in the west and increases to between 60 and 75 days in further east.

The soils occur in the Subboreal white spruce - alpine fir zone. The droughty conditions have produced a forest cover that is often open to semi-open. Lodgepole pine is the dominant species with associated white spruce and scattered aspen, willow and Douglas-fir. The understory shrubs, herbs and mosses are species adapted to droughty environments.

Soil Association Components - Two components of the Kluk association were identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
KK1	Orthic Dystric Brunisol	Degraded Dystric Brunisol	rapid	Occurs on the north side of the Vanderhoof glacial lake basin on south and east aspects.
KK2	Degraded Dystric Brunisol	Orthic Dystric Brunisol	rapid	Occurs in the central part of map area.



Map Complexes - The Kluk soils occur as the dominant association in map complexes with the Barrett soils (developed on glacial till), along the margins of, and as islands in, the glacial lake basins. Complexes with the Barrett and Crystal soils are also mapped where intermixed beach deposits, drumlinized till, and ablation till occur adjacent to the glacial lake margins. The Kluk soils are also mapped as the secondary component in map complexes with the Pinevew and Vanderhoof soils.

Plate 9. Glaciolacustrine beach ridges on which Gunniza soils have developed. Kluk soils have developed on similar materials.

KNEWSTUBB SOIL ASSOCIATION (KB)

General Location and Physiography - The Knewstubb soil association occurs in the Fraser Basin and is located in the deeply entrenched east-west section of the Stuart River valley meltwater channel between its origin to the west of the map area (in the Fort St. James glacial lake basin) and Taginchil Lake. This meltwater channel formed part of the glacial drainage for the extensive Stuart River esker complex which extends in a southeastern direction from west of Taginchill Lake to Prince George. Elevations vary from about 2,200' to 2,500'.

Landform - The landforms consist of extensively to occasionally kettled and dissected, fine sandy to silty glaciolacustrine deposits which were deposited in a small glacial lake in the Stuart River valley.

Post-glacial erosion has resulted in the entrenchment of the Stuart River in the western two-thirds of the deposits and dissection by various streams draining the adjoining glacial till deposits has also occurred. These creeks have occasionally spread small fans on to the glaciolacustrine deposits.

Part of the area is gently undulating to gently rolling with occasional kettle holes and creek gullies with steep sides. Most of the area, however, is extensively kettled and dissected and has rolling to hilly or strongly to very steeply sloping topography. Small ponds, lakes, or organic soils occupy the kettles.

Parent Material and Soils - The unweathered glaciolacustrine parent material is dark grayish brown to dark brown in color, stratified, calcareous at depth, and has moderate permability and friable to firm consistence.

The deposits are underlain at depth by interstratified, moderately coarse to medium textures. Where the surface textures are similar, namely fine sandy loam, sandy loam or silt loam, the Knewstubb soils are mapped. Where the surface textures are moderately fine, predominantly silty clay loam or silt loam, the Berman soils are mapped.

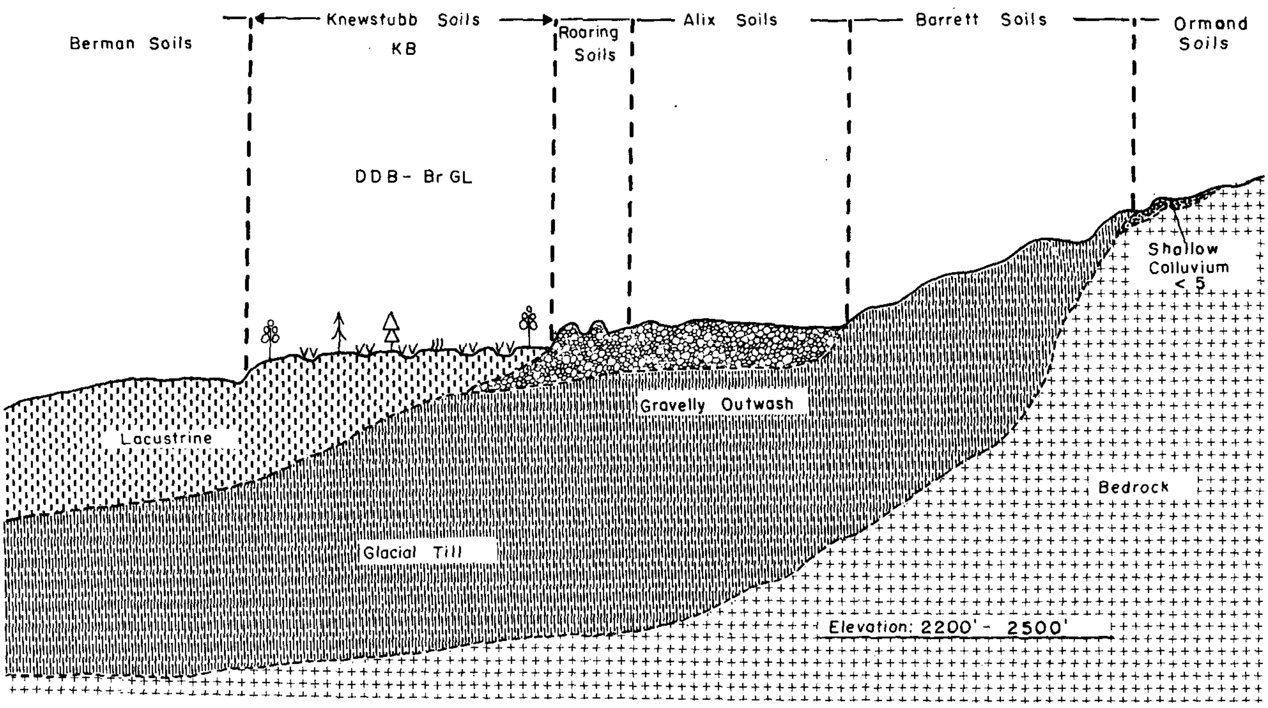
The soils are well to moderately well drained Degraded Dystric Brunisols with significant inclusions of Brunisolic Gray Luvisols. The strength and thickness of diagnostic horizons varies with topography, stratification of the deposits, aspect and the proximity to the Berman soils.

Climate and Vegetation - The Knewstubb soils occur in a narrow river valley which is subject to cool air ponding. This effect, however, is often compensated for by increased humidity and fog which reduces heat loss from the land surface. Clouds also often occur in the valley in the autumn when surrounding higher ground is clear. The frost-free season is generally less than 60 days. The average annual, and May to September precipitations are estimated to be between 17" and 20", and 7" and 9", respectively.

The Knewstubb soils all occur in the Subboreal white spruce - alpine fir zone. They have good rooting depth and support a mixed coniferous-deciduous forest cover. Lodgepole pine, white spruce and aspen are the dominant forest species and occur in mixed or open stands with inclusions of willow and birch. The understory of shrubs, herbs and mosses is variable. The vegetation is similar to that on Berman soils and is utilized extensively for grazing by wildlife, especially during the winter.

Soil Association Components - Only one component of the Knewstubb association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
KB	Degraded Dystric Brunisol	Brunisolic Gray Luvisol	well - moderately well	Diagnostic surface and subsurface horizons are often thin or weakly expressed.



Map Complexes - Map complexes in which the Knewstubb soils are dominant have not been mapped. The soils only occur as a secondary component in Berman-Knewstubb complexes.

LANEZI SOIL ASSOCIATION (LZ)

General Location and Physiography - The Lanezi association occurs in the east-central part of the map area, mainly between Mount Bowron and Spring Mountain within the Fraser Basin. Elevations vary from about 2,450' to 4,000. Lanezi soils dominate over 0.2% of the map area, all as the dominant soil in map complexes with Wendle soils.

Landform - The landforms consist of relatively deep basal till whose surface form usually conforms to that of the underlying bedrock. Scattered glacial grooves and drumlins occur in these areas. Well drumlinized areas also occur but are less common. The topography is strongly to very steeply sloping or moderately rolling to hilly.

A few small creeks originate on the glacial till slopes and drain into Wansa, Vama and Jaspar creeks or the Bowron River. The soils in general, have relatively good surface drainage.

Parent Material and Soils - The unweathered glacial till parent material is grayish-brown to olive gray or olive brown in color, weakly calcareous at depth, very compact, and has slow permeability and hard to very hard consistence.

The deposits are predominately medium to moderately fine textured in the subsoil but may be moderately coarse textured at the surface. Gravelly loam or gravelly clay loam are the dominant subsoil textures while gravelly sandy loam or gravelly loam are most common at the surface. Stoniness is variable within the deposits and grades from slightly to very stony at the surface.

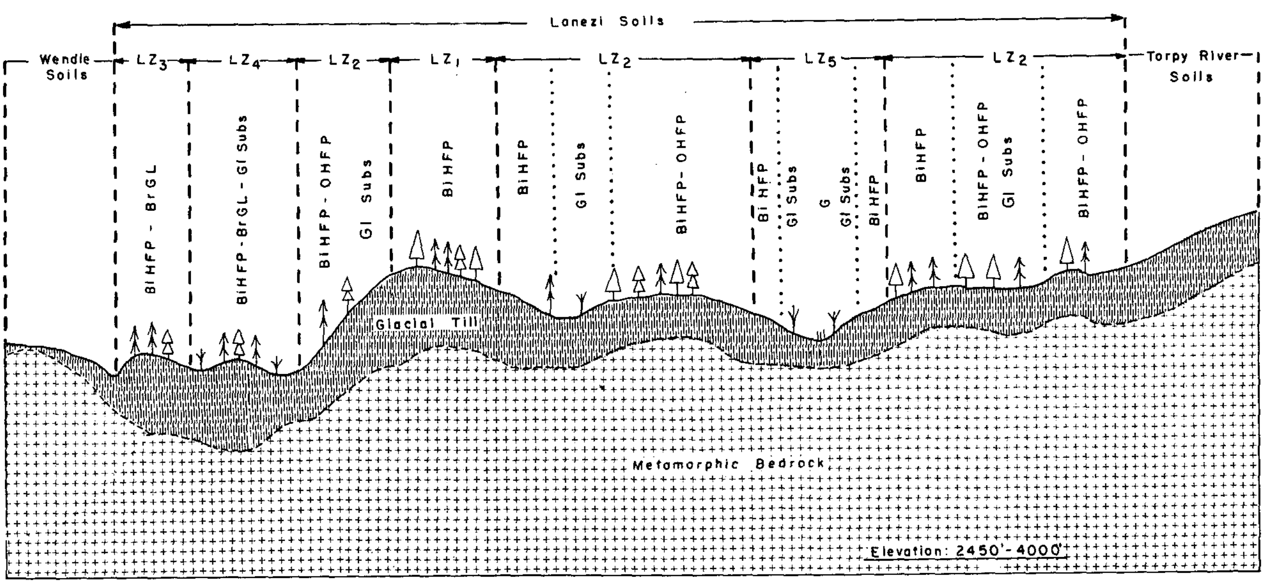
The soils are generally characterized by a predominance of moisture shedding sites having moderately well to well drained Bisequa Humo-Ferric Podzol soils. Intermixed are significant amounts of well to moderately well drained Orthic Humo-Ferric Podzols and some Brunisolic Gray Luvisols. Inclusions of imperfectly drained (gleyed subgroups) soils also occur, mainly on lower slopes and slight depressions where seepage accumulates.

Climate and Vegetation - Lanezi soils occur in the moister portions of the map area; the average annual and May to September precipitations are estimated to range from 35" to 40", and 12" to 14", respectively. The average frost-free period varies from between 30 and 50 days at the higher elevations where most of the soils are mapped, to between 50 and 75 days at lower elevations.

The Lanezi soils support a forest cover which represents the western extremities of the Interior Wet Belt. Summer precipitation and temperatures appear to favor the growth of western hemlock and western red cedar. The understory shrubs, herbs and mosses vary with the age and density of the forest cover.

Soil Association Components - Five components have been established for the Lanezi association but only two occur in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
LZ2	Bisequa Humo-Ferric Podzol	Orthic Humo-Ferric Podzol	moderately well - well	Orthic Humo-Ferric Podzols soils occur in areas transitional to the Wendle soils.
		gleyed subgroups	imperfect	
LZ4	Bisequa Humo-Ferric Podzol	Brunisolic Gray Luvisol	moderately well - well	Very limited in area.
		gleyed subgroups	imperfect	



Map Complexes - The Lanezi soils only occur in map complexes with the Wendle soils.

MAPES SOIL ASSOCIATION (MS)

General Location and Physiography - The Mapes soil association is located in the southwestern part of the map area, within the Nechako Plain and the Fraser Basin. Most of the area lies west and southwest of Cluculz Lake at elevations between about 2,500' and 3,000'. The Mapes soils predominate on 0.2% of the map area.

Landform - The landforms mainly consist of sandy, glaciofluvial terraces and deltas. Intermittent, sandy outwash deposits also occupy a glacial meltwater channel complex which extends southeastward from north of Eulatazella Lake to Naltesby Lake, and onward to the Chilako River. Sand dunes, due to wind erosion, occupy parts of the terraces southwest of Cluculz Lake.

The topography ranges from gently undulating or undulating to gently or moderately rolling. The latter usually occurs were the sandy deposits are relatively shallow and overlie glacial till.

Parent Material and Soils - The sandy deposits are usually deeper than at least 5'. The subsoil texture is predominantly coarse sand while surface textures are mainly loamy sand with inclusions of sand and sandy loam. Stratified lenses of gravel occasionally occur at depth as do minor amounts of gravel throughout the deposits.

The Mapes soils are very droughty, very porous, rapidly permeable and rapidly to well drained. They are also susceptible to wind erosion when the vegetation is removed and the surface is exposed.

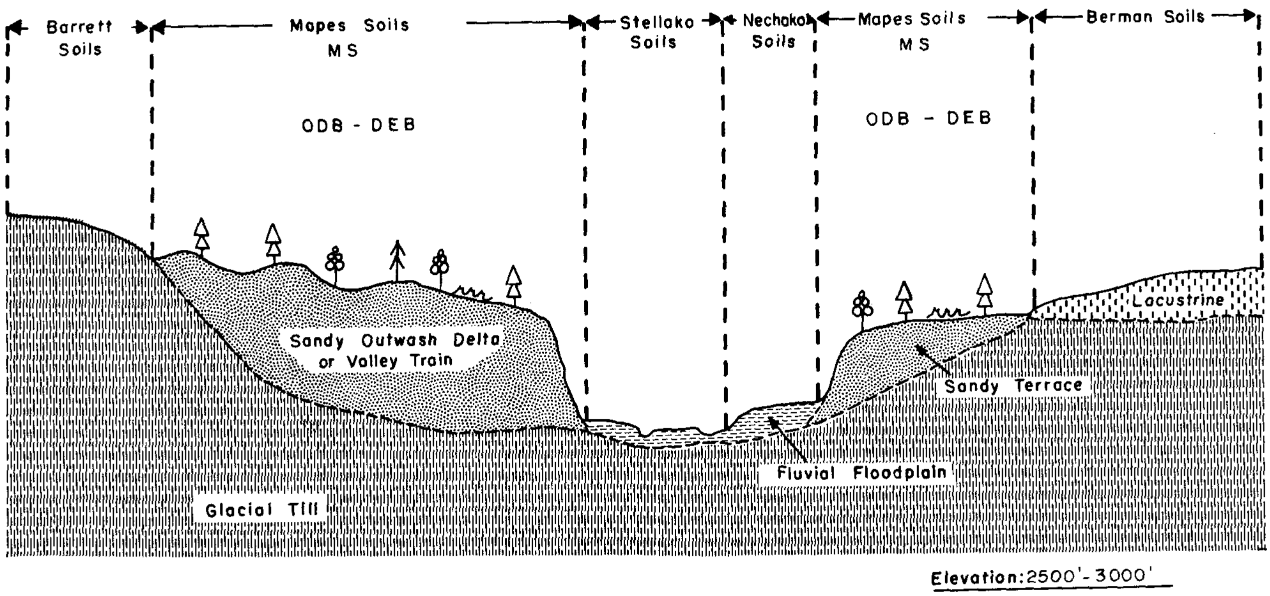
The Mapes soils are classified as Orthic Dystric Brunisols with significant inclusions of Degraded Eutric Brunisols. They occur on similar landforms and parent materials, but in drier environments, than do those of the Peta and Bear Lake soils.

Climate and Vegetation - The soils occur in the drier, southwestern part of the map area where the average annual, and May to September precipitations are estimated to be between 15" and 20", and 7" and 9", respectively. The average frost-free period varies somewhat with location but is generally about 60 days or less.

The soils occur within the Subboreal white spruce - alpine fir zone. They suport a low productivity forest compcsed mainly of semi-open stands of lodgepole pine with inclusions of scattered white spruce and aspen. The sparce shrub and herb cover varies with the density of the forest cover and is mainly composed of plants adapted to the droughty soils.

Soil Association Components - Only one component of the Mapes association was identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
MS	Orthic Dystric Brunisol	Degraded Eutric Brunisol	rapid - well	Coarse textured soils. Ae or Aej horizon is frequently absent.



Map Complexes - The Mapes soils are not mapped as the dominant soil in map complexes with other soils. However, they do occur as the secondary component in map complexes with the Crystal and Alix soils north of Eulatazella Lake and southeast of Naltesby Lake, respectively.

MCGREGOR SOIL ASSOCIATION (MG)

General Location and Physiography - The McGregor soil association occurs in the Fraser Basin and is mainly located on the lower terraces of the Fraser River. Additional areas occur in the east of the map area on the lower terraces of the Willow, Bowron and McGregor rivers and Wansa, Seebach and Olson creeks. Elevations range from 1,800' to 2,500'. The McGregor soils are dominant in 0.8% of the map area.

Landform - The landforms consist of non-gravelly, laterally accreted, fluvial (alluvial) terraces subject to flooding during spring freshets and variable water tables during the growing season.

The topography varies from gently undulating to undulating with inclusions of nearly level ground. Numerous current scars due to former meandering channels are randomly distributed across the surface of the landforms.

Parent Material and Soils - The upper 2' to 4' of the deposits, which are water sorted and often interstratified, have mainly medium to moderately coarse textures with a few very coarse textured inclusions. Surface textures are mainly silt loam, fine sandy loam or sandy loam. The coarse textured underlying materials, extending to various depths, are predominantly gravel-and stone-free. Minor shallow cappings composed of moderately fine textured material occur at random in backwater channels where localized ponding has occurred.

Fluctuating water tables and seepage in the coarse textured subsoil, as well as flooding, cause a variable soil drainage pattern.

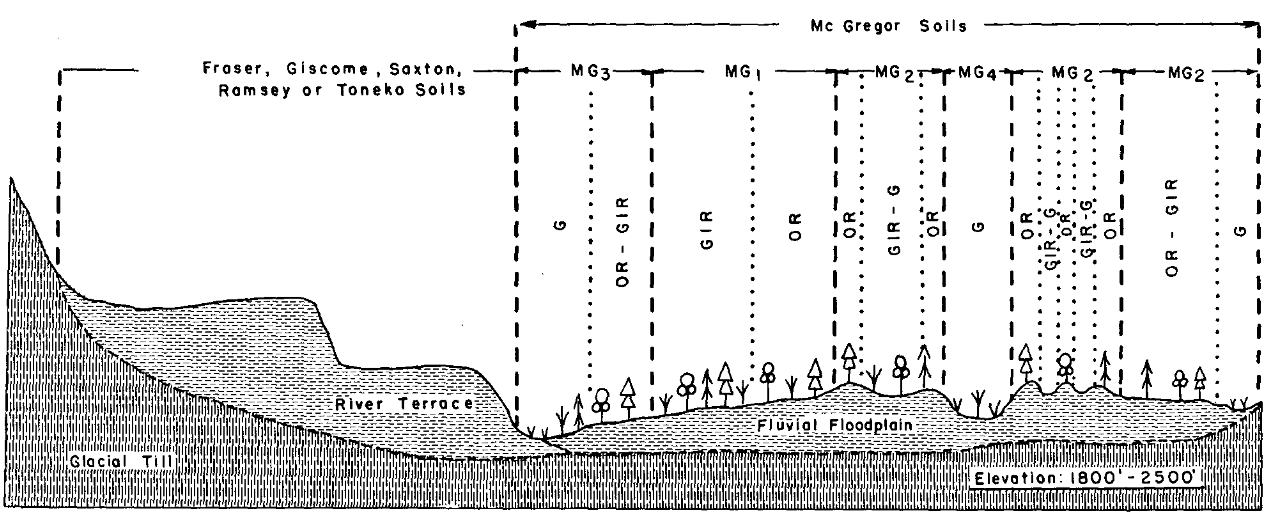
The McGregor soils are mainly classified as Regosols since they lack soil development due to their recent deposition. Orthic Regosols occur where the soils are moderately well to rapidly drained (usually the highest portions of the terraces), and Gleyed Regosols are found in intermediate landscape positions (imperfectly drained). Gleysolic soils occur in depressions and other low-lying areas where the soils are poorly drained due to restricted subsurface drainage or high water tables. Where the Gleysolic soils are associated with very poorly drained Organic soils, they may have a thin organic surface layer.

Climate and Vegetation - The average annual, and May to September precipitations are estimated to range from 25" to 40", and 11" to 14", respectively. In the more favorable climatic locations along the Fraser River the frost-free period varies from 75 to 90 days. Along the Willow and Bowron rivers and Wansa and Olson creeks, the frost-free period varies from 50 to 75 days.

The soils occur within the Subboreal white spruce - alpine fir zone. Forest cover is a mixture of coniferous and deciduous species, mainly white spruce, alpine fir, lodgepole pine, trembling aspen, birch, cottonwood and willow. Shrub and herb cover is variable.

Soil Association Components - Four components of the McGregor association have been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
MG1	Gleyed Regosol		imperfect	Occurs on the higher terraces; current scars, oxbows and backwater channels occupy minor areas.
		Orthic Regosol	moderately well - rapid	
MG2	Gleyed Regosol		imperfect	Similar to the MG1 but with significant areas of poorly drained current scars, oxbows and backwater channels.
		Orthic Regosol	moderately well - rapid	
		Gleysolic	poor	
MG3	Gleysolic		poor	Occurs where soil drainage is mainly restricted by high water tables.
		Gleyed Regosol	imperfect	
		Orthic Regosol	moderately well - rapid	
MG4	Gleysolic		poor	Occurs in association with organic (Chief) soils.



Map Complexes - The MG1 and MG2 components of McGregor soils are sometimes mapped in complexes with Fraser soils on higher-lying terraces. In low-lying areas the MG3 and MG4 components are often mapped in complexes with Chief soils.

MOXLEY SOIL ASSOCIATION (MO)

General Location and Physiography - The Moxley soil association occurs throughout the map area at elevations from about 2,000' to 4,500'. The soils are dominant over 1.5% of the map area.

Landform - Moxley soils have developed on mostly forested organic deposits that have accumulated in depressional and topographic lows where run-off and seepage water collects and water tables are high. The organic deposits occur in many different shapes and sizes, ranging from a few acres to more than a hundred. Surface drainage is variable, ranging from depressions with no drainage outlets to organic areas through which streams meander.

The topography varies from depressional or nearly level to very gently sloping or undulating.

Parent Material and Soils - The organic deposits vary from relatively undecomposed to highly decomposed and mainly consist of the remains of sphagnum and other mosses and lesser amounts of Labrador tea, sedges, other hydrophytic vegetation and woody forest materials. The rate of accumulation and/or decomposition is generally related to the water table conditions. The most undecomposed deposits occur where a high water table has persisted for long periods of time, whereas the intermediate to highly decomposed stages occur where the water table is somewhat lower or fluctuates. The decomposition within individual deposits can therefore be fairly uniform or interstratified, depending on past water table characteristics.

The deposits vary in depth from as shallow as about 20" to deeper than 15'. Layers of mineral soil of variable thickness and texture are sometimes interstratified in the organic deposits. The underlying mineral materials are usually medium to fine textured.

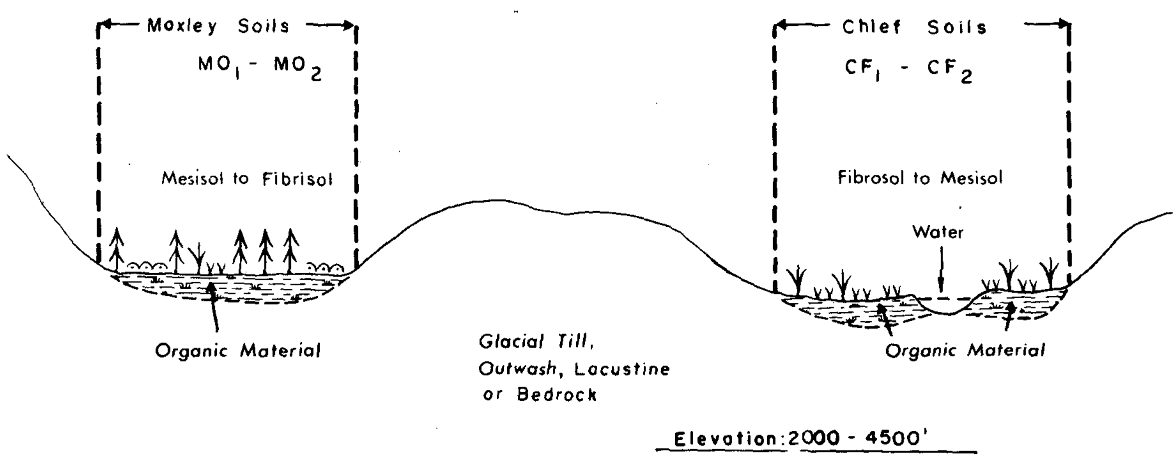
The Moxley soils are characterized by a predominance of very poorly drained Mesic Fibrisols and Typic Mesisols. In addition, inclusions of Fibric Mesisols, Humic Mesisols and terric subgroups (less than 52" in depth) also occur. Mesic Humisols were observed on drained sites developed for agricultural purposes.

Climate and Vegetation - The Moxley soils have slightly lower frost-free periods than the adjacent mineral soils due to their depressional and/or topographic low locations where frost-pooling occurs.

The soils occur in both the Subboreal white spruce - alpine fir and Subalpine Engelmann spruce - alpine fir zones. They mainly support a tree cover of black spruce and lodgepole pine and lesser amounts of deciduous species. The understory mainly consists of a variable density of sphagnum moss, Labrador tea, sedges and related hydrophytic vegetation. A variable vegetation pattern exists in transitions to the non-forested, closely related Chief soils.

Soil Association Components - Two components of the Moxley association were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
MO1	Mesic Fibrisol	Fibric Mesisol	very poor	Usually occurs where surface drainage is either non-existant
		terric subgroups	very poor	or poorly developed.
MO2	Typic Mesisol	Humic Mesisol	very poor	Usually occurs in areas with partial
		terric subgroups	very poor	surface drainage.



Map Complexes - The Moxley soils are mapped in complexes with the Chief soils where their respective forested and non-forested vegetation patterns are distinguishable on air photographs. Soil development on the two associations is very similar.

The Moxley-Stellako map complex occurs in fluvial areas where the respective organic and gleysolic soils are closely intermingled. The Moxley-Pineview map complex occurs in topographic lows in deposits where the Moxley soils are intermingled with the poorly drained components of the clayey Pineview soils.

NECHAKO SOIL ASSOCIATION (N)

General Location and Physiography - The Nechako soil association occurs mainly in the Nechako River valley between Vanderhoof and Prince George. Additional areas are mapped in the Chilako River valley near its confluence with the Nechako River, in the east-west portion of the Stuart River valley, and along the lower Salmon River near its junction with the Fraser River. Elevations vary from 1,800' to 2,500'. The Nechako soils are dominant in 0.2% of the map area.

Landform - The landforms consist of vertically accreted fluvial (alluvial) terraces, usually located in sequence above the present floodplains of rivers. Topography varies from nearly level or gently undulating to undulating. Old current scars and shallow abandoned channels are evident on the surfaces of some terraces.

Parent Material and Soils - The parent material consists of a moderately coarse to medium textured fluvial capping, at least 2' thick, underlain by gravel and stone-free sands, and occasionally gravelly sands. The main surface and subsurface textures of the capping are fine sandy loam or silt loam with inclusions of loam or sandy loam. These textures may be interstratified.

The Nechako soils are mostly well to moderately well drained. On low-lying terraces some imperfectly drained areas occur due to subsoil seepage from the adjacent rivers or periodic high water tables during the spring freshet season. The soils are mostly Orthic Gray Luvisols although significant inclusions of imperfectly drained Gleyed Gray Luvisols occur within some low-lying map units.

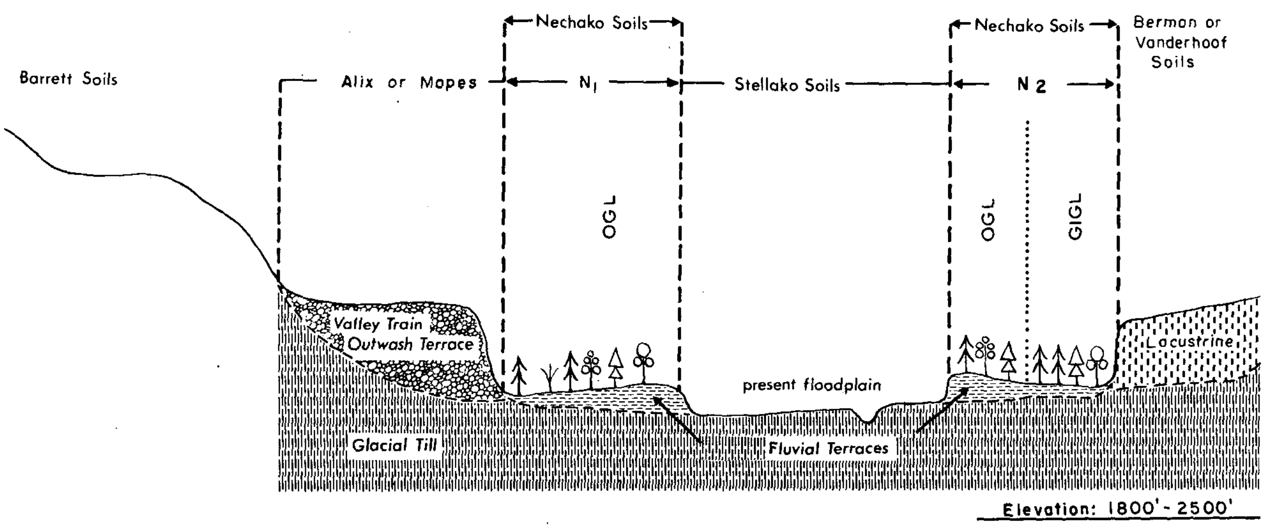
The Nechako and Fraser soils occur on similar landforms and parent materials and have similar soil development. The Nechako soils are mapped along rivers draining from the western plateau areas, the Fraser soils along rivers draining from the east.

Climate and Vegetation - The average annual, and May to September precipitations on the Nechako soils vary between 18" and 25", and 8" to 12", respectively. The lower values generally occur in the western parts of the map area. The average frost-free period varies from 75 to 90 days in the lower Nechako and Chilako River valleys near Prince George. It decreases to between 50 and 60 days in the Nechako River valley near Vanderhoof and in the Stuart River valley.

The soils all occur within the Subboreal white spruce - alpine fir zone. Forest cover is mainly composed of white spruce, lodgepole pine, aspen, birch and some cottonwood. The shrub and herb layer varies with the age, density and composition of the forest cover and is usually most abundant on imperfectly drained sites.

Soil Association Components - Two components of the Nechako association have been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
N1	Orthic Gray Luvisol		well - moderately well	Occurs mainly on the higher terraces.
N2	Orthic Gray Luvisol		well - moderately well	Occurs mainly on the lower terraces or in complexes with Stellako soils.
		Gleyed Gray Luvisol	imperfect	



Map Complexes - The Nechako-Giscome complex occurs mainly in the Nechako and lower Chilako river valleys where the medium textured capping is missing (or very shallow) on portions of some terraces. The Nechako-Stellako map complex occurs along the Nechako River east of Vanderhoof where some of the lower terraces are poorly drained and subject to flooding.

OONA SOIL ASSOCIATION (ON)

General Location and Physiography - The Oona soil association occurs in the Fraser Basin, mainly in the northern half of the map area on bedrock-controlled heights on or near Coffee Pot and Tea Pot mountains, Merton Hill and Mount Prince. Additional areas occur further south in the vicinity of Bobtail Mountain. Elevations vary from 3,000' to 4,100'. The soils are dominant on 0.6% of the map area, primarily in map complexes with Deserters, Dominion and Twain soils.

Landform - The landforms are characterized by steep to extreme slopes associated with glacial grooves, convex bedrock summits, apexes and ridges. The bedrock mainly consists of basaltic and andesitic lavas and related volcanic rocks (Tipper, 1961) and is covered by a shallow cover (less than 5' thick) of glacial till and/or colluvium. Surface drainage patterns have variable density and are generally not well developed.

Parent Material and Soils - The shallow mantle comprising the parent material is generally less than 5' in thickness and often, less than 20". It is composed of glacial till and/or colluvium derived from glacial till and broken, weathered bedrock. Localized bedrock exposures occur on some ridge tops and slopes.

The texture of the shallow soil mantle is usually similar to that of the adjoining deeper, medium to moderately fine textured basal till. Moderately coarse textures sometimes occur where the mantle is very shallow. Gravelly loam or gravelly clay loam are the dominant subsoil textures and surfaces vary from gravelly sandy loam to gravelly loam. Stoniness varies with the content in the glacial till while rockiness depends on the depth of the mantle over bedrock. Compactness and permability vary with the amount of down-slope movement on steeper slopes and on the thickness of the compact glacial till. Those areas with substantial colluvium and little subsoil till are most permeable and least compact.

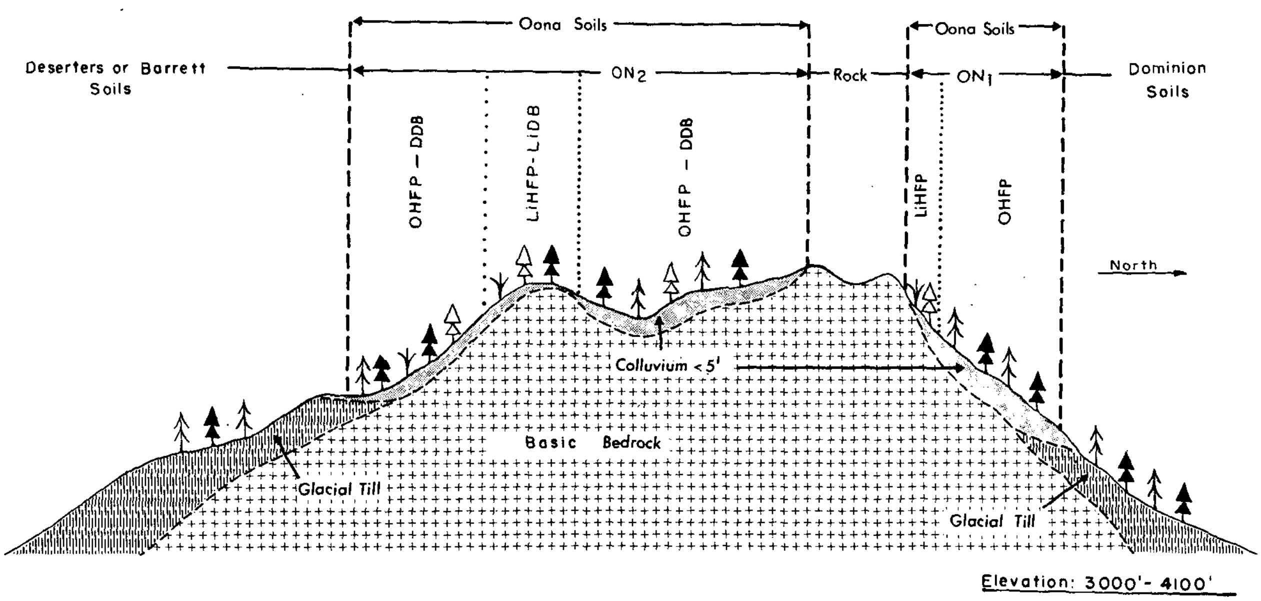
The soils are dominantly characterized by moisture shedding, well to rapidly drained Orthic Humo-Ferric Podzols. Significant areas of Degraded Dystric Brunisols and lithic subgroups also occur.

Climate and Vegetation - The climate is variable, with the higher elevation areas having cooler summer temperatures, higher winter snowfall and increased cloud cover. The estimated average annual precipitation varies between 20" and 35". The Oona soils occur at higher elevations and in moister environments than do the similar Ormond soils.

Oona soils occur in both the upper Subboreal white spruce - alpine fir and lower Subalpine Engelmann spruce - alpine fir zones. Forest cover is mainly spruce, lodgepole pine and alpine fir. The forest canopy is variable in density and is sometimes wind damaged at higher elevations. The understory of shrubs, herbs, mosses and lichens varies with forest cover, aspect and depth to bedrock. As the soil mantle thickens to more than 20" a gradual increase in understory abundance occurs.

Soil Association Components - Two components of the Oona association were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
ON1	Orthic Humo-Ferric Podzol		well	Occurs at the higher, moister elevations or on dominantly
		Lithic Humo-Ferric Podzol	well - rapid	north aspects.
ON2	Orthic Humo-Ferric Podzol	Degraded Dystric Brunisolic	well	Usually occurs at the lower elevations; Degraded Dystric
		lithic subgroups	well - rapid	Brunisols are dominantly on south and/or west aspects.



Map Complexes - The Oona soils occur in map complexes with three soils developed on deep basal till. The Oona-Dominion complex occurs in the higher precipitation environments in the northeast of the map area while the Oona-Deserters complex occurs in the northwest on higher elevation, north aspects on mixed deep, and shallow to bedrock basal till landforms. The Oona-Twain map complex occurs on steep, bedrock-controlled topography such as that in the south-central part of the map area near Bobtail Mountain.

ORMOND SOIL ASSOCIATION (OD)

General Location and Physiography - The Ormond association is mainly located in the northwest of the map area on bedrock-controlled heights within the Fraser Basin. Additional areas occur in the southeast on and near Mount Baldy Hughes. Elevations vary from about 2,600' to 3,500', with a few areas extending somewhat higher. Ormond soils are dominant in 0.2% of the map area, the majority in map complexes with the Barrett and Deserters associations.

Landforms - The landforms are characterized by steep to extreme slopes associated with glacial grooved, convex shallow to bedrock apexes and ridges. A shallow mantle, composed of glacial till and/or colluvium derived from glacial till and broken, weathered bedrock, overlies bedrock mainly consisting of basaltic and andesitic lavas and related volcanic rocks (Tipper, 1961). Surface drainage patterns have variable density and are generally not well developed.

Parent Material and Soils - The shallow mantle varies in depth from approximately 5' to less than 20', with small, localized bedrock exposures on some apexes and steep slopes.

Soil textures are usually similar to the adjoining, deeper medium to moderately fine textured basal till. A gradation to moderately coarse textures occurs where the mantle is very shallow. Gravelly loam or gravelly clay loam are the dominant subsoil textures while surface textures vary from gravelly sandy loam to gravelly loam.

Compactness and permeability depends on the depth of hard, compact glacial till and to the amount of down-slope movement on steeper slopes. Areas most shallow to bedrock are the least compact and most permeable. Stoniness varies with the content in the associated glacial till while rockiness varies with the depth of the mantle over bedrock.

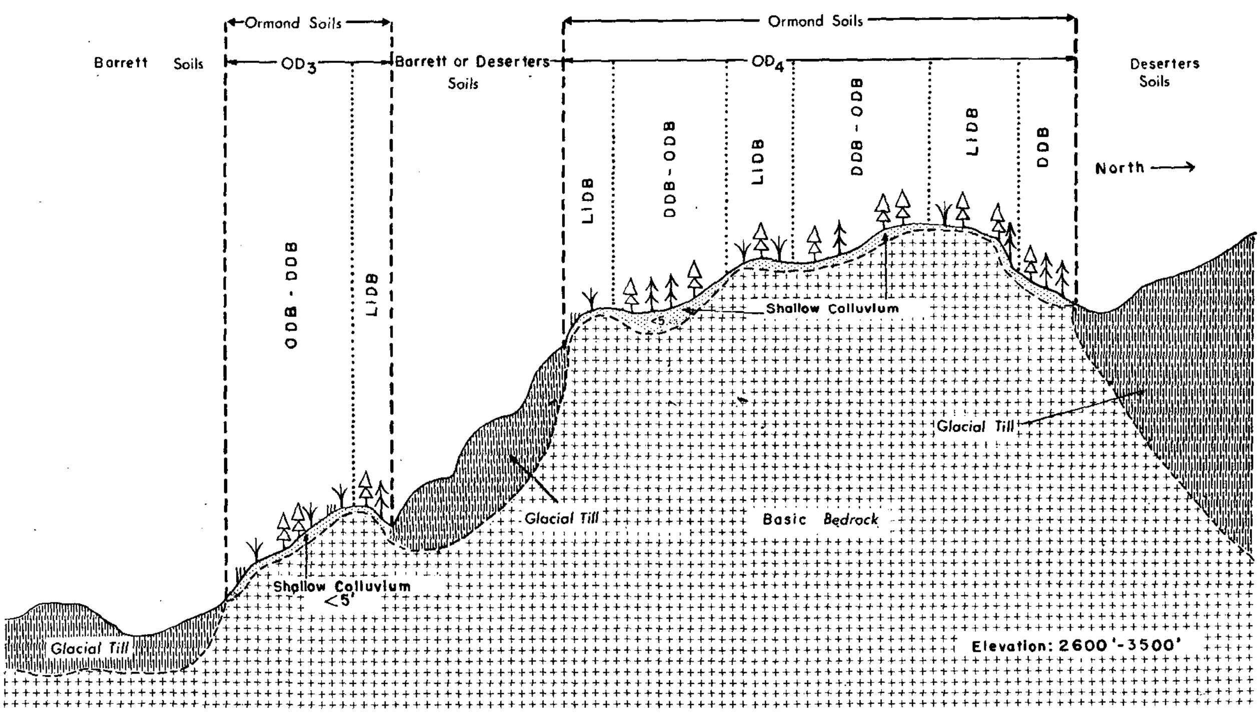
The soils are classified as well to rapidly drained Orthic and Degraded Dystric Brunisols with significant lithic inclusions.

Climate and Vegetation - The Ormond soils occur mainly in the drier, western half of the map area, where estimated annual precipitation is about 18" to 25". The OD4 component is mapped on Mount Baldy Hughes where elevation and precipitation are somewhat higher than in areas to the west.

The soils lie within the Subboreal white spruce - alpine fir zone. Forest cover is mainly spruce, lodgepole pine and alpine fir. The understory shrubs, herbs, mosses and lichens vary with the density of the forest canopy, aspect, and depth to bedrock. Abundance increases as the soil mantle thickens to more than 20".

Soil Association Components - The OD3 and OD4 components of the Ormond association occur in the Prince George - McLeod Lake map area. Components OD1 and OD2 only occur farther west in the Nechako - Francois Lake map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
OD3	Orthic Dystric Brunisol	Degraded Dystric Brunisol	well	Occurs in the somewhat drier, western parts of the map area.
		lithic subgroups	well - rapid	
OD4	Degraded Dystric Brunisol	Orthic Dystric Brunisol	well	Occurs in moister environments than the OD3 component.
		lithic subgroups	well - rapid	



Map Complexes - The Ormond soils are mapped as complexes with two soils derived from basal till. The Ormond-Barrett complex occurs in the drier, western part of the map area, while the Ormond-Deserters complex occurs in areas transitional to, or within, the moister eastern parts.

PETA SOIL ASSOCIATION (PA)

General Location and Physiography - The Peta association is located on the Nechako Plain in the northwest of the map area, specifically on the west side of Great Beaver Lake and on terraces along the Salmon River between Great Beaver Lake and the Muskeg River - Salmon River junction. Elevations are between 2,400' and 2,800'. The Peta soils are dominant over 0.2% of the map area.

Landform - The landform consist of sandy glaciofluvial terraces generally more than 5' thick. The topography is usually nearly level to undulating. However, where kettles occur, or the underlying glacial till influences topography, the deposits are gently to moderately rolling. Wind erosion and minor duning has occurred in some areas.

Parent Material and Soils - The sandy parent material is usually more than 5' thick, but depth can be quite variable. In general, the deposits are somewhat shallower than similar deposits in the large river valleys.

Surface textures are mainly loamy sand or sandy loam and usually grade to gravelly sand or gravel at greater than 5' depth.

The Peta soils have developed on similar parent materials to those of the Mapes, Bear Lake and Saxton soils. They however occur in areas that receive precipitation intermediate between the Mapes and Bear Lake soils, and lie at higher elevations than the Saxton soils.

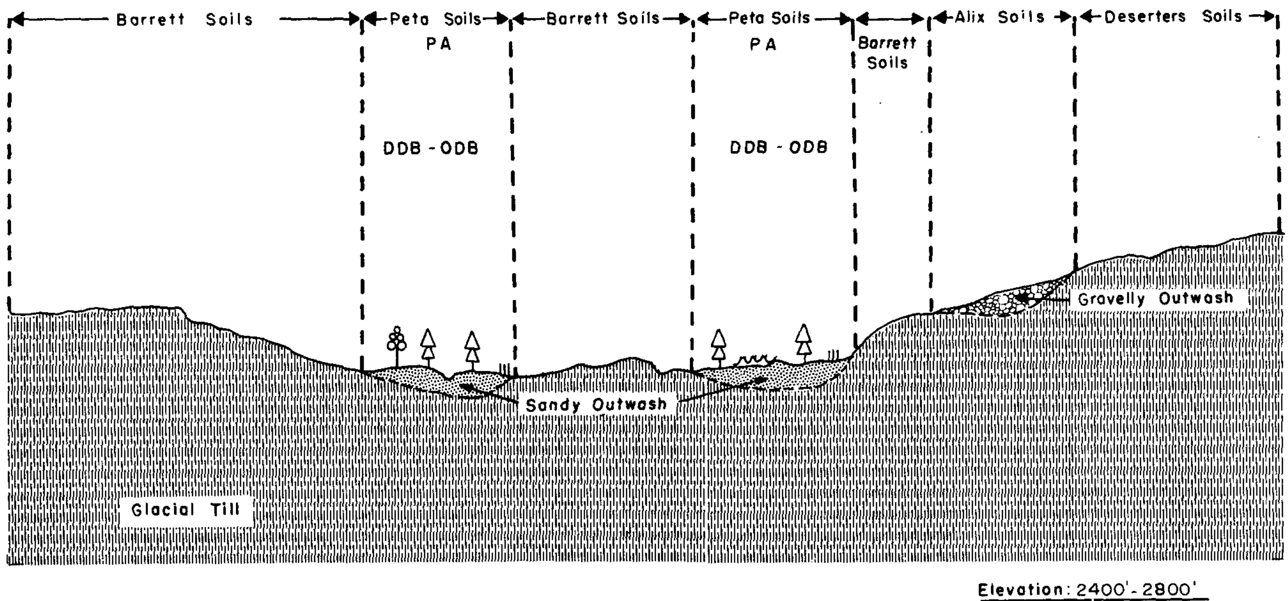
The soils are rapidly drained, rapidly permeable, porous and droughty. They are classified as Degraded Dystric Brunisols with significant inclusions of Orthic Dystric Brunisols. The latter usually occurs where the soils are sandier at or near the surface or where the forest cover is immature (ie. where relatively recent disturbance has occurred).

Climate and Vegetation - The Peta soils occur in a climatic environment where the average frost-free period varies from 30 to 50 days. The average May to September, and annual precipitations are estimated to be between 8" and 9", and 18" and 20", respectively.

The soils occur in the Subboreal white spruce - alpine fir zone. They support a low productivity forest mainly composed of lodgepole pine, trembling aspen, scattered white spruce with a sparse shrub and herb cover that is adapted to the dry site conditions.

Soil Association Components - Only one component of the Peta soils was defined in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
PA	Degraded Dystric Brunisol	Orthic Dystric Brunisol	rapid	Ae or Aej horizons are commonly absent.



Map Complexes - The Peta-Berman map complex occurs in the vicinity of Great Beaver Lake. Here sandy glaciofluvial and silty glaciolacustrine deposits are intermixed where glacial streams flowed into the glacial lake basin. The Peta-Chief and Peta-Chief-Stellako map complexes occur in meltwater channels from near the east end of Great Beaver Lake northward to and across, the Salmon River.

PINEVIEW SOIL ASSOCIATION (P)

General Location and Physiography - Pineview soils occur in all three glacial lake basins forming the Nechako Plain. They mainly occur in the eastern half and west-central part of the map area at elevations from as low as 2,000' adjacent to the deeply entrenched Fraser River, up to 2,600'. The Pineview association is dominant over 15.2%, of the map area.

Landform - The landforms consist of usually deep, clayey glaciolacustrine plains having variable topography. The topography is related to the depth of sediments, and to the surface form of the underlying deposits that existed prior to the formation of the glacial lakes. Generally, the thicker the sediments, the smoother the landforms.

Deep deposits are generally characterized by gently undulating to gently rolling topography. Shallower deposits (usually less than 20' to 30') overlying drumlinized glacial till have topographies that generally conform to the gently, moderately or strongly rolling topography of the glacial till. Slumping of the glaciolacustrine sediments in the grooves between the drumlins is usual, and as a result, the slopes are somewhat more gradual than those of the undulating drumlinized glacial till. Post-glacial dissection and erosion adjacent to large rivers has resulted in strongly rolling to very steeply sloping topography in these areas.

Surface drainage of these clayey landforms is by a network of intermittent creeks with long, low gradients. Associated gullies and creek channels do not have the sharp-angled and steep-sided characteristics of silty sediments but have flat-angled, gradually sloping sides typical of cohesive clays. A few small ponds and lakes occur in kettle holes or depressions within the sediments.

Parent Material and Soils - The unweathered parent material is brownish to grayish in color, varved, calcareous at depth, has very slow permeability and very firm consistence. Surface sediments are fine or very fine textured and are underlain by siltier textures at depth. Variations in surface and profile textures are usually associated with the amount of post-glacial erosion, topography and the proximity to lighter textured soils.

Upper textures are predominantly heavy clay, gradually grading to clay or silty clay with depth. Heavy clay textured material between 4' and 8' deep overlaying interstratified clay and silty deposits down to 15' were observed in exposed sections along highways. Leaching in the top 2" to 6" has varied the texture to clay or silty clay loam, abruptly underlain by heavy clay.

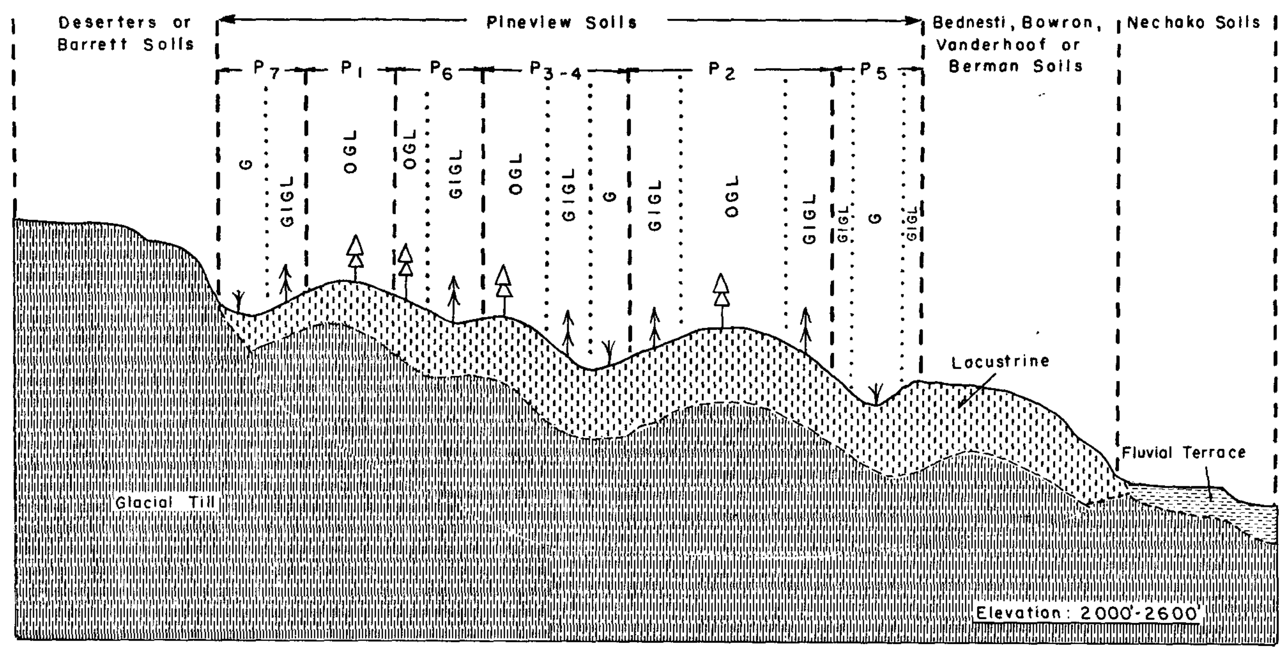
The heavy textures cause the Pineview soils to have restricted subsoil drainage and rooting depths. The soils are classified as moderately well drained Orthic Gray Luvisols with significant inclusions of imperfectly drained Gleyed Gray Luvisols. Poorly drained Gleysolics and very poorly drained Organics occupy depressions and swales.

Climate and Vegetation - The average annual, and May to September precipitation is estimated to be between 18" and 40", and 7" and 14", respectively. The lower values occur in the western part of the map area. The frost- free period of Pineview soils is slightly higher than on the surrounding, higher elevation glacial till plain and varies from about 60 to 90 days in the eastern Prince George lake basin to generally less than 60 days in the western Vanderhoof lake basin.

The soils occur in the Subboreal white spruce - alpine fir zone. Dense stands of white spruce, relatively pure stands of lodgepole pine and/or aspen, or mixed stands of white spruce, lodgepole pine and aspen occur. White spruce favors the imperfectly drained soils where additional moisture and seepage are beneficial to forest growth. Alpine fir occurs in the understory and willow and cottonwood occur in scattered locations. Under dense canopies there is little ground cover except for an abundant moss layer. More open forest has a variable understory that is most luxuriant on imperfectly drained soils. Poorly and very poorly drained areas support willow, various hydrophytic plants and mosses with some black spruce, white spruce and lodgepole pine.

Soil Association Components - Seven components of the Pineview association were established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
P1	Orthic Gray Luvisol		moderately well	Occurs mainly on rolling topography that has better good surface drainage.
P2	Orthic Gray Luvisol		moderately well	Significant proportion of imperfectly drained areas.
		Gleyed Gray Luvisol	imperfect	
P3	Orthic Gray Luvisol		moderately well	Similar to P2 except a significant proportion of poorly drained areas also occur.
		Gleyed Gray Luvisol	imperfect	
		Gleysolic	poor	
P4	Gleyed Gray Luvisol		imperfect	Dominant proportion of imperfectly drained areas.
		Orthic Gray Luvisol	moderately well	
		Gleysolic	poor	
P5	Gleysolic		poor	Wet, depressional areas often associated with Organics.
		Gleyed Gray Luvisol	imperfect	
P6	Gleyed Gray Luvisol		imperfect	Similar to P2 but imperfectly drained areas predominate.
		Orthic Gray Luvisol	moderately well	
P7	Gleyed Gray Luvisol		imperfect	Soil drainage is somewhat better than in P5.
		Gleysols	poor	



Map Complexes - The Pineview association has been mapped as the dominant soil in map complexes with the Bednesti, Berman, Bowron and Vanderhoof associations, all of which have also developed in glaciolacustrine deposits. The Pineview-Bednesti and Pineview-Bowron complexes occur in the eastern part of the map area, the Pineview-Vanderhoof complex occurs in the west, and the Pineview-Berman complex is distributed westward from near the Fraser River. The main differentiating criteria in the complexes are changes from clayey to silty textures.

At their upper elevations the clayey glaciolacustrine deposits are intimately intermixed with glacial till. Here the Pineview association is mapped in complexes with the Barrett and Crystal associations in the western part of the map area and with the Deserter association in the east.

Where beach deposits occur along the margins of the Prince George and Vanderhoof glacial lake basins, complexes of the clayey glacial lake deposits and coarse textured beach materials have been mapped. The Pineview-Gunniza complex has been established in the eastern part of the map area and the Pineview-Kluk complex in the west.

Various Gleysolic and Organic soils also occur in the Pineview association. Where the Organic soils occupy large enough areas they are mapped as the Chief or Moxley associations. Smaller areas of Organic soils are included in the respective Pineview components.

POPE SOIL ASSOCIATION (PP)

General Location and Physiography - The Pope soil association occurs in the Fraser Basin and is located in the northwestern corner of the map area where it is the eastern extent of a larger area to the west. The soils are shallow to bedrock and lie adjacent to the Fort St. James glacial lake basin. Elevations vary from about 2,600' near the margins of the lake basin, to 3,100' on isolated bedrock outcrops. The soils dominate over less than 0.1% of the map area; additional areas occur where Pope soils are the secondary component in map complexes with the Barrett association.

Landform - The surface form is characterized by shallow to bedrock areas that protrude through the surrounding basal till. The topography is moderately rolling to hilly, with associated glacial grooves in the bedrock. Surface drainage conforms to the adjoining drumlinized glacial till.

The shallow mantle is mostly composed of glacial till with minor areas of colluvium on steeper slopes. The underlying bedrock is limestone, ribbon chert and argillite (Tipper and Muller, 1961).

Parent Material and Soils - The shallow mantle generally varies in thickness from 5' to less than 20" (lithic soils). The unweathered parent material is gray to brownish in color, has variable permeability depending on the depth of the soil mantle, and is usually calcareous.

The soil texture is similar to that of the adjoining, deeper medium to moderately fine textured glacial till (Barrett soils). A gradation to moderately coarse textures occurs where the mantle is very shallow. Gravelly sandy loam or gravelly loam are the dominant textures with inclusions of gravelly clay loam occurring where the deposits are deeper. Surface stoniness varies from slightly to very stony and is usually similar to the contents in the glacial till.

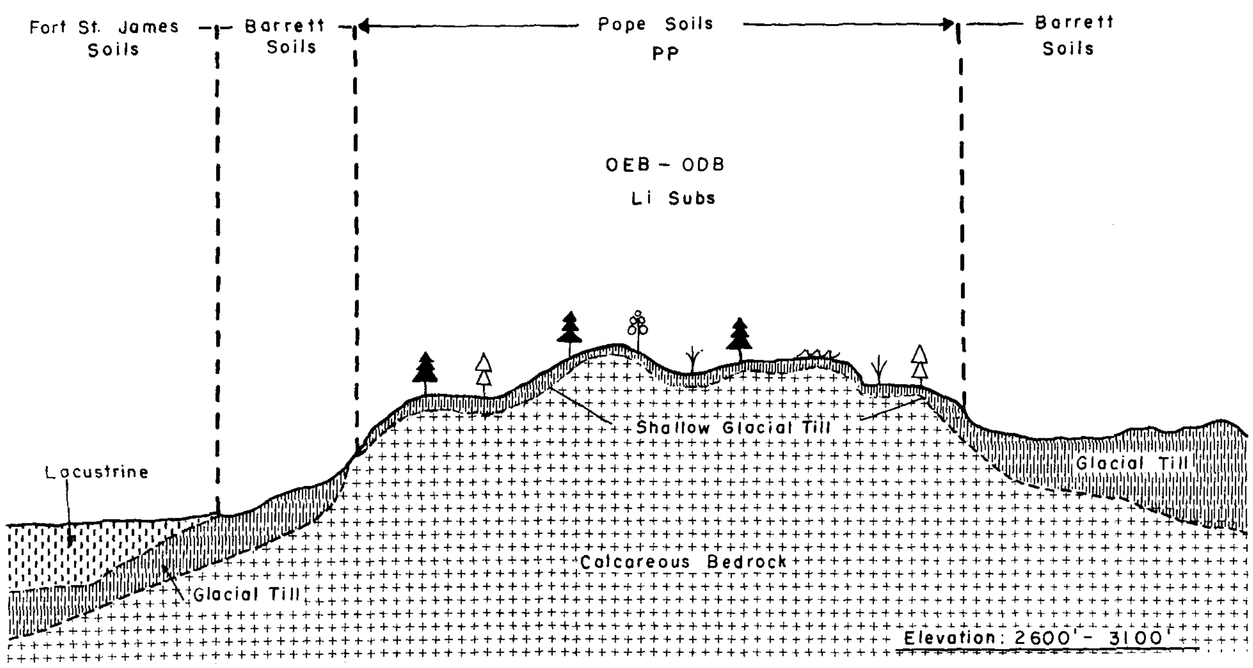
The soils are well to rapidly drained and are classified as Orthic Eutric Brunisols with significant inclusions of Orthic Dystric Brunisols and lithic subgroups. The Eutric Brunisols occur where the soils are shallow over calcareous glacial till and/or bedrock. The Dystric Brunisols are found where the soil is deeper, the bedrock grades to non-calcareous, or where the aspect is north or east.

Climate and Vegetation - The average annual, and May to September precipitations are estimated to range between 18" and 25", and 8" and 10", respectively. The average frost-free period is less than 60 days.

The soils occur within the Subboreal white spruce - alpine fir zone. Forest cover is mainly composed of lodgepole pine, white spruce and aspen with scattered Douglas-fir on south and west aspects. The understory shrubs, herbs and mosses vary with the density of the forest canopy, depth to bedrock, and aspect. A gradual increase in understory abundance occurs as the soil mantle thickens to more than 20".

Soil Association Components - Only one component of the Pope association was established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
PP	Orthic Eutric Brunisol	Orthic Dystric Brunisol	well	Lithic subgroups occur where the depth to bedrock is 20" or less.
		lithic subgroups	well - rapid	



Map Complexes - Pope soils are not mapped as the dominant soil in any map complexes. They occupy about 20% of the relatively large area mapped as the Barrett-Pope (BA4-PP) complex, in which the Barrett soils occur on basal till that is deeper than 5'.

RAMSEY SOIL ASSOCIATION (R)

General Location and Physiography - The Ramsey soil association occurs mainly in the wetter environment of the southeast and northeast portions of the map area, within the eastern part of the Fraser Basin and on the Fraser and McGregor plateaus. A large proportion of the soils occur within the wide Crooked River meltwater channel draining north from Summit Lake. Additional soils occur at higher elevations on the Nechako Plateau in the southwest of the map area. Overall, elevation varies from approximately 2,400' to 4,000'. The Ramsey soils are dominant over 0.8% of the map area.

Landform - The gravelly glaciofluvial landforms occur as outwash terraces, deltas, gravel-filled channels, and kames that have kettled and hummocky surfaces in places. In addition, the landforms occur as intermittent outwash deposits between drumlins or randomly scattered on the basal till landforms.

Topography is very variable, ranging from nearly level or undulating on terraces to gently to strongly rolling or hilly. In addition, very steep slopes occur on terrace scarps, eskers and sides of meltwater channels.

Parent Material and Soils - The deposits vary considerably in depth and composition. They are generally deep but can vary to less than 5' in depth over till in places. They consist of predominantly stony and cobbly gravels and sands which are loose, porous, rapidly permeable and vary from well sorted and stratified, to poorly sorted and stratified.

The deposits are generally overlain by a shallow, gravelly coarse textured capping varying in depth from less than 1' to 2' in thickness. The textures of the capping are mostly gravelly sandy loam or gravelly loamy sand; these grade through gravelly loamy sand and gravelly sand to gravel with depth. Surface stoniness varies from slightly to exceedingly stony depending on the texture and depth of the capping.

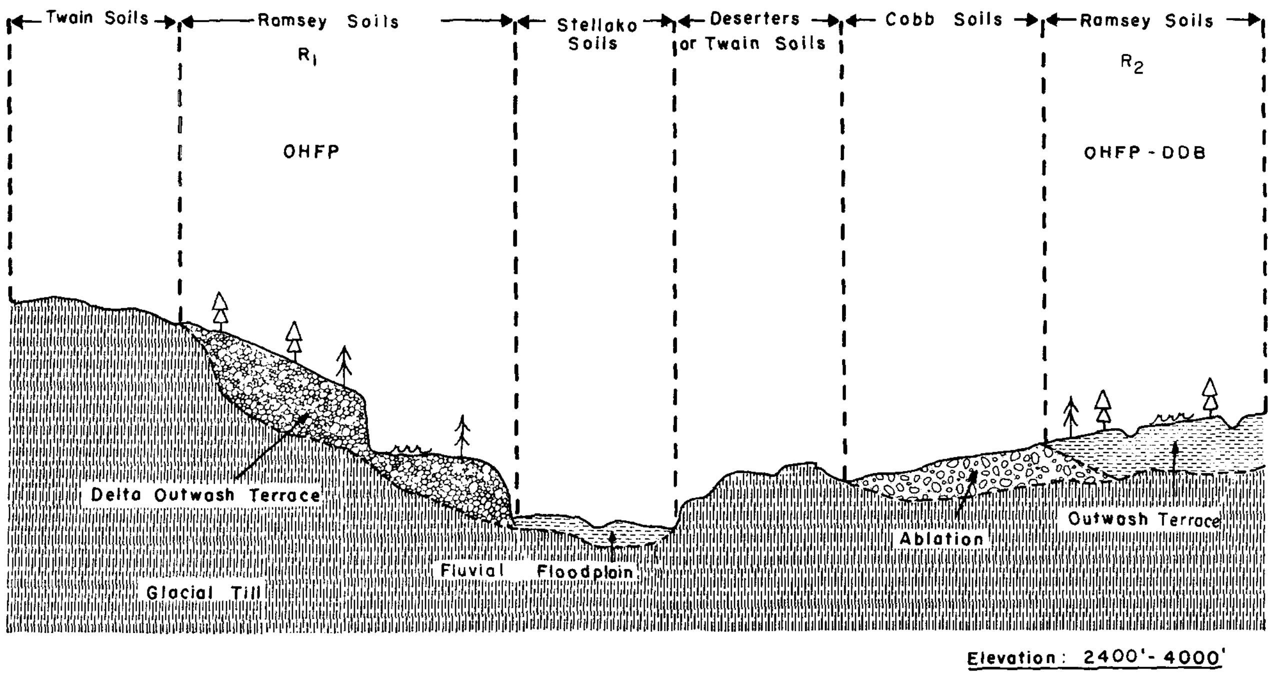
The Ramsey soils are rapidly drained and have low moisture holding capacities. In the moister environments of the eastern map area they are classified as Orthic Humo-Ferric Podzols. In the slightly drier southwest, they are also classified as Orthic Humo-Ferric Podzols but contain significant inclusions of Degraded Dystric Brunisols. The Dystric Brunisols are transitional to the Alix association which occurs on similar landforms and parent materials, but usually in a drier environment.

Climate and Vegetation - The average frost-free period varies from 50 to 60 days in the Crooked River - Bowron River areas. Most of the remainder of the area has a frost-free period varying from 30 to 50 days. Total annual precipitation is estimated to range from 30" to 40".

The soils mostly occur in the Subboreal white spruce - alpine fir zone and occasionally in the lower Subboreal Engelmann spruce - alpine fir zone. They support a low productivity forest mainly composed of thick stands of lodgepole pine with associated white spruce either in mixed stands or as understory regeneration. The understory shrubs and herbs are variable and their abundance depends on the thickness of the forest canopy. Forest fires frequently occurs in these stands.

Soil Association Components - Two components of the Ramsey association were identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
R1	Orthic Humo-Ferric Podzol		rapid	Occurs in moister environments and at higher elevations.
R2	Orthic Humo-Ferric Podzol	Degraded Dystric Brunisol	rapid	Surface texture, maturity of the forest cover and aspect determine Ae/Bf or Ae/Bm soil development.



Map Complexes - The Ramsey-Bear Lake map complex occurs on kettled glaciofluvial landforms within the Crooked River meltwater channel. The Ramsey-Chief, Ramsey-Stellako and Ramsey-Stellako-Chief map complexes occur in the upper Willow River drainage in the southeast corner of the map area. Additional areas of Ramsey-Chief soils occur where drainage has been restricted along upper Seebach Creek in the northeastern corner of the area.

The Ramsey-McGregor map complex also occurs in the upper Seebach Creek area as well as on terraces along the Bowron River. Map complexes of gravelly Ramsey and sandy Toneko soils also occur along the Bowron River, in the general vicinity of Boat Canyon.

ROARING SOIL ASSOCIATION (RG)

General Location and Physiography - The Roaring soils occur mainly on the Nechako Plain and in the Fraser Basin in the southwestern part of the map area. More specifically they are associated with the Bednesti esker complex and the esker complexes northeast of the Sinkut Hills. Additional areas occur in the southeast of the map area near Spring Mountain and in the upper Willow River drainage. Elevations vary from about 2,400' to 3,500'. Roaring soils dominate over 0.5% of the map area.

Landform - The gravelly glaciofluvial landforms occur as individual eskers, compound eskers, esker deltas and crevasse fillings. Most of the esker deposits consist of steep-sided wandering ridges, with deep, elongated or circular depressions between. Within compound eskers, the size and shape of ridges and depressions vary considerably. Many of the depressions and kettles are poorly drained and often contain small lakes, ponds, and/or organic deposits. Intermittent or active creek channels are associated with some of the esker landforms.

The topography varies considerably and ranges from steeply to extremely sloping or from strongly rolling to very hilly. Minor areas of gently to moderately rolling or moderately to strongly sloping topography also occur. The poorly drained mineral and organic soils which occur in depressions and along creek channels generally have nearly level to gentle slopes.

Parent Material and Soils - The parent material consists of deep, interstratified, stony and gravelly, coarse textured glaciofluvial material. Steeply ridged and kettled slopes have often been modified by slumping and down-slope movement.

The deposits are mainly very droughty, very porous, and very permeable gravels and gravelly sands. Surface textures include gravel, gravelly sand, gravelly loamy sand and gravelly sandy loam. Minor amounts of silty material inconsistently occur at or near the surface, or as stratified layers within the deposits.

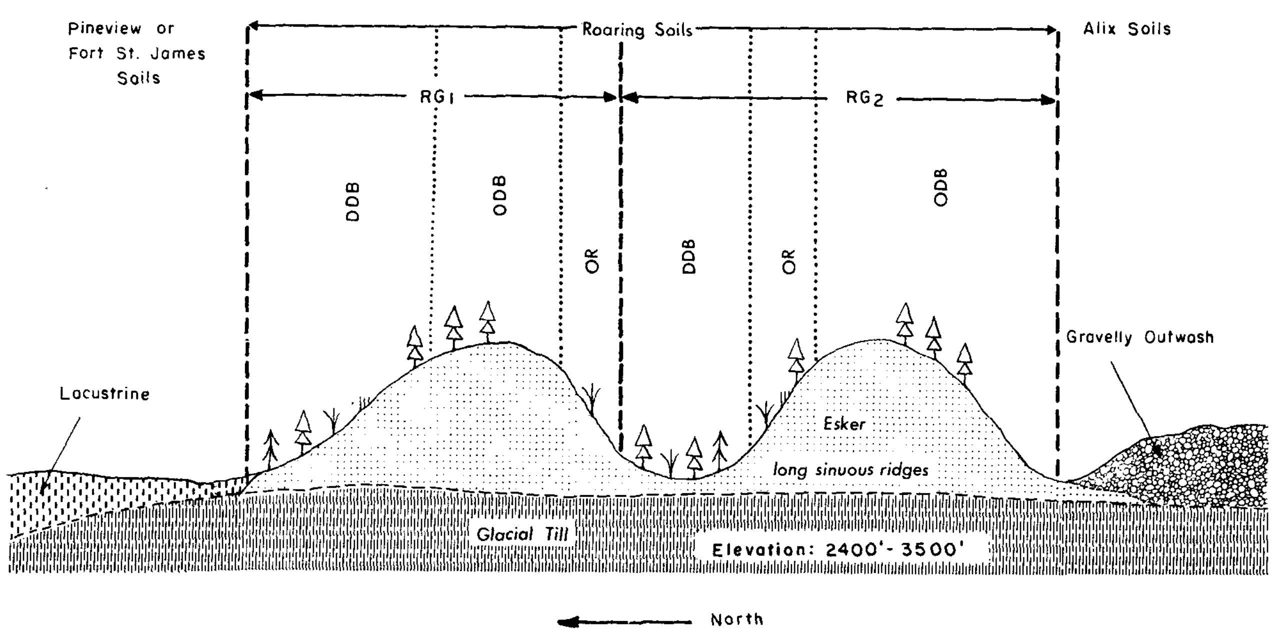
The soils are rapidly drained and mostly classified as Degraded Dystric Brunisols. There are significant inclusions of Orthic Dystric Brunisols and Orthic Regosols mainly on south or west aspects and/or on the steeper, colluviated slopes. In the southeast significant inclusions of Orthic Humo-Ferric Podzols occur rather than Orthic Dystric Brunisols, due to the moister conditions.

Climate and Vegetation - The Roaring soils in the southwest of the map area have annual, and May to September precipitations estimated to be between 18" and 22", and 7" and 9", respectively. The frost-free period below 2,600' elevation generally varies from 60 to 75 days with inclusions of 50 to 60 days in depressional locations. Above 2,800' elevations the frost-free period drops to between 30 and 50 days. The Roaring soils in the southeast are in higher precipitation environments, with annual precipitation estimated to be between 25" and 40". The frost-free period here also varies between 30 and 50 days.

The soils all occur within the Subboreal white spruce - alpine fir zone. The forest in the southwest varies from low productivity lodgepole pine, aspen and the occasional Douglas fir to higher productivity lodgepole pine and white spruce. The forest cover in the southeast has a higher component of spruce associated with lodgepole pine. The shrub and herb cover reflects the very droughty characteristics of the soils and varies with aspect, slope and forest maturity.

Soil Association Components - Three components of the Roaring association were identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
RG1	Degraded Dystric Brunisol	Orthic Dystric Brunisol Orthic Regosol	rapid rapid	Occurs in the south-west; Orthic Dystric Brunisols and Orthic Regosols occur mainly on south or west aspects and/or steeper slopes.
RG2	Orthic Dystric Brunisol	Degraded Dystric Brunisol Orthic Regosol	rapid rapid	Occupies the driest portions of the associations' range.
RG3	Degraded Dystric Brunisol	Orthic Humo-Ferric Podzol	rapid	Occurs in the south-east; soil deevelopment varies with surface texture, aspect and slope.



Map Complexes - Map complexes occur with the Chief, Moxley and Stellako soils which occupy poorly to very poorly drained kettles, depressions, and creek channels. Additional areas have the Roaring soils mapped as the secondary component in complexes with the Alix, Eena and Decker soils.

SAUNDERS SOIL ASSOCIATION (SD)

General Location and Physiography - The Saunders soil association is located in the southeast of the map area on the Mount George highland, which is within the Fraser Plateau. Elevations vary from approximately 4,500' to 5,600'. The Saunders soils are mapped mainly as the secondary soil in map complexes with the Skins soils. The Skins-Saunders map complex occupies 0.5% of the map area, while areas of Saunders-Chief soils occupy less than 0.1%.

Landform - The landforms are characterized by steeply to extremely sloping basal till, usually greater than 5' in depth which is associated with bedrock-controlled mountainous topography. There are also small areas of strongly sloping and strongly rolling topography. The underlying bedrock is mainly acidic and of plutonic origin.

Several small creeks drain the Mount George highland; these have eroded an intermittent assortment of shallow gullies and channels to various depths.

Parent Material and Soils - The gravelly and stony basal till was deposited to variable depths over the pre-existing bedrock-controlled topography. Where the till is shallow to bedrock on very steep slopes, summits and ridges, Skin soils are mapped, whereas on steeply sloping topography with relatively thick deposits, Saunders soils occur. Variable amounts of colluvium derived from till and weathered bedrock overlie or are intermixed with the basal till in lower slope positions.

The unweathered basal till parent material is grayish-brown to olive gray or olive brown in color, weakly calcareous at depth, very compact, and has slow permeability and hard to very hard consistence.

Gravelly sandy loam, gravelly loam and gravelly clay loam are dominant subsoil textures while gravelly sandy loam, gravelly loam, and minor gravelly loamy sand are most common at the surface. Stoniness is variable within the deposits; at the surface it ranges from slightly to exceedingly stony, with small boulders in places.

The Saunders association is a variable group of soils. Due to inaccessibility of most of the area, the complete range of soil development has not been defined. The association is generally characterized by a predominance of moisture shedding, moderately well to well drained soils classified as Bisequa Humo-Ferric Podzols. There are significant inclusions of moderately well to well drained Orthic Humo-Ferric Podzols where textures are somewhat coarser, and gleyed subgroups in imperfectly drained, seepage receiving areas.

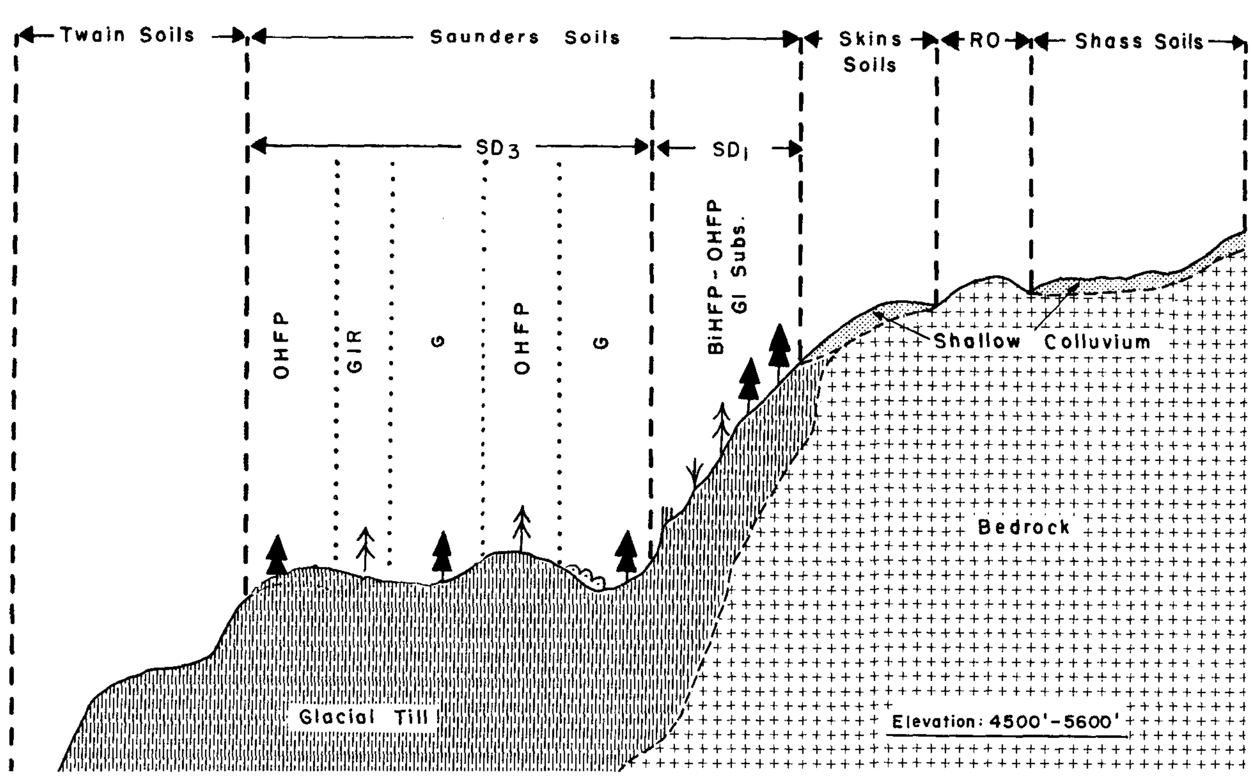
Small areas of poorly drained Gleysolic and very poorly drained, shallow Organic soils, occur near the bottoms of the longer mountain slopes where substantial seepage accumulates. In addition, similar wet soils occur in isolated locations at higher elevations near the headwater drainage of a few small creeks.

Climate and Vegetation - The Saunders soils occur at some of the highest elevations in the map area and receive higher precipitation, higher snowfall, cooler summer temperatures, and more cloud cover than the majority of the map area. Annual precipitation is estimated to be greater than 45". The average frost-free period varies from less than 30 days at the highest elevations to between 30 and 50 days at lower elevations.

The vegetation is indicative of the upper Subalpine Engelmann spruce - alpine fir zone. Alpine fir and Engelmann spruce are the dominant forest species with krummholz areas occurring above 5,000' elevation. On imperfectly drained sites, seepage contributes substantially to growth during the growing season; in wet years, this seepage may occur during the entire growing season.

Soil Association Components - Three components have been established for the Saunders association but only two were identified in the map area. The SD2 component has been mapped in the Nechako-Francois Lake map area to the west.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
SD1	Bisequa Humo-Ferric Podzol	Orthic Humo-Ferric Podzol	moderately well - well	Occurs as the secondary association in map complexes with the Skins soils.
		gleyed subgroups	imperfect	
SD3	Gleysolic		poor	Occurs in map complexes with Chief soils at higher elevations.
		Orthic Humo-Ferric Podzol	moderately well - well	
		Gleyed Regosol	imperfect	



Map Complexes - The Saunders-Chief map complex (SD3-CF1) occurs at higher elevations near the headwater drainages of a few small creeks. The Skins-Saunders (SK-SD1) map complex is mapped on the Mt. George highland.

SAXTON SOIL ASSOCIATION (S)

General Location and Physiography - The Saxton soils are located in the Fraser Basin, mainly along the Fraser River between Prince George and the southern boundary of the map area. There is an additional area along the lower Nechako River between its junction with the Chilako River and its confluence with the Fraser River. Elevations vary from about 1,800' to 2,200'. The Saxton soils are dominant over 0.3% of the map area.

Landform - The landforms consist of fluvial and glaciofluvial valley train terraces formed by down- cutting of the Fraser and Nechako rivers below the general level of the glaciolacustrine deposits in the Prince George glacial lake basin. In places, small isolated fans have been deposited over the terraces.

The topography is mainly gently undulating or undulating. Escarpments between the various terrace levels are usually steeply to very steeply sloping.

Parent Material and Soils - The deposits are predominantly deep, stratified, cobbly, gravelly and sandy outwash overlain by a coarse textured, sandy capping of variable depth. Textures of the capping are mainly loamy sand or sandy loam, with inclusions of sand.

Variability in deposition has resulted in the sandy capping being absent in some places and gravelly coarse textures characteristic of Giscome soils extend to the surface. This has resulted in the Saxton and Giscome soils being commonly mapped in complexes.

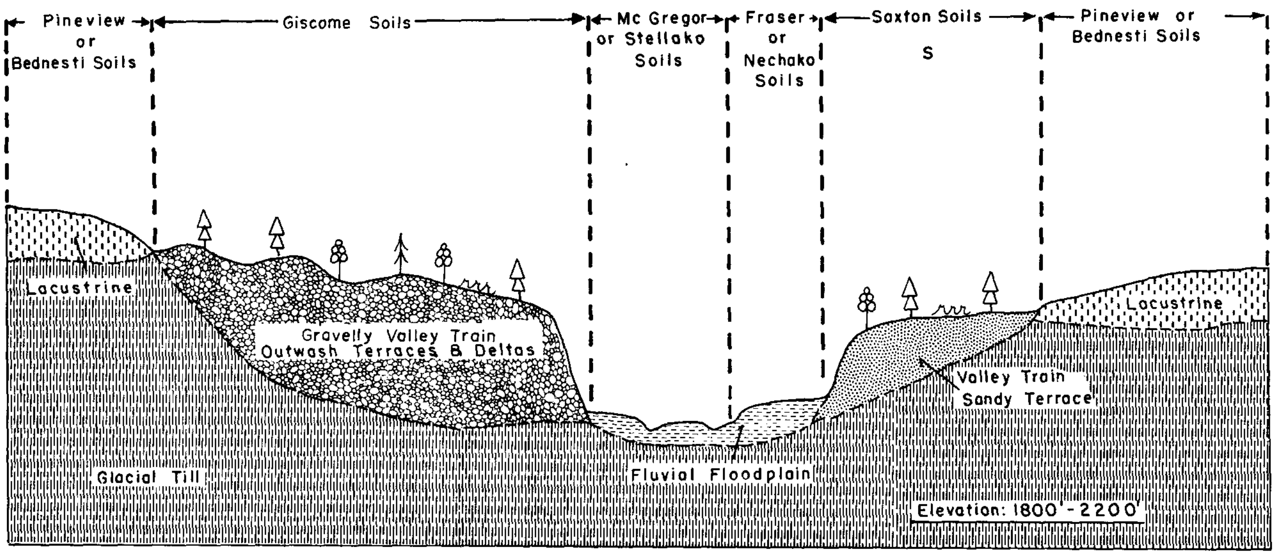
The Saxton soils are classified as Orthic and Degraded Dystric Brunisols. They are rapidly drained, rapidly permeable, porous and droughty.

Climate and Vegetation - Saxton soils occur in the more favorable climatic locations in the map area and have average frost-free periods between 75 and 90 days. The average annual, and May to September precipitations are approximately 25" and 11", respectively, and decrease slightly southward to the map boundary.

Saxton soils fall within the Subboreal white spruce - alpine fir zone. Because of frequent but variable fires, forest cover varies from open stands of aspen to thick stands of lodgepole pine. White spruce is intermixed in places or occurs as scattered regrowth under the lodgepole pine canopy. The ground cover is generally light and mainly composed of shrubs and herbs adapted to dry sites.

Soil Association Components - One component of the Saxton association was identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
S	Orthic Dystric Brunisol	Degraded Dystric Brunisol	rapid	Presence of Ae and Aej horizons is dependant on texture and degree of disturbance.



Map Complexes - The Saxton soils occur in map complexes with the Giscome and Fraser soils; all three soil associations are closely related on river terrace deposits.

Plate 10. Glaciofluvial terraces in the Crooked River meltwater channel.

SEEBACH SOIL ASSOCIATION (SB)

General Location and Physiography - The Seebach soils occur extensively on a large pitted outwash plain that lies east of the map area between the McGregor River and Hansard. Only about 80 acres of this extensive plain falls within the map area near the confluence of the McGregor and Fraser rivers. Another area (about 2,000 acres) occurs as a single map unit northeast of Eaglet Lake and south of the Fraser River. The soils occur within the Nechako Plain at elevations between about 2,200' and 2,500'.

Landform - The landforms consist mainly of sandy glaciofluvial terraces and deltaic deposits underlain by glaciolacustrine materials at various depths. The underlying materials usually begin at depths well in excess of 5'. The topography is predominantly gently undulating with minor inclusions of gently rolling land near the McGregor River.

Parent Material and Soils - The deposits (parent material) are predominantly coarse sands which have a slightly finer textured capping of variable thickness. Surface textures are mainly loamy sand, sandy loam or sand, all of which usually contain a high percentage of fine sand.

The soils are classified as Orthic Humo-Ferric Podzols with significant inclusions of Bisequa Humo-Ferric Podzols. A weakly to well developed, cemented, orstein layer generally occurs in the upper 6" to 18". Bands and layers of finer sands in the subsoil are conducive to the formation of the Bt horizon of Bisequa Humo-Ferric Podzol soils.

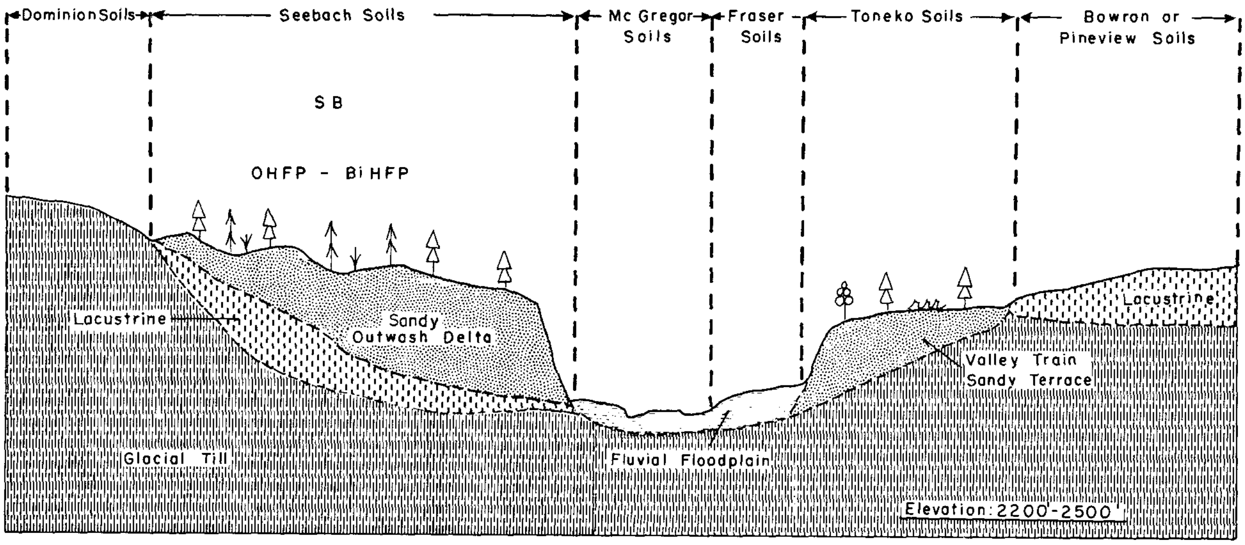
The soils are well to moderately well drained, have rapid to moderate permeability, and have moisture holding capacities somewhat higher than the majority of the sandy glaciofluvial soils in the map area.

Climate and Vegetation - Seebach soils occur in the higher precipitation portions of the map area; annual precipitation is estimated to range from 35" to 40". The frost-free period mostly varies from 60 to 75 days with inclusions of 75 to 90 days occurring in close proximity to the Fraser and McGregor Rivers.

The soils occur within wetter parts of the Subboreal white spruce - alpine fir zone. Forest cover is predominantly white spruce with inclusions of alpine fir. The understory is usually lush and abundant.

Soil Association Components - Only one component of the Seebach soils was established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
SB	Orthic Humo-Ferric Podzol		well	Discontinuous ortstein (cemented) layer at depths between 6" and 18".
		Bisequa Humo-Ferric Podzol	moderately well	



Map Complexes - The Seebach soils are not mapped as the dominant soil in any map complex. The soils do occur as the secondary soil in a Bednesti-Seebach-Averil map complex north of the east end of Eaglet Lake.

Plate 11. Esker terrain on which Roaring soils have developed.

SKINS SOIL ASSOCIATION (SK)

General Location and Physiography - The Skins soil association occurs on the Fraser Plateau; more specifically, it is located on the Mount George highland, in the southeastern part of the map area. Elevations vary from approximately 4,500' to 5,700'. The soils dominate in 0.8% of the map area, mainly as the dominant soil in map complexes with the Saunders soils.

Landform - The landforms are characterized by steep to extreme mountain slopes, with inclusions of strongly rolling landscapes, associated with bedrock apexes and ridges. A shallow surficial mantle, consisting mainly of colluvium derived from glacial till and weathered bedrock and generally less than 5' thick overlies the bedrock. The acidic plutonic rock is mainly quartz monzonite, monzonite, granite and minor diorite (Tipper, 1961). Parts of the higher elevation areas have been nivated as indiated by the presence of longitudinal and circular surface hollows.

Parent Material and Soils - The depth of the surficial mantle (parent material) is generally less than 5' and grades to 20" or less (lithic soils) in some areas. Localized bedrock exposures occur on apexes, ridges and steep slopes at higher elevations.

Soil textures are predominantly gravelly sandy loam or gravelly loam, with minor gravelly loamy sand. Stoniness varies with depth over bedrock and ranges from slightly to exceedingly stony with small boulders occurring in places.

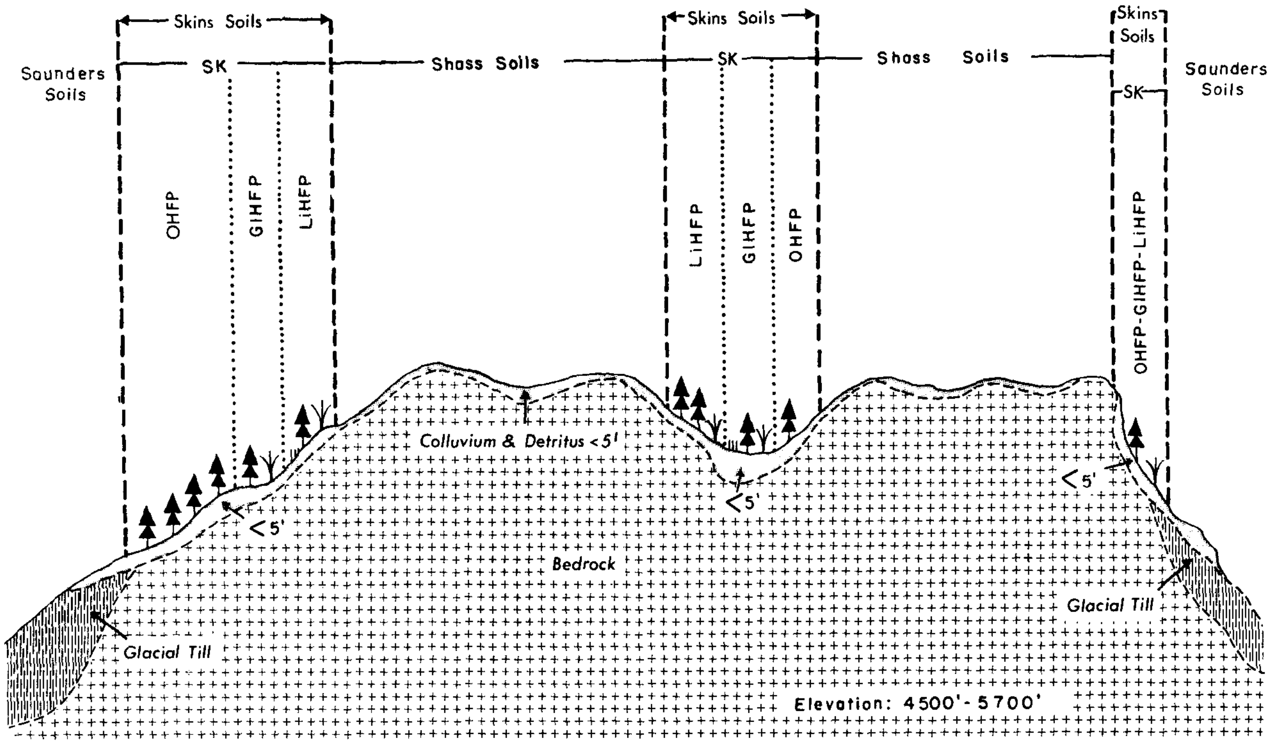
Skins soils are classified as moderately well to well drained, Orthic Humo-Ferric Podzols. Where bedrock is close to the surface, Lithic Humo-Ferric Podzols occur; in imperfectly drained, seepage areas, Gleyed Humo-Ferric Podzols are usual.

Climate and Vegetation - The Skins soils occur at the highest elevations in the map area. They have high precipitation, high winter snowfall, cool summer temperatures and substantial cloud cover. Annual precipitation is estimated to be greater than 45".

The forest vegetation is indicative of the upper Subalpine Engelmann spruce - alpine fir zone; alpine fir and Engelmann spruce are the dominant forest species. Krummholz areas occur above 5,000' elevation.

Soil Association Components - Only one component of the Skins association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
SK	Orthic Humo-Ferric Podzol		moderately well - well	Occurs at the highest elevations in the southeast.
		Lithic Humo-Ferric Podzol	well - rapid	
		Gleyed Humo-Ferric Podzol	imperfect	



The Shass soils indicated in the cross-section only occur in the Nechako-Francois Lake map area to the west.

<u>**Map Complexes**</u> - The Skins soils are only mapped as the dominant soil in map complexes with the Saunders soils which occur on adjacent deeper deposits of basal till.

SPAKWANIKO SOIL ASSOCIATION (SW)

General Location and Physiography - The Spakwaniko association occurs on the McGregor Plateau in the northeast of the map area. Most of the acreage is located in East Seebach, West Seebach and Olson creek valleys and in an unnamed valley northeast of Summit Lake. Elevations vary from approximately 2,400' to 3,500'. The Spakwaniko soils are dominant in 0.2% of the map area.

Landform - The landforms on which Spakwaniko soils occur are fluvial (alluvial) fans consisting of material eroded by post-glacial streams from adjoining, higher lying glacial till. The topography grades from moderately sloping near fan apexes to gently or very gently sloping on fan aprons.

Parent Material and Soils - The fan deposits (parent material) are predominantly unsorted, interstratified, gravelly and stony. Textures grade from moderately coarse (gravelly sandy loam or gravelly loam) at the fan apexes to moderately fine (gravelly loam or gravelly clay loam) on the aprons.

Low slope gradients and high precipitation, especially snowfall, produce large amounts of seepage which cause the soils to be poorly to very poorly drained. In addition, the fans are closely associated with narrow floodplains containing poorly and very poorly drained floodplain and organic deposits. Shallow organic layers often occur on the surface of Spakwaniko soils.

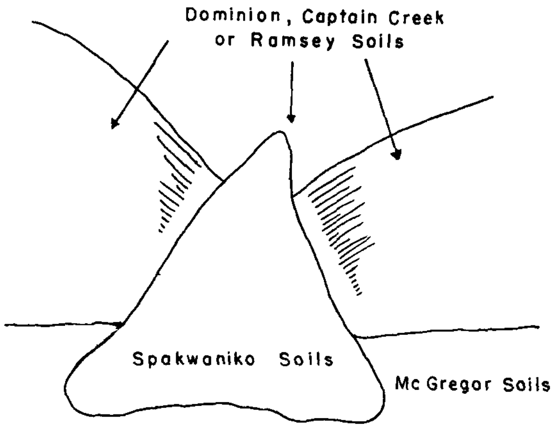
The Spakwaniko soils are classified as poorly drained Gleysolics. The significant inclusions of shallow organic deposits that overlie the Gleysolic soils on the lower fan aprons are mapped as peaty phases. These gradually grade to the organic soils of the Chief and Moxley associations. Spakwaniko soils have developed on similar parent materials and landforms to the Tabor Lake and Fontaniko soils, but occur in a much wetter environment, with subsequent differences in soil development.

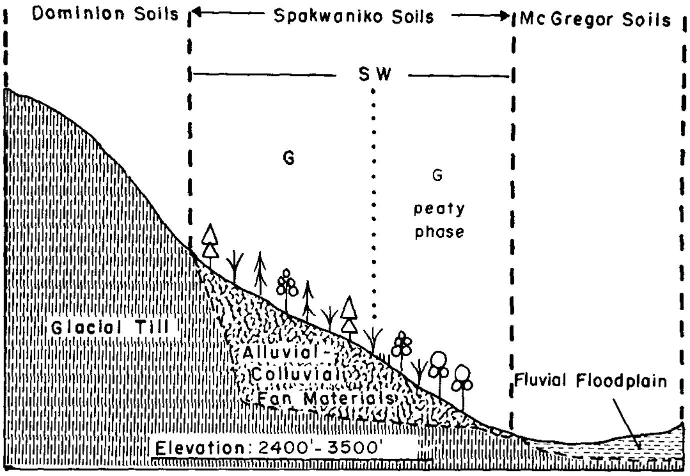
Climate and Vegetation - The Spakwaniko soils occur in the highest precipitation environments in the map area. The average annual, and May to September precipitations are estimated to be greater than 38" and 13", respectively. The average frost-free season varies from 30 to 50 days with inclusions of 50 to 60 days at lower elevations.

The soils lie in the wetter sections of the Subboreal white spruce - alpine fir zone. They support a forest of alpine fir and spruce. Understory vegetation is shrubs, herbs and other hydrophytic vegetation adapted to seepage and poor drainage conditions.

Soil Association Components - Only one component of the Spakwaniko association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
SW	Gleysolic		poor	Peaty phases usually occur on the lower fan aprons.
		Gleysolic: peaty phase	very poor	





Map Complexes - The Spakwaniko soils occur as the dominant soil in map complexes with both organic and fluvial soils in narrow river valleys. Complexes with the Chief and Moxley soils occur in several valleys, the Spakwaniko-McGregor-Chief (SW-MG4-CF2) map complex occurs along East Seebach Creek, and the Spakwaniko-Stellako-Chief (SW-SL4-CF2) map complex is found in the upper Olson Creek valley. The Spakwaniko-Ramsey (SW-R1) map complex occurs along West Seebach Creek where small fans have been deposited over narrow glaciofluvial terraces.

Plate 12. Agriculture Canada's research station near Prince George located on Pineview soils.

STELLAKO SOIL ASSOCIATION (SL)

General Location and Physiography - The Stellako association occurs throughout the map area at elevations varying between about 1,800' to 4,000'. The soils were mapped on floodplains of rivers and streams, with the exception of the Fraser and Bowron rivers where on similar landforms, the McGregor soils occur. The Stellako soils are dominant in 1.9% of the map area.

Landform - The landforms on which Stellako soils occur are laterally accreted, fluvial (alluvial) terraces subject to inundation during spring freshet and with water tables at variable depths during the growing season.

The landforms are generally characterized by a ridge and swale topography varying from gently undulating to undulating with inclusions of nearly level areas. Current scars, oxbows and backwater channels are variably distributed on the surface of the terraces.

Parent Material and Soils - The fluvial (parent material) derived from the adjacent glacial till and glaciolacustrine deposits, are variable in soil texture, depth and soil drainage. They are mainly moderately coarse to medium textured, sometimes with interstratified inclusions of very coarse and moderately fine textures. Surface textures are mainly sandy loam, fine sandy loam, silt loam or silty clay loam, and often change from one to another within short distances. Occurring at variable depths (usually below 1') are underlying deposits ranging from gravel-and stone-free sand to gravelly sand and gravel.

Soil drainage is variable, ranging from well to poor. The width of the proximity to rivers and creeks, and depth to coarse textured subsoils all influence drainage. Generally the higher portions of the floodplain are the best drained; these areas are least likely to flood as well.

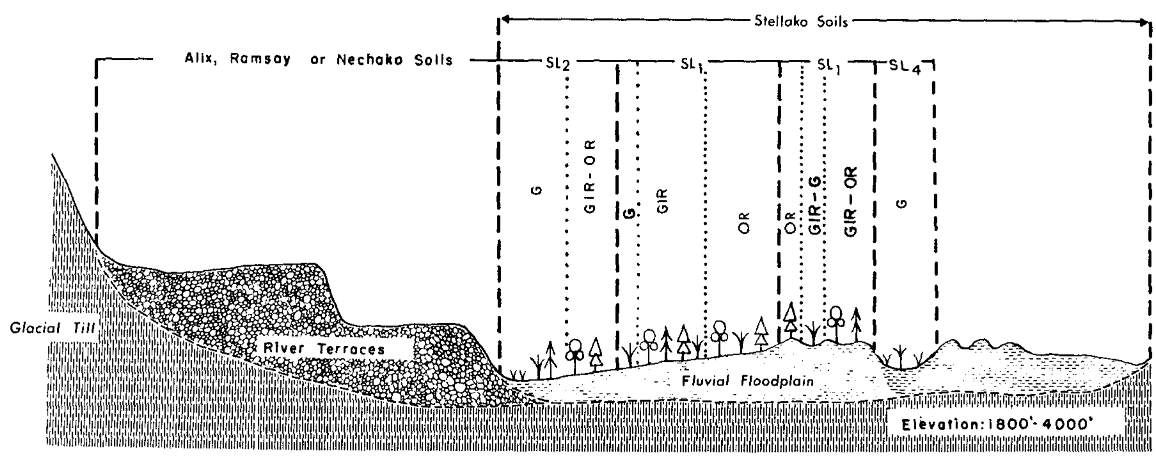
Stellako soils are mainly classified as Regosols and lack soil development due to their recent deposition. Orthic Regosols occur where the soils are moderately well to rapidly drained and Gleyed Regosols are found in slightly depressional, imperfectly drained locations. Gleysolic soils are mainly located in poorly drained depressions with restricted drainage and high water tables. These latter soils are sometimes overlain with thin organic deposits where they grade into the very poorly drained Chief and Moxley soils.

Climate and Vegetation - Because the Stellako soils are distributed throughout the map area, precipitation varies considerably. Similarly, average frost-free period is also variable, ranging from 75 to 90 days at lower elevations to between 30 and 50 days at higher elevations.

Forest canopy and understory vegetation are very variable and depend on soil texture, soil drainage, flood frequency, elevation and duration of inundation. The soils occur within both the Subboreal white spruce - alpine fir zone and the lower Subalpine Engelmann spruce - alpine fir zone. In general, the forest cover is a mixture of white spruce, alpine fir, lodgepole pine, trembling aspen, birch, cottonwood and willow. The shrub and herb cover is most abundant and lush where imperfectly drained soils occur. Poorly drained Gleysolic soils have a variable shrub and herb cover.

Soil Association Components - Four components of the Stellako associations have been established but only the SL1, SL2 and SL4 components occur in the map area. Component SL3 occurs in the Nechako-Francois Lake map area to the west.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
SL1	Gleyed Regosol		imperfect	Usually occupies the highest lying parts of the floodplains.
		Orthic Regosol	moderately well - rapid	
		Gleysolic	poor	
SL2	Gleysolic		poor	Intermediate between SL1 and SL4.
		Gleyed Regosol	imperfect	
		Orthic Regosol	moderately well - rapid	
SL4	Gleysolic		poor	This map unit occurs mainly in the wetter eastern part of the map area.



Map Complexes - The Stellako soils are often mapped as SL1-SL2 or SL2-SL1 map complexes where the pattern of soil textures, drainage and classification is very complex. The Stellako-Alix and Stellako-Ramsey map complexes occur where the respective fluvial and glaciofluvial landforms, and their large variation in soil drainage were inseparable at the scale of mapping. The Stellako-Chief and Stellako-Moxley map complexes occupy substantial areas; these organic soils are associated with both the SL2 and SL4 components.

TABOR LAKE SOIL ASSOCIATION (TR)

General Location and Physiography - The Tabor Lake association mainly occurs east of Prince George between Tabor and Buckhorn lakes, and on the northeast side of Tabor Mountain at, and northwest of, Bowes Creek. Small acreages also occur north of Summit Lake and along the Fraser River near the southern boundary of the map area. These areas are all within the Nechako Plain, or transitional to the Fraser Basin, with elevations ranging from approximately 1,800' to 2,700'. The Tabor Lake soils predominate in less than 0.1% of the map area.

Landform - The landforms of Tabor Lake soils are fluvial (alluvial) fans which were eroded from adjoining basal till highlands by post-glacial streams. The topography is predominantly moderately sloping with minor, gently sloping inclusions on the lower fan aprons. One of the fans northeast of Tabor Mountain near Bowes Creek is delta-like, strongly to steeply sloping and has v-grooved, channelled topography.

Parent Material and Soils - The deposits (parent material) are predominantly unsorted, interstratified, gravelly and stony. Textures grade from gravelly loamy sand or gravelly sandy loam at the stony fan apexes to more sorted, gravelly sandy loam or gravelly loam on the fan aprons. Minor braiding and periodic deposition on the fan surfaces occurs during spring runoff.

The soils are mostly well drained Degraded Dystric Brunisols. On lower fan aprons there are inclusions of both well and moderately well drained Orthic Gray Luvisols and, in seepage receiving areas, imperfectly drained, Gleyed Gray Luvisols. A few, small areas of somewhat poorly drained soils are sometimes in association with the imperfectly drained soils.

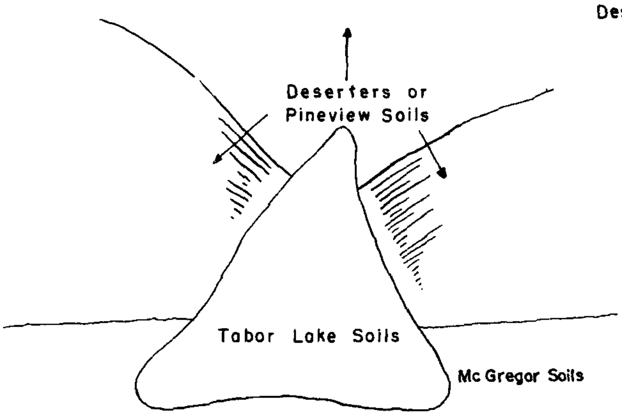
The Tabor Lake soils occur in environments that are drier than the other soils that have developed on fluvial fans, namely the Fontaniko and Spakwaniko associations.

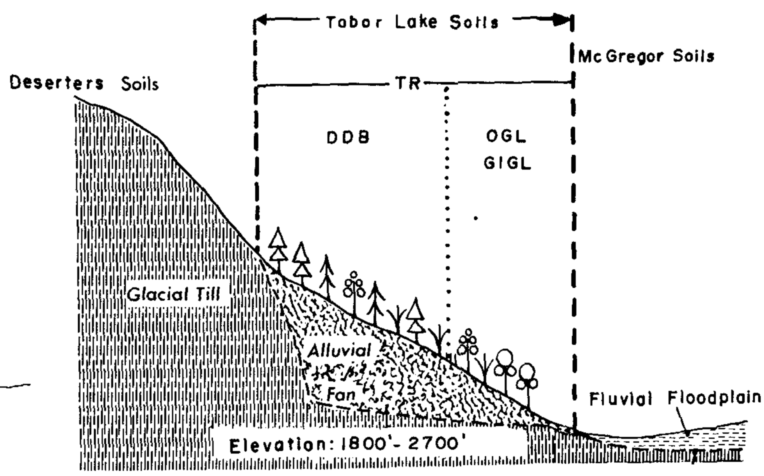
Climate and Vegetation - The average annual, and May to September precipitation for the Tabor Lake soils are approximately 25" and 11", respectively. The average frost-free period for most of the area varies from 50 to 75 days; for the area along the Fraser River, it is in the range of 75 to 90 days.

The soils occur within the Subboreal white spruce - alpine fir zone. Much of the Tabor Lake soil area has been burned by recent forest fires but surrounding vegetation indicates that the forest was mainly white spruce and lodgepole pine, with inclusions of alpine fir, aspen and birch. The understory shrubs and herbs vary with forest cover and soil drainage.

Soil Association Components - Only one component of the Tabor Lake association has been established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
TR	Degraded Dystric Brunisol		well	Orthic Regosols occur sporatically where recent creek deposition and braiding has occurred.
		Orthic Gray Luvisol	well - moderately well	
		Gleyed Gray Luvisol	imperfect	





Map Complexes - The Tabor Lake soils occur as the dominant soil in a map complex with the McGregor soils along the Fraser River, near the southern boundary of the map area.

TONEKO SOIL ASSOCIATION (TO)

General Location and Physiography - The Toneko soils, located on the Nechako Plain in the east-central part of the map area, occur along the Bowron and the lower Willow rivers. Elevations vary from about 2,200' to 2,600'. The Toneko soils are dominant over 0.2% of the map area.

Landform - The landforms of the Toneko soils are glaciofluvial and fluvial terraces along the Bowron and Willow rivers. The topography is predominantly gently undulating to undulating; escarpments leading to lower adjoining terraces are moderately to steeply sloping.

Parent Material and Soils - The deposits (parent material) are predominantly deep, stratified, cobbly, gravelly and sandy glacial outwash overlain with a sandy capping of variable depth. Surface textures are mainly loamy sand or sandy loam with inclusions of sand.

Because the thickness of the sandy capping is variable on the terraces, the Toneko soils can either grade to the gravelly, coarse textures characteristic of the Alix and Ramsey soils, or to the more silty Fraser, McGregor and Stellako soils.

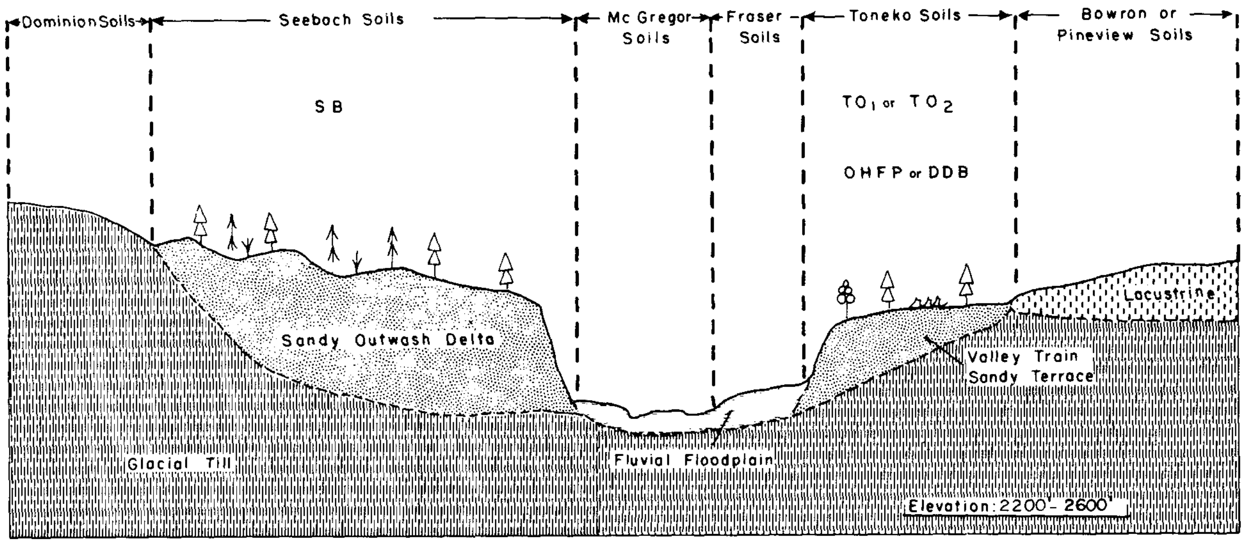
Toneko soils are rapidly drained, rapidly permeable, and porous. They are classified as Orthic Humo-Ferric Podzols along the Bowron River and Degraded Dystric Brunisols along the lower Willow River. The latter occurs in association with the gravelly Alix soils (AX3 component) that are also classified as Degraded Dystric Brunisol.

Climate and Vegetation - The Toneko soils occur in the higher precipitation environments of the map area; annual precipiation is estimated to be between 35" and 40". Average frost-free period varies from 50 to 60 days.

The soils occur within the Subboreal white spruce - alpine fir zone; forest cover is predominantly white spruce and lodgepole pine, with inclusions of western hemlock and western red cedar near the Bowron River.

Soil Association Components - Two components of the Toneko soils were identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
TO1	Orthic Humo-Ferric Podzol		rapid	Occurs on terraces of the Bowron River.
TO2	Degraded Dystric Brunisol		rapid	Occurs on terraces of the lower Willow River.



Map Complexes - Map complexes with the Ramsey, Fraser and McGregor soils occur on terraces along the Bowron River. The Toneko-Stellako map complex occurs on terraces on the lower Willow River.

Plate 13. A landscape of the shallow-to-bedrock Skins soils on Mount George.

TORPY RIVER SOIL ASSOCIATION (TP)

General Location and Physiography - The Torpy River association occurs in two locations; on the McGregor Plateau in the vicinity of Mount Beauregard; and on the western slopes of the Spring Mountain on the Fraser Plateau. Elevations vary from about 3,000' to 3,800'. Torpy River soils dominate in 0.2% of the map area, mostly in complexes with Bearpaw Ridge soils.

Landform - The landforms of the Torpy River soils are characterized by basal till covered, steeply to very steeply sloping mountainous terrain, with inclusions of strongly sloping and strongly rolling land.

Drainage is by small, intermittent creeks and down-slope seepage. In places the landforms are dissected by shallow gullies and channels.

Parent Material and Soils - The unweathered basal till is grayish-brown to olive gray or olive brown in color, weakly calcareous at depth, very compact, slowly permeable, and has hard to very hard consistence. Depth of the gravelly and stony glacial till is variable, but is mostly in excess of 5'. Small amounts of colluvium, derived from both basal till and weathered bedrock, occurs on, or intermixed with the till deposits.

Gravelly sandy loam, gravelly loam and gravelly clay loam are the dominant subsoil textures while gravelly sandy loam, gravelly loam and gravelly silt loam are most common at the surface. The deposits have a variable cobble and stone content.

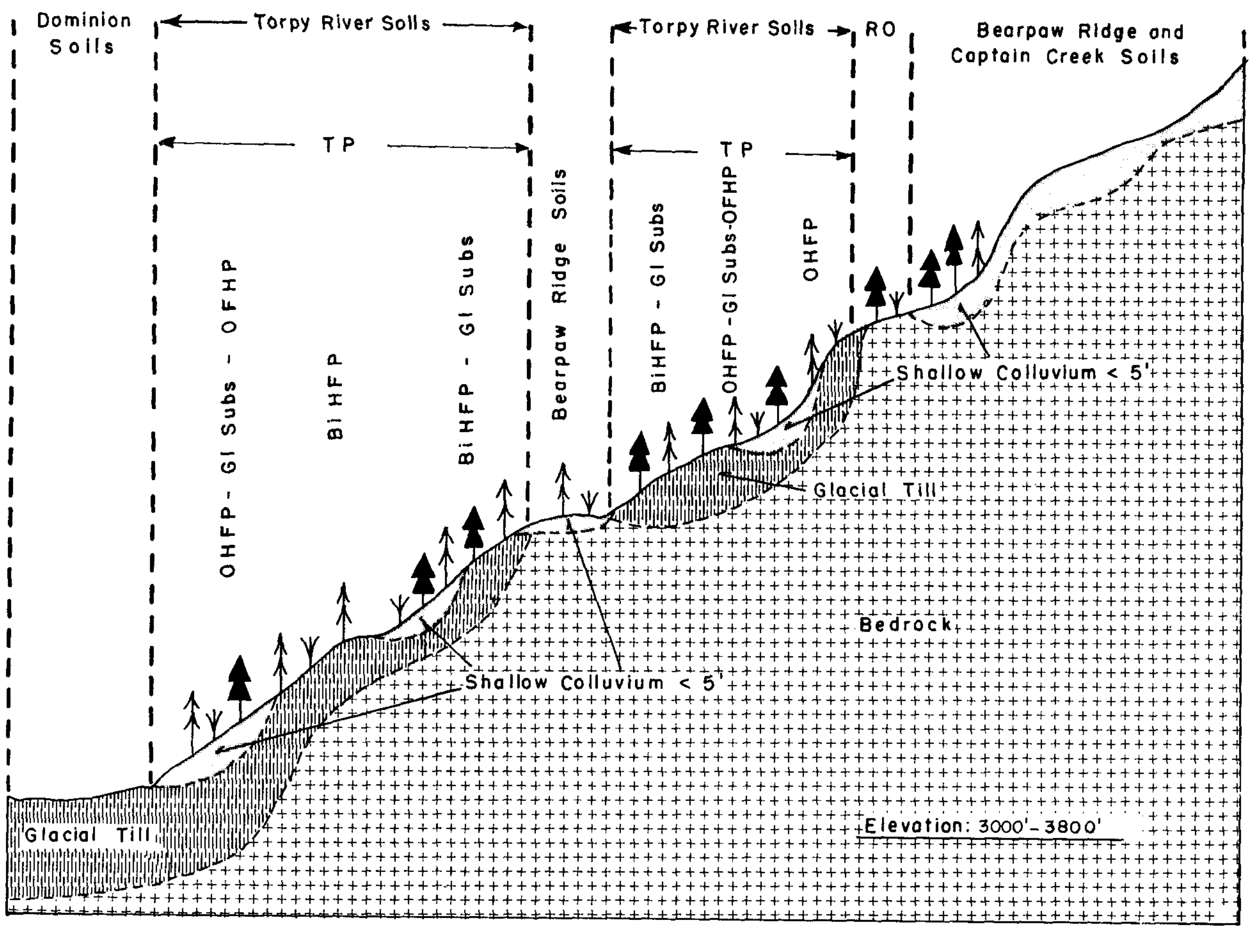
Slopes are predominantly moisture shedding and steep; soil drainage varies from well to imperfectly drained. The soils are mainly Orthic Humo-Ferric Podzols with significant inclusions of Bisequa Humo-Ferric Podzols, Orthic Ferro-Humic Podzols and gleyed subgroups. The imperfectly drained, gleyed soils occur on seepage receiving, lower slopes and are often associated with an increase in forest productivity. Orthic Ferro-Humic Podzol soils occur on stable, moist slopes and occur in close relation with the gleyed soils. Inclusions of shallow-to-bedrock and lithic soils are usually found where the Torpy River soils grade to the Bearpaw Ridge soils.

Climate and Vegetation - The Torpy River soils occur in the highest precipitation environments in the map area. Summer temperatures are cool, winter snowfall is high and substantial cloud cover occurs. Annual precipitation is greater than 40".

The soils occur within the Subbreal white spruce - alpine fir and lower Subalpine Engelmann spruce - alpine fir zones. Forest cover is mainly white spruce and alpine fir. The understory shrubs, herbs and mosses are generally lush and abundant; devil's club is scattered throughout and becomes abundant in open canopied, seepage receiving sites.

Soil Association Components - Only one component of the Torpy River association was established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
TP	Orthic Humo-Ferric Podzol	Bisequa Humo-Ferric Podzol	moderately well - well	Ferro-Humic Podzols and gleyed subgroups occur on more stable, seepage receiving sites.
		Orthic Ferro-Humic Podzol	moderately well - well	
		gleyed subgroups	imperfect	



Map Complexes - The Torpy River soils have only been mapped as the dominant soil in map complexes with the Bearpaw Ridge soils. In these complexes the basal till Torpy River soils and shallow-to-bedrock Bearpaw Ridge soils are closely intermingled on mountain slopes.

TWAIN SOIL ASSOCIATION (TW)

General Location and Physiography - The Twain association is located in both the southwest and southeast of the map area on the Nechako and Fraser Plateaus. Most of the mapped area lies between 3,500' and 4,500' elevations, occasionally extending as low as 3,000'. The soils dominate over 2.6% of the map area, mainly in map complexes.

Landform - The landforms of the Twain soils are mostly steeply to extremely sloping, basal till covered mountainous topography rising above the general level of the Fraser Basin till plain. Parts of the area are moderately to strongly rolling. Glacial grooves and a few drumlins, mostly rock cored, are randomly distributed.

Several creeks draining off heights of land have eroded an assortment of gullies and channels whose depths vary with slope gradients. Isolated, small lakes occasionally occur.

Parent Material and Soils - The basal till deposits (parent material) are generally relatively thick but become thinner where associated with bedrock on steep slopes, summits and ridges. Variable amounts of colluvium derived from both glacial till and weathered bedrock occurs at lower elevations on steeper slopes.

The unweathered basal till is dark grayish brown in color, weakly calcareous at depth, slowly permeable, very compact and has hard to very hard consistence.

The textures of the till is mostly gravelly loam or gravelly clay loam. Minor inclusions of gravelly sandy clay and light clay probably occur at depth. Surface texture modifications variably occur and are often associated with the amount of colluvium present. The usual surface textures are gravelly sandy loam or gravelly loam. The deposits have variable cobble and stone contents and small boulders occur in places. Surface stoniness varies from slightly to very stony.

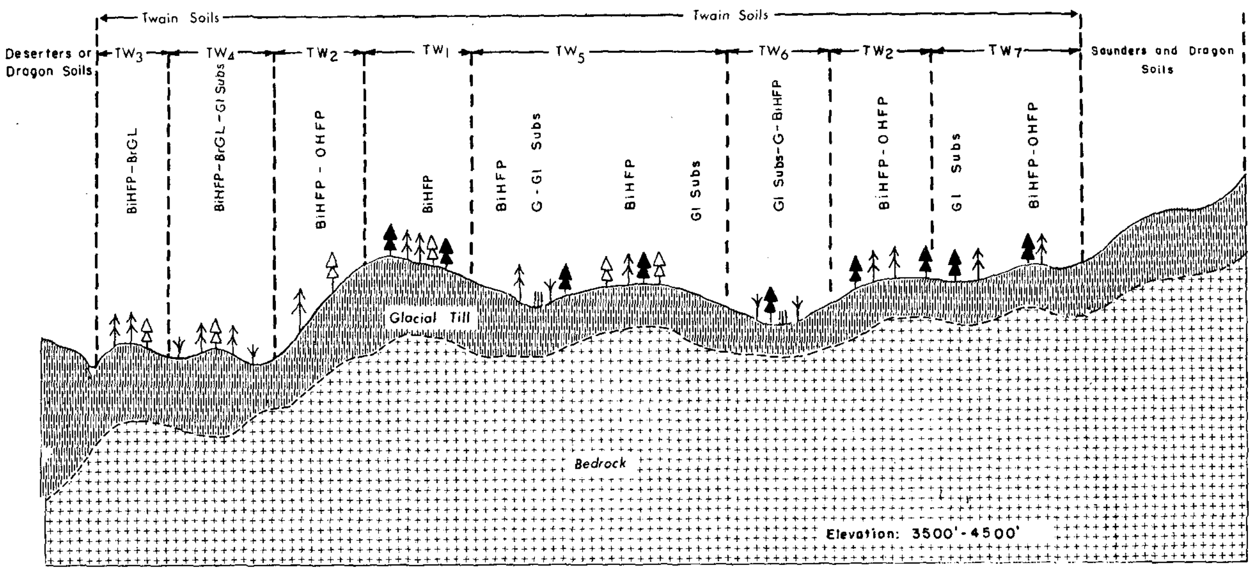
Twain soils predominantly occupy moisture shedding sites that are moderately well to well drained. They are mostly classified as Bisequa Humo-Ferric Podzol, with significant inclusions of both Orthic Humo-Ferric Podzol associated with coarser textures, and Brunisolic Gray Luvisol. Surface horizons are often disturbed by erosion and can be thin or absent, depending on slope gradient. Imperfectly drained, gleyed subgroups associated with lower slope, seepage areas occur throughout; their occurrence can vary from less than 10% to 40% of a map unit. Poorly drained Gleysolic soils and associated very poorly drained, shallow Organic soils occur in depressions and on some longer, mountainous slopes where seepage accumulates.

Climate and Vegetation - The majority of the Twain soils occur in higher elevation, moister environments than do the Deserters and Barrett soils. Average annual precipitation is estimated to vary from at least 20" in the southwest to more than 30" in the southeast. The higher elevations also result in cooler summer temperatures, increased cloud cover and higher winter snowfall. Average frost-free period varies with location, elevation, and aspect but is generally less than 50 days. In some years frosts occur in every month.

The soils mainly lie in the Subalpine Engelmann spruce - alpine fir zone; some lower elevation areas are within the Subboreal white spruce - alpine fir zone. Forest cover is mainly alpine fir and spruce with a variable amount of lodgepole pine; their relative dominance varies with location, elevation or aspect. Understory shrubs, herbs and mosses are variable but are generally more abundant on imperfectly drained sites. Dense, mature forest is almost devoid of understory except for an abundant moss layer.

<u>**Soil Association Components**</u> - Seven components of the Twain association have been established but only five occur in this map area. TW1 and TW5 components occur in the Nechako-Francois Lake map area to the west.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
TW2	Bisequa Humo-Ferric Podzol	Orthic Humo-Ferric Podzol	moderately well - well	Occurs on steeper areas; Orthic Humo-Ferric Podzols usually occupy coarser textured colluvial inclusions.
TW3	Bisequa Humo-Ferric Podzol	Brunisolic Gray Luvisol	moderately well - well	Occurs in transition to drier environments and/or on south or west aspects.
TW4	Bisequa Humo-Ferric Podzol	Brunisolic Gray Luvisol gleyed subgroups	moderately well - well imperfect	Similar to TW3 but with higher proportion of seepage and/or moisture receiving sites.
TW6	gleyed subgroups	 Bisequa Humo-Ferric Podzol Gleysols	imperfect moderately well - well poor	Minor areas occurring in depressions and seepage receiving sites.
TW7	Bisequa Humo-Ferric Podzol	Orthic Humo-Ferric Podzol gleyed subgroups	moderately well - well imperfect	Similar to the TW2 but with higher proportion of seepage and/or moisture receiving sites; most common component.



Map Complexes - The Twain-Deserters map complex occurs in lower elevation areas transitional to drumlinized till plain and/or associated with mixed topography characterized by steep to very steep slopes, glacial grooves and indistinct drumlinized terrain. The Twain-Dragon and Twain-Oona complexes occur on very steep slopes which have some shallow-to-bedrock areas. On similar landforms, the Twain soils also occupy substantial areas as the secondary soil in map complexes where the Dragon, Oona and Cluculz soils are dominant.

The Twain-Cobb complex occurs at higher elevations on Mount George where basal and ablation till are closely intermixed. The Twain-Fontaniko complex also occurs on Mount George in association with George Creek where the steep slopes and alluvial fans could not be separated at the scale of mapping.

VANDERHOOF SOIL ASSOCIATION (V)

General Location and Physiography - The Vanderhoof association lies within the Nechako Plain and is mainly located in the west-central part of the map area in the Vanderhoof glacial lake basin. Additional areas occur in the Chilako River valley. Elevations vary from 2,200' to about 2,600'; the former occur adjacent to the Stuart and Nechako Rivers. The Vanderhoof association is dominant over 2.5% of the map area.

Landform - The landform of the Vanderhoof soils is a clayey glaciolacustrine plain characterized by nearly level to undulating topography. Where the glaciolacustrine sediments are shallow (usually less than 20' - 30'), they have gently to moderately rolling topography that conforms to the underlying drumlinized basal till. Small, shallow kettles occur in some areas.

Surface drainage is characterized by a network of streams, both intermittent and active, draining towards the major rivers. The glaciolacustrine sediments are dissected adjacent to rivers and where associated with the Berman soils. Occasional ponds and/or small lakes occupy some kettles and other depressions.

Parent Material and Soils - The sediments are predominantly deep but have shallower inclusions over basal till along the former glacial lake margins. The sediments are silty at depth, grading to fine or moderately fine textures near the surface. Silty clay and light clay, with inclusions of silty clay loam and clay loam, are the dominant subsoil textures. In the top 4" to 8", textures vary from silty clay to silt loam. A change to the more clayey Pineview or silty Berman soils occurs laterally across the glaciolacustrine plain where there are obvious rises or falls in elevation. The Vanderhoof soils are intermediate in texture between these two soils.

The unweathered parent material is brownish to grayish in color, varved, calcareous at depth, and has slow permeability and firm to very firm consistence.

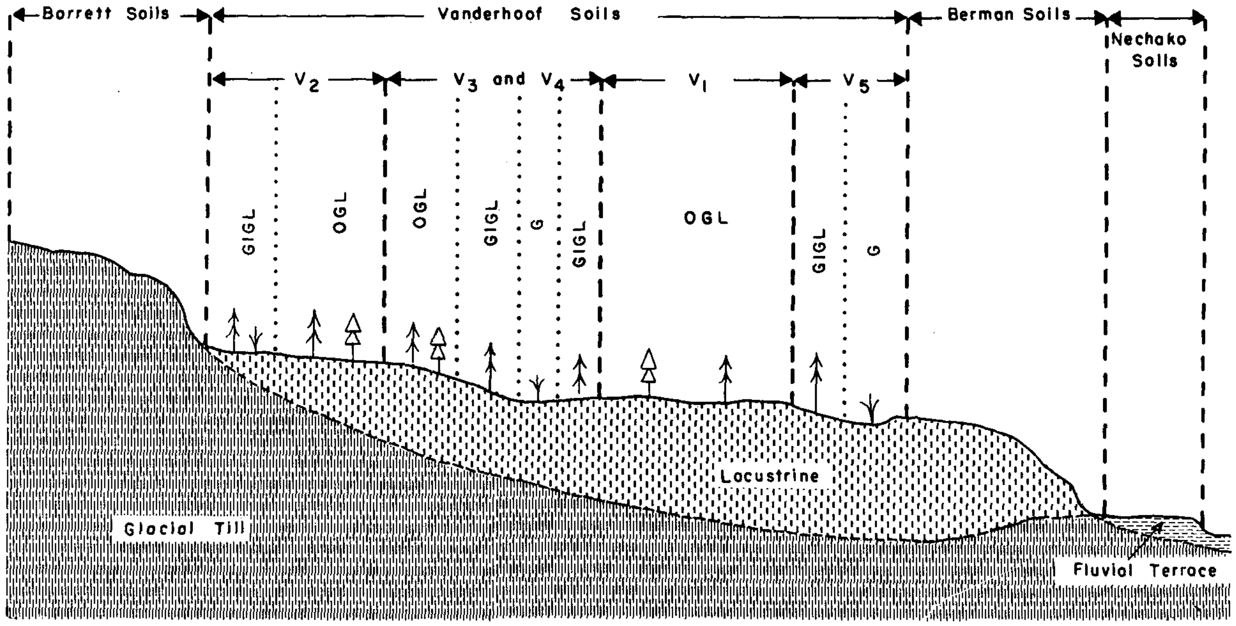
Vanderhoof soils are generally well to moderately well drained and are classified as Orthic Gray Luvisols. Inclusions of imperfectly drained Gleyed Gray Luvisols are scattered throughout and occur most commonly in the lower lying areas where the topography is gently to moderately rolling. Small areas of poorly to very poorly drained Gleysolic and Organic soils occur adjacent to creeks, and in deeper depressions and kettles.

Climate and Vegetation - The average annual, and May to September precipitations on the Vanderhoof soils are approximately 18" and 8", respectively, with a slight increase towards the east. Overall, the average frost-free period is generally less than 60 days but varies with location and aspect. Soils in the west have a slightly shorter frost-free period than those in the east. Soils in the narrow Chilako River valley are susceptible to late spring and early fall frosts.

The soils occur within the Subboreal white spruce - alpine fir zone. A large part of the area is covered by dense stands of aspen or a semi-open forest cover of lodgepole pine, with successional stages of white spruce in the canopy and the understory. Willow occurs variably and Douglas-fir and birch are scattered. Understory cover is variable. Growth and cover of both the forest canopy and the understory is usually best on imperfectly drained sites. The scattered, poorly to very poorly drained sites support willow, aspen, various hydrophytic plants and mosses with variable amounts of black and white spruce and lodgpole pine. The drier environment and its associated vegetation make a large part of the Vanderhoof soils area suitable for grazing.

Soil Association Components - Five components of the Vanderhoof soils have been established but only two have been identified in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
V1	Orthic Gray Luvisol		well - moderately well	Occurs in areas of good surface drainage.
V2	Orthic Gray Luvisol		well - moderately well	Significant proportion of imperfectly drained sites in slightly depressional areas or kettles.
		Gleyed Gray Luvisol	imperfect	



Elevation: 2200'- 2600'

Map Complexes - The Vanderhoof soils occur as the dominant soil in map complexes with the siltier Berman and heavy clay Pineview soils. At their upper elevations, glaciolacustrine deposits are often intermixed with glacial till deposits; the Vanderhoof soils have been mapped in complexes with the Barrett and Crystal associations in these situations.

WENDLE SOIL ASSOCIATION (WD)

General Location and Physiography - The Wendle association occurs in the east-central part of the map area within the Fraser Basin. Most of the acreage is found between Mount Bowron and Spring Mountain at elevations from about 3,000' to 4,000'. The Wendle soils, dominant over 0.2% of the map area, are mostly mapped in complexes with the Lanezi soils.

Landform - The landforms are characterized by both strongly to very steeply sloping, and moderately rolling to hilly topography associated with bedrock slopes and ridges. A shallow surficial mantle, less than 5' deep composed of glacial till and/or colluvium derived from both glacial till and broken, weathered bedrock, overlies the mixed sedimentary and volcanic bedrock (Tipper, 1961).

Parent Material and Soils - The parent material is generally less than 5' in depth and grades to 20" or less (lithic soils). Minor localized bedrock exposures occur on apexes and steep slopes at higher elevations.

Soil textures are predominantly gravelly sandy loam or gravelly loam. Stoniness varies with the composition of the associated glacial till and/or colluvium, and rockiness with the depth of the mantle. The soils have variable permeability and compactness depending on the thickness of the hard, compact glacial till, and on the amount of down-slope movement on steeper slopes.

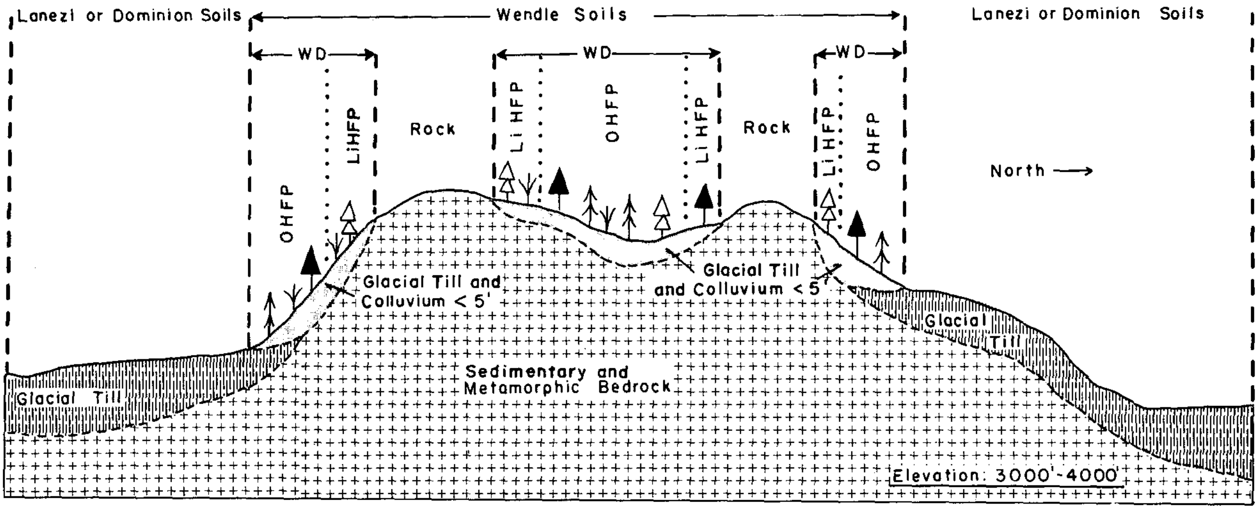
The soils are characterized by a predominance of moisture shedding sites with well to moderately well drained Orthic Humo-Ferric Podzol soils and lesser amounts of well to rapidly drained Lithic Humo-Ferric Podzols.

Climate and Vegetation - The Wendle soils occur in the moister environments of the map area; average annual, and May to September precipitations are greater than 35 and 13", respectively. Summer temperatures are cool.

The forest cover of western hemlock and western red cedar represents the western extremities of the Interior Wet Belt. The understory varies with the density of the forest canopy, aspect and depth to bedrock; diversity and abundance improve as soil depth increases to over 20".

Soil Association Components - Only one component of the Wendle soils was established in the map area.

Soil Association Component	Dominant Soil(s)	Significant Soil(s)	Drainage	Comments
WD	Orthic Humo-Ferric Podzol		well - moderately well	The only non-complexed area occurs on Mount Bowron.
		Lithic Humo-Ferric Podzol	well - rapid	



Map Complexes - Most of the Wendle soils are mapped as the dominant soil in map complexes with the Lanezi association. Additional acreage also occurs in Lanezi-Wendle map complexes. Lanezi soils occur in similar environments to the Wendle soils, but on deeper basal till deposits.

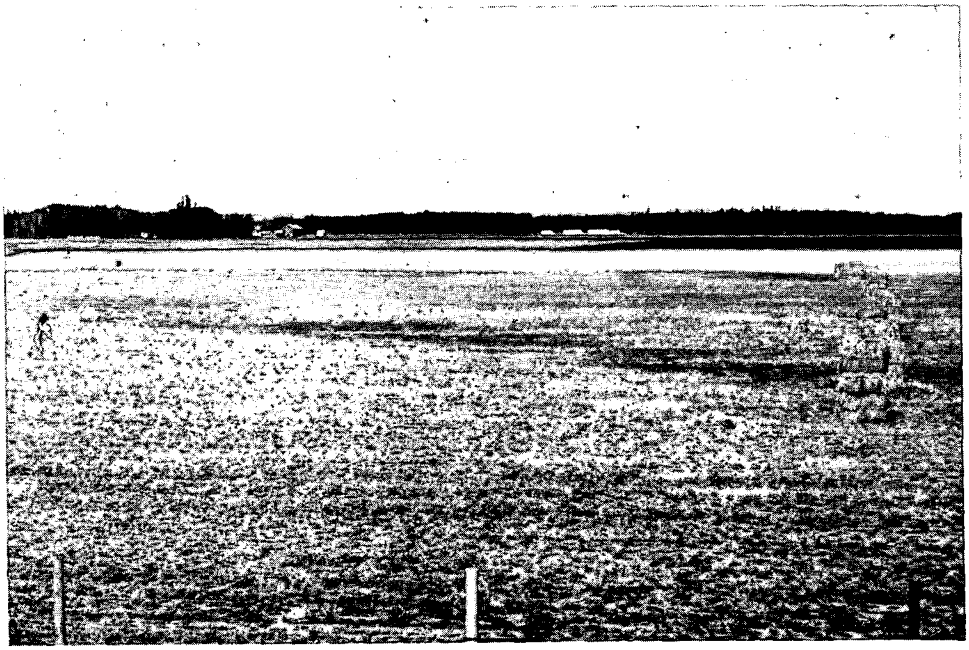


Plate 14. A landscape of nearly level Vanderhoof soils north of Vanderhoof.

MISCELLANEOUS LAND TYPES

Bluff (BF)	Very steeply to extremely sloping glaciolacustrine and/or glacial till deposits which have been eroded and dissected by glacial and post-glacial rivers and streams.
Rock Outcrop (RO)	Bedrock is exposed at the soil surface; usually occurs on strongly to extremely sloping topography associated with ridges and mountain slopes; often closely associated with lithic subgroups of the respective soil associations.
Water (W)	Small lakes, ponds and other open water which occupy depressions in the topography and are too small and/or numerous to identify individually at the scale of mapping.

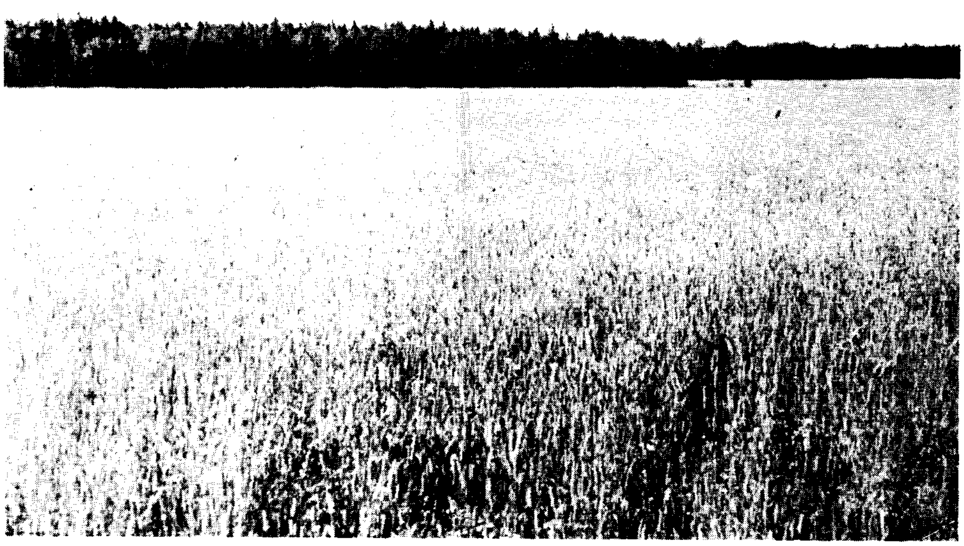


Plate 15. Timothy-clover crop on Pineview soils north of Prince George.

PART III

SOIL INTERPRETATIONS AND LAND USE

SOIL INTERPRETATIONS FOR AGRICULTURE

Agricultural Cropping

Agriculture in the map area is principally based on forage crop and livestock production. Besides economic motives (self sustained, small farms, distance from markets, etc.), climate is the main reason for such orientation. Properties of the soils also make a forage-livestock economy most desirable because the fine and very fine textured soils are not generally suited to the intensive cultivation required for many agricultural crops.

Tests conducted by Agriculture Canada's Prince George Research Station have shown the perennial forage crops are advantageous because of their higher yields and beneficial influence on soil properties, particularly structure. Alfalfa, red clover, alsike and sweet clover are well established in the area and are grown in combination with grasses like brome, timothy, reed canary and red fescue. Heavy textured soils such as the Fort St. James and Pineview soils are not suitable for alfalfa production due to poor soil structure and soil moisture relationships. A red clover-grass mixture, probably the most used legume-grass combination in the area, is well adapted to these heavy soils and provides satisfactory productivity.

Most cereal crops are not well adapted to the area and only early maturing varieties of oats and barley can be grown with moderate success. These crops mature slowly and sometimes never reach maturity due to low temperatures in the latter part of growing season. Cereals should be grown only in rotation with legumes and grasses and should not consist of more than one-third of the rotation. Oats and barley, when grown as companion crops with legumes and grasses, are used for green forage, silage or hay.

A small amount of vegetable production for home consumption is carried out but there is very limited commerical production.

Soil Fertility and Fertilizer Use

Soil fertility has to be maintained in order to farm profitably. In the Prince George - McLeod Lake map area the soils have developed under forest in subhumid and humid climates where leaching is intensive and acidic soil conditions prevail. As a result, the soils generally have low natural fertility.

In areas where agriculture is established, and where the potential for further development exists due to somewhat better climatic conditions, Gray Luvisol soils predominate. Arable agriculture is confined to these soils. Gray Luvisol soils have low organic matter content, low nitrogen content and low natural fertility. Most of them are clayey soils with unfavourable physical characteristics that further aggravate their use. The structure in the plow layer is poorly developed and increased organic matter content is necessary to form more stable and durable aggregates. By this means, porosity, permeability and moisture holding capacity are improved. Organic matter is also a source of nitrogen and to a lesser extent, other elements necessary to sustain plant growth. It is also the most active part of the soil, in which micro-organisms thrive, continually decomposing the organic matter and making nutrients available to the plant root system. Additions of fresh organic matter are therefore very important for good soil management and maintenance of soil fertility. If livestock is a part of the farm operation, barnyard manure is usually used to replenish organic matter, otherwise a green manure crop is recommended.

Depleted nutrients are also returned to the soil through commercial fertilizers. For the best results and largest economic return soil tests are recommended. Soil tests in the map area generally indicate severe sulfur deficiencies in all Gray Luvisols in the area, particularly in the Vanderhoof soils, a general need for nitrogen fertilizer, and responses to phosphorus and potassium additions are variable.

Soil Management

Soil conservation practices include all operations connected with soil and crop management that ease the problems of erosion, moisture conservation and drainage.

Except where natural erosional processes are still occurring, past erosion scars are more or less stabilized. Vegetation, particularly forest, covers most of the area and has a stabilizing influence on the soils. Erosion usually only becomes a problem when the land is cleared and used for some other purpose, usually agricultural production. The damage from erosion is multiple. Removal of both the finest particles and organic compounds depletes the soil of nutrients and causes its physical properties to deteriorate. The ability of the soil to sustain good vegetative cover is thus diminished and its susceptibility to further erosion is increased. Corrective measures should be taken to prevent such occurrences; these procedures are also effective in soil moisture preservation. Vegetative cover lowers runoff and erosion. When land with high erosion potential, such as the clays and silts in the area, is cultivated, vegetative and mechanical measures should be combined for runoff and erosion control. Even in landscape positions less susceptible to erosion some of these soils are not well suited for agriculture because of their physical properties, and their tillage should be kept at a minimum.

Past wind erosion (duning) is apparent on some of the Bear Lake and Mapes soils. These soils are stabilized now, but clearing and cultivation would expose them to potentially renewed erosion.

Lack of adequate soil moisture during the summer months is usually a limiting factor for dryland farming. With about 8" of rainfall during the growing season, the Vanderhoof - Fort St. James area is usually deficient in moisture for most crops. Tests conducted by the Prince George Research Station on the Vanderhoof soils showed irrigation of a brome grass-alfalfa mixture doubled its yield in normal years and produced three times as much in dry years compared to non-irrigated lands. To maintain optimum moisture conditions, four 2" irrigation applications were required when rainfall was normal and five were required in a dry season.

Irrigation, however, is often unavailable because of the prohibitive cost; some farms also do not have adequate water supplies due to the distance from suitable water sources. The farmer has to cope with these problems by adjusting farming practices to minimize the adverse effect of the dry summer conditions. Trials on the Vanderhoof soils have shown that the application of 200 lbs of ammonium phosphate/acre to a brome grass-alfalfa mixture increased the yield as much as irrigation in all but the driest seasons.

Adequate fertility is essential for the efficient use of soil moisture. A well distributed, adequate nutrient supply encourages vigorous root development. These roots penetrate deeper into the subsoil, enlarging the soil volume from which moisture can be drawn.

Annual and perennial crops differ regarding effective use of stored soil moisture. Perennials, like alfalfa, with well developed, deep roots utilize moisture from a much larger soil volume than annual crops with roots mostly in the plow layer. Soil moisture in the upper soil profile is least stable and in a dry period is depleted first. Perennials with roots already developed start using water earlier in spring than the annual crops; at that time more moisture is available even in the upper soil.

Many agricultural practices are aimed at both storing more water in the soil and preserving the existing moisture longer. Tillage practices like subsoiling and contour cultivation on sloping land diminish runoff by slowing down water movement on the surface, thus leaving more time for water infiltration. Other practices such as pulverizing the soil surface are not effective in reducing evaporation. Also, under these conditions the finely divided surface soil under the impact of rain becomes sealed and difficult to infiltrate; the clay soils of the area become almost impermeable. By growing perennials, cultivation is kept to a minimum and many adverse effects are avoided (e.g., pulverization, compaction, erosion hazard, etc.).

Cover provided by vegetation or surface residues helps to conserve moisture and diminish soil losses by runoff. Deep rooted plants, like alfalfa, not only make better use of available moisture but make water infiltration easier because spaces around living and dead roots serve as infiltration routes. Root penetration and opening of the subsoil is particularly important in the clayey soils of the area.

Soil Drainage

Excess water caused by flooding or seepage occurs on many floodplain areas. In other low lying areas, high water tables persist throughout the year, the soils are poorly drained, and only moisture tolerant vegetation such as reeds and sedges thrive. Major reclamation is required to rid these areas of surplus water.

Low lying areas on lacustrine plains accumulate water from runoff, seepage or restricted subsoil drainage. Most of the soils are poorly drained and some have organic surface deposits. Drainage of these areas has not been extensive; they are used as a source of low quality hay or as pasture in summer and fall.

Land Clearing

Dense forest and large trees make land clearing expensive although the use of modern equipment has facilitated and accelerated land clearing operations. When land is cleared particular attention should be given to preserving the surface organic layers and to preventing the exposure of the subsoil. Often forest litter is burned or deeply duried and the inactive subsoil brought to the surface. This causes loss of fertility and deterioration of surface soil structure.

Cleared land is sometimes abandoned after being cultivated for a number of years and some has never been plowed. Clearing of land that is marginal or unsuitable for agriculture may increase in the future, because the moist suitable land is already alienated (privately owned).

Soil Capability Classification for Agriculture*

The soil capability classification is a grouping of soils according to their capability or limitations for agricultural use. The seven capability classes in the Canadian system are designated by arabic numbers. Class 1 soils have few or no limitations and the widest range of use. The soils in other classes have progressively greater natural limitations.

Classes 1, 2 and 3 are considered capable of sustained production of the cultivated crops common to the area, Class 4 is marginal for sustained arable agriculture, Class 5 is limited to perennial forage or improved pasture production, Class 6 is suitable only for natural pasture, while Class 7 is not suitable for agricultural use.

The second level of the classification system is the subclass, which indicates the major limitation(s) placing the soil in the class. Each subclass is designated by a letter beside the class numeral, for example - 2C, 3M, 4D, 7T_C.

The subclass notations are:

C - Adverse climate
D - Undersirable soil structure and/or permeability
E - Erosion
F - Low natural fertility
I - Inundation (flooding)
M - Moisture deficiency (droughtiness)
P - Stoniness
R - Consolidated bedrock near the surface
T - Topography (slope)
W - Excess Water (high water tables)
X - Combination of minor soil factors

Climate Capability for Agriculture

The highest potential agricultural capability of a soil or area is determined by its climatic characteristics. Climate classes form the basis of soil capability for agriculture. The soil capability for agriculture cannot be higher than the climate capability rating for the area in which the soil is located.

Data from the Climate and Data Services Division, Environment and Land Use (ELUC) Secretariat, indicates relatively favourable agricultural climates up to elevations of approximately 3,800' - 4,000'. Frost-free periods and growing degree days are approximately 90 and 2,125, respectively, at elevations between 1,775' and 2,550'. Above 5,000', the growing degree days are between 735 and 1,100. The frost-free period is highly variable once away from the Fraser River Valley, with the variation depending on local topography.

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* Soil Capability for Agriculture maps 93G/SE, 93G/SW, 93J/NE and 93J/NW have been published by the Canada Land Inventory.

The best agricultural climates in the region occur in the Fraser River Valley at elevations below 1,800' and mostly lie south of the map area. These are rated climate Class 1. The climate is suitable for a wide range of fruits and vegetables to be grown with corn being a key crop. Cereals include wheat, oats, and barley while forages include alfalfa, clovers and grasses.

Climate Class 2 occurs within the Fraser Valley and a short distance up the Nechako River Valley as well as in small areas around Eaglet and Hansard lakes. In the Fraser River Valley, it occurs below 2,500' elevation in the south and 2,100' in the north, while in the Nechako River Valley it is found below 2,100'. A fair range of vegetables, some small fruits, wheat, oats, barley and most forage crops can be grown in this class.

Climate Class 3 adjoins the Fraser River Valley below 2,900' elevation in the south and 2,500' in the north. It also occurs in the southwest portion of the map area at elevations below 2,700' in the south and 2,500' further north. Cool season vegetables and some small fruits in favoured sites, as well as oats and barley, can be grown. Forage crops include clovers and grasses.

Within the general elevational constraints of climate Class 3, some areas are downgraded to climate Class 4 because of short frost-free periods. This is mostly evident in the west of the map area. Hardy varieties of cool season vegetables can be grown and barley and oats are capable of being matured periodically. Forage crops are predominantly clovers and grasses.

Climate Class 5 is found near the Fraser River Valley between 2,900' and 3,800' elevation in the south and 2,600' and 3,800' in central and northern areas. In the western half of the map area, climate Class 5 occurs between 2,700' and 3,800' elevation in the south and 2,500' and 3,800' in central and northern areas. These areas are generally only suitable for growing forage crops.

Above 3,800' to 4,000' elevations climate Class 6 occurs, due to generally low temperatures, and the land is suitable for natural grazing purposes only.

Within each of the previous climatic classes there are low lying, depressional pockets or gullies in which cold air pools; in these the climate class is lowered due to a frost limitation.

Climatic data such as frost-free period and growing degree days indicate definite constraints to the range of crops that can be grown in the map area. For these reasons, the most successful crop is forage. The major climatic limitation in regard to growing forage is precipitation. In the west, low May-September precipitation (7.7") limits productivity. As the seasonal precipitation increases eastward, another moisture problem presents itself: untimely precipitation during the July haying season. This problem and also that of a short growing season for cereals, can be circumvented by changing to silage production.

Adverse climate is the most important limitation imposed on soils in the area. Due to severe climatic conditions the best soils in the map area cannot generally be rated better than Class 2C. On the other hand Class 5 is the upper limits of land used for cultivation. Consequently, soils used for arable agriculture are mainly in Classes 3 to 5. Soil properties as a means of distinguishing among them are not obvious and many completely different soils are included in the same class. Class 5, for example, includes soils that in a better climate would be distributed among several classes.

Table 4 summarizes soil capability class and subclasses, management considerations and suitability for farming of the soil associations in the map area.

Table 4. Agricultural Soil Capability and Management Considerations

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
Alix AX1, 2, 3	5M, $5M_{P}$, $5P_{M}$	Moisture deficiency, low fertility[1], topography, stoniness	Perennial forage crops, pasture
	$6P_{T}$, $7T_{P}$	Moisture deficiency, low fertility, topography, stoniness	Limited forested grazing to unsuited
Averil AL1, 2	$7R_{T}$, $7T_{R}$, $7T_{C}$	———	Unsuited
Barrett BA1, 2, 3, 4	4C	Low fertility, moisture deficiency, stoniness, soil workability	Perennial forage crops, pasture, short growing season coarse grains
	5X, 5T, $5T_{P}$	Low fertility, moisture deficiency, stoniness, soil workability	Perennial forage crops, pasture
	5C	Low fertility, moisture deficiency, stoniness soil workability	Perennial forage crops, pasture
	6T, $6T_{P}$, $7T_{C}$	Low fertility, moisture deficiency, stoniness, topography	Limited forested grazing to unsuited
Bear Lake BE	5M, $5M_{T}$, $5T_{M}$	Moisture deficiency, low fertility, wind erosion, topography	Perennial forage crops, pasture
Bearpaw Ridge BR	$7R_{T}$, $7T_{R}$, $7T_{C}$	———	Unsuited
Bednesti B1, 2, 3, 4	3C, 4C	Low fertility, moisture deficiency, slight surface puddling	Perennial forage crops, coarse grains

1 Low fertility means low natural fertility

Table 4. (Continued)

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
Bednesti (cont'd)	4X, 4T, 5X, 5T	Low fertility, moisture deficiency, erodibility, slight surface puddling, topography	Perennial forage crops, coarse grains, pasture
	6T, 7T	Topography, erodibility	Limited forested grazing to unsuited
Berman			
BN1, 2	3C, 4C	Low fertility, moisture deficiency, slight surface puddling	Perennial forage crops, coarse grains
	4X, 4T, 5X, 5T	Low fertility, moisture deficiency, erodibility, slight surface puddling, topography	Perennial forage crops, coarse grains, pasture
	6T, 7T	Topography, erodibility	Limited forested grazing
BN5	5W	High water table, poor drainage	Pasture, low quality perennial forage crops
Bowron			
BO1, 2, 3, 4	3C, 4C	Low fertility, soil workability	Perennial forage crops
	4T, 5T	Low fertility, soil workability, topography	Perennial forage crops, pasture
	$4T_D$, $5T_D$	Low fertility, soil workability, topography	Perennial forage crops, pasture
BO5	5W, $5W_D$	Poor drainage, soil workability	Pasture, low quality perennial forage crops
Captain Creek			
CT	$7T_C$, $7T_P$	———	Unsuited
Chief			
CF1, 2	O	Low fertility, high water table, poor drainage	Low quality forage crops, pasture, source of sedge hay

Table 4. (Continued)

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
Cluculz CZ	7^{R}_{T}, 7^{T}_{R}, 7^{T}_{C}	———	Unsuited
Cobb CB1, 2	6^{T}_{M}, 6^{T}_{P}, 7^{T}_{C}	Mositure deficiency, low fertility, topography, stoniness	Limited forested grazing to unsuited
Crystal CR1, 2, 3	6^{T}_{M}, 6^{T}_{P}, 7^{T}_{C}	Moisture deficiency, low fertility, topography, stoniness	Limited forested grazing to unsuited
Decker DR1, 2	7^{R}_{T}, 7^{T}_{R}, 7^{T}_{C}, minor 6^{R}_{T}, 6^{T}_{R}	———	Varies from unsuitable to limited forested grazing
Deserters D1, 2, 3, 4, 5	4C	Low fertility, moisture deficiency, stoniness, soil workability	Perennial forage crops, pasture, short growing season coarse grains
	5C	Low fertility, moisture deficiency, stoniness, soil workability	Perennial forage crops, pasture
	5^{T}_{P}	Low fertility, moisture deficiency, stoniness, topography	Perennial forage crops, pasture
	6^{T}_{P}, 7^{T}_{P}, 7^{T}_{C}	Low fertility, moisture deficiency, stoniness, topography	Limited forested grazing to unsuited
D6	5^{T}_{P}, 7^{T}_{C}, 7W	As above with inclusions of poor drainage	Perennial forage crops to unsuited
Dezaiko DZ	7^{R}_{T}, 7^{T}_{R}	———	Unsuited

Table 4. (Continued)

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
Dominion			
DO1, 2, 3, 4	7^{T}_{C}, 7^{T}_{P}	———	Varies from unsuited to very limited forested grazing
DO5	5^{T}_{P}, 7^{T}_{C}, 7W	———	Varies from unsuited to limited forested grazing and perennial forage crops
Dragon			
DN1, 2	7^{R}_{T}, 7^{T}_{R}, 7^{T}_{C}	———	Unsuited
Dunkley			
DU1, 2, 3	7^{T}_{C}, 5^{T}_{P}	———	Unsuited to very limited forested grazing and perennial forage crops
DU4, 5	5^{T}_{P}, 7^{T}_{C}, 7W	———	Perennial forage crops and limited forested grazing to unsuited
Eena			
E1, 2, 3, 4	4M, 5^{T}_{M}, 5^{M}_{T}	Moisture deficiency, low fertility, topography	Perennial forage crops, pasture, cool season vegetables
	7T	Moisture deficiency, low fertility, topography	Unsuited
Fontaniko			
FN	4^{M}_{P}, 5^{M}_{P}, 5^{T}_{P}	Moisture deficiency, low fertility, stoniness, topography	Perennial forage crops, pasture
Fort St. James			
FJ	5D, 5^{D}_{W}	Soil workability, low fertility, compaction and puddling	Perennial forage crops
Fraser			
F1, 2	2C, 3C, 3X, 4X	Low fertility, moisture deficiency in certain seasons	Perennial forage crops, coarse grains, pasture, vegetables

Table 4. (Continued)

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
Giscome			
GI1, 2	4^{M}_{P}, 5^{M}_{P}	Moisture deficiency, low fertility, stoniness	Perennial forage crops, pasture, limited vegetables
Gunniza			
GU	5^{M}_{P}, 5^{P}_{M}, 5^{T}_{P}	Moisture deficiency, low fertility, stoniness, topography	Pasture, perennial forage crops
	7^{M}_{P}, 7^{P}_{M}, 7^{T}_{P}	———	Unsuited
Kluk			
KK1, 2	5^{M}_{P}, 5^{P}_{M}, 5^{T}_{P}	Moisture deficiency, low fertility, stoniness, topography	Pasture, perennial forage crops
	6^{M}_{P}, 6^{P}_{M}, 6^{T}_{P}	Moisture deficiency, low fertility	Limited forested grazing
Knewstubb			
KB	5X, 5T	Low fertility, moisture deficiency, erosion, topography	Perennial forage crops, pasture, very limited cool season vegetables
	6T	Low fertility, moisture deficiency, erosion	Limited forested grazing
Lanezi			
LZ2, 4	7^{T}_{C}, 7^{T}_{P}	———	Unsuited
Mapes			
MS	5M	Moisture deficiency, low fertility, wind erosion	Perennial forage crops, pasture
	6^{T}_{M}	Moisture deficiency, low fertility, wind erosion, topography	Limited forested grazing
McGregor			
MG1, 2	5I, 5M, 5W	Low fertility, wetness and flooding, moisture deficiency in certain seasons in some areas	Pasture, perennial forage crops

Table 4. (Continued)

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
McGregor (cont'd) MG3, 4	5W, 6W, 7W, 6^{W}_{I}, 6^{I}_{W}, 7^{W}_{I}, 7^{I}_{W}	High water tables, poor drainage	Limited forested grazing, low quality perennial forage crops, unsuited in some areas
Moxley MD1, 2	0	Low fertility, high water tables, poor drainage	Low quality perennial forage crops, limited grazing
Nechako N1, 2	2C, 3C, 4C, 3X, 4X	Low fertility, moisture deficiency in certain seasons	Perennial forage crops, coarse grains, pasture, vegetables
Oona ON1, 2	7^{R}_{T}, 7^{T}_{R}, 7^{T}_{C}	———	Unsuitable
Ormond OD3, 4	6^{R}_{T}, 6^{T}_{R}	Moisture deficiency, low fertility, shallowness to bedrock	Limited forested grazing
Peta PA	5M	Moisture deficiency, low fertility	Perennial forage crops, pasture
Pineview P1, 2, 7	4D, 4^{D}_{T}, 4^{T}_{D}, 5D, 5^{D}_{T}, 5^{T}_{D}	Soil workability, low fertility, compaction and puddling	Perennial forage crops, coarse grains, pasture
P3, 4, 6	4D, 4^{D}_{T}, 4^{T}_{D}, 5D, 5^{D}_{T}, 5^{T}_{D}, 5^{D}_{W}, 5^{W}_{D}	Soil workability, low fertility, compaction and puddling, inclusions of poor drainage	Perennial forage crops, coarse grains, pasture
P5	5^{D}_{W}, 5^{W}_{D}	Soil workability, low fertility, poor drainage, compaction and puddling	Low quality perennial forage crops, pasture

Table 4. (Continued)

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
Pope			
PP	6^{R}_{T}, 6^{T}_{R}	Moisture deficiency, low fertility, topography, shallowness to bedrock	Limited forested grazing
Ramsey			
R1, 2	5M, 5^{P}_{M}, 5^{P}_{M}	Moisture deficiency, low fertility, stoniness	Perennial forage crops, pasture
	6^{P}_{T}, 7^{T}_{P}	Moisture deficiency, low fertility, stoniness, topography	Limited forested grazing to unsuited
Roaring			
RG1, 2, 3	6^{T}_{M}, 6^{T}_{P}, 6T, 7T	Moisture deficiency, low fertility, stoniness topography	Limited forested grazing
Saunders			
SD1, 3	7^{T}_{C}, 7^{T}_{P}	———	Unsuited
Saxton			
S	4M, 5M	Moisture deficiency, low fertility	Perennial forage crops, pasture, vegetables
Seebach			
SB	4M, 4^{M}_{T}	Moisture deficiency, low fertility, topography in some areas	Perennial forage crops, limited forested grazing
Skins			
SK	7^{R}_{T}, 7^{T}_{R}	———	Unsuited
Spakwaniko			
SW	5W, 7W	Low fertility, high water tables, poor drainage	Low quality perennial forage crops, limited forested grazing, unsuited in some areas
Stellako			
SL1, SL2	5I, 5M, 5W	Low fertility, wetness and flooding, moisture deficiency	Pasture, perennial forage crops

Table 4. (Continued)

Soil Association and Components	Main Soil Capability Class(es) and Subclasses	Management Considerations	Agricultural Suitability (Crop, Range)
Stellako (cont'd) SL4	5W, 6W, 7W, 6^{W}_{I}, 6^{I}_{W}, 7^{W}_{I}, 7^{I}_{W}	High water table, poor drainage, flooding	Limited grazing, low quality perennial forage crops, unsuited in some areas
Tabor Lake TR	4^{M}_{P}, 5^{M}_{P}, 5^{T}_{P}, 5W	Low fertility, moisture deficiency in mid to upper parts of fans, seepage in lower parts, stoniness	Perennial forage crops, pasture
Toneko TO1, 2	4M, 5M	Moisture deficiency, low fertility	Perennial forage crops, limited forested grazing
Torpy River TP	7^{T}_{C}, 7^{T}_{P}	———	Unsuited
Twain TW2, 3, 4, 6, 7	7^{T}_{C}, 7^{T}_{P}	———	Unsuited
Vanderhoof V1, 2	4C	Low fertility, moisture deficiency, soil workability, moderate compaction and puddling	Perennial forage crops, coarse grains
	5X, 5T, 5D	Low fertility, moisture deficiency, soil workability, moderate compaction and puddling, topography in some areas	Perennial forage crops, very limited coarse grains
Wendle WD	7^{R}_{T}, 7^{T}_{R}, 7^{T}_{C}	———	Unsuited

SOIL INTERPRETATIONS FOR ENGINEERING

The interpretation of engineering properties of the soils of the Prince George - McLeod Lake map area are mainly based on field observations and on limited laboratory analysis. The information presented is general and is not intended for site specific design of engineering works. The general guidelines used for determining the interpretations are contained in "U.S.D.A., 1971, Guide for Interpreting Engineering Uses for Soils".

Tables 5 and 6 relate the soil associations to:

1. the degree and kind of limitations affecting septic tank absorption fields, sewage lagoons, shallow excavations, dwellings with basements, and road construction;

2. soil features affecting the construction of ponds, reservoirs, embankments, dikes and levees;

3. the suitability for use as road fill, gravel, sand, and topsoil.

Limitations are rated using the classes: slight, moderate and severe. Where the soil limitation is slight, the degree of limitation is minor and can be overcome easily. Moderate degrees of limitation can be overcome or modified by special planning, design, or maintenance. Severe soil limitations is the rating given to soils that have one or more unfavourable property, such as steep slopes, bedrock near the surface, flooding hazard, high shrink-swell potential, a seasonally high water table, or low bearing strengths. To overcome this degree of limitation, soils would generally require major reclamation, special design, or intensive maintenance.

Suitability for specific uses is rated by the terms good, fair and poor. When rating soils as a source of sand and gravel, the term unsuited is also used. No ratings are given when assessing those soil features affecting construction of ponds and embankments.

The ratings were determined by considering the relevant soil properties as indicated below.

Soil properties that affect the suitability of a soil for **septic tank absorption fields** are depth to water table or bedrock, permeability, porosity, stoniness, susceptibility to flooding, and slope.

Shallow excavations require digging or tenching to a depth of less than 6'. Examples are excavations for pipelines, sewer lines, telephone or power transmission lines, ditches and cemetaries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of large stones or boulders, and freedom from flooding or high water tables.

The suitability of a soil for **low dwellings with basements** (less than three stories high) is related to its capacity to support a load; properties that affect foundations are emphasized. The rating depends on wetness, susceptibility to flooding, density, texture, plasticity, shrink-swell potential, susceptibility to frost action, slope and depth to bedrock.

Properties that most affect **road construction** are load supporting capacity, stability of the subgrade and quality and quantity of cut-and-fill material. These depend on soil drainage, susceptibility to flooding, slope, depth to rock, shrink-swell potential, susceptibility to frost action and content of stones.

Ponds and reservoirs consist of water held behind a dam or embankment. Soils suitable for ponds and reservoirs have low rates of seepage (low permeability) and substantial depth over permeable material (e.g., fractured or permeable bedrock).

Dikes, levees, and other embankments for retention of water require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, compaction characteristics, sheer strength, stone content and organic matter content.

Road fill is soil material used in embankments for roads. Its suitability depends on the predicted performance after it is removed from its original location and placed in embankments; it also depends on its relative ease of excavation.

The ratings of the soils for **gravel and/or sand** indicate the suitability of each soil as a local source of sizeable quantities of coarse aggregate. It does not indicate the kind of sand or gravel, nor does it refer to any specific use. A soil rated good or fair generally has a sand or gravel layer at least 3' thick, the top of which is within 6' of the surface.

The ratings of the soils as a source of **topsoil** are based mainly on the texture of the soil, ease of working and spreading of the material, thickness of topsoil layers, natural fertility or the response to fertilizer applications, stoniness, soil drainage and presence of toxic substances.

More specific and quantitative details of the individual ratings are given in U.S.D.A. (1971).

Table 5: Interpretation of Engineering Properties of the Soils - Septic Tank Absorption Fields, Sewage Lagoons, Excavations, Dwellings with Basements, and Local Roads and Streets

	Degree and Kind of Limitations for				
Soil Association and Map Symbol	Septic Tank Absorption Fields	Sewage Lagoons	Shallow Excavations	Dwellings with basements	Local Roads and Streets
ALIX - AX	Slight	Severe; very porous	Severe; sidewall instability (gravelly)	Slight	Slight
AVERIL - AL	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe: shallow over rock, slope
BARRETT - BA	Severe; slow permeability	Slight to moderate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; susceptible to frost action	Moderate; susceptible to frost action, shrink-swell potential, slope
BEAR LAKE - BE	Slight	Severe; very porous	Severe; sidewall instability (sandy)	Slight	Slight
BEARPAW RIDGE - BR	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope
BEDNESTI - B	Moderate; moderate permeability	Moderate; moderate permeability	Slight	Moderate to severe; susceptible to frost action	Moderate to severe; susceptible to frost action, moderate permeability
BERMAN - BN	Moderate to severe; moderate to slow permeability	Moderate; moderate permeability	Slight	Moderate to severe; susceptible to frost action	Severe; susceptible to frost action, high erodibility
BOWRON - BO	Moderate to severe; slow permeability	Slight	Slight	Severe; high shrink-swell potential, susceptible to frost action	Severe; high shrink-swell potential, susceptible to frost action
CAPTAIN CREEK - CP	Severe; slow permeability, slope	Slight to moderate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; moder- shrink-swell potential, susceptible to frost action	Moderate to moderate shrink-swell potential, susceptible to frost action
CHIEF - CF	Severe; high water tables	Severe; high water tables	Severe; high water tables	Severe; high water tables, low bearing strength	Severe; high water tables, low bearing strength

Table 5: Interpretation of Engineering Properties of the Soils - Septic Tank Absorption Fields, Sewage Lagoons, (cont'd) Excavations, Dwellings with Basements, and Local Roads and Streets

	Degree and Kind of Limitations for				
Soil Association and Map Symbol	Septic Tank Absorption Fields	Sewage Lagoons	Shallow Excavations	Dwellings with basements	Local Roads and Streets
CLUCULZ - CZ	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope
COBB - CB	Moderate; moderate permeability, slope	Moderate; variable stoniness	Moderate; slope, stoniness	Moderate to severe; slope, stoniness	Moderate; slope, stoniness
CRYSTAL - CR	Moderate; moderate permeability, slope	Moderate; variable stoniness	Moderate; slope, stoniness, sidewall instability	Moderate to severe; slope, stoniness	Moderate; slope, stoniness
DECKER - DR	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope
DESERTERS - D	Severe; slow permeability, slope	Slight to moderate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; susceptible to frost action, moderate shrink-swell potential	Moderate; susceptible to frost action, moderate shrink-swell potential, slope
DEZAIKO - DZ	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope
DOMINION - DO	Severe; slow permeability, slope	Slight to moderate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; moderate shrink-swell potential, susceptible to frost action	Moderate; moderate shrink-swell potential, susceptible to frost action
DRAGON - DN	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope
DUNKLEY - DU	Severe; slow permeability, slope	Slight to moderate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; moderate shrink-swell potential, susceptible to frost action	Moderate; moderate shrink-swell potential, susceptible to frost action, slope
EENA - E	Slight	Severe; very porous	Severe; sidewall instability (sandy)	Slight	Slight

Table 5: Interpretation of Engineering Properties of the Soils - Septic Tank Absorption Fields, Sewage Lagoons, (cont'd) Excavations, Dwellings with Basements, and Local Roads and Streets

	Degree and Kind of Limitations for				
Soil Association and Map Symbol	Septic Tank Absorption Fields	Sewage Lagoons	Shallow Excavations	Dwellings with basements	Local Roads and Streets
FONTANIKO - FN	Slight	Moderate to severe; variable stoniness	Moderate; stoniness, variable textures	Slight	Slight
FORT ST. JAMES - FJ	Severe; very slow permeability	Slight	Moderate; difficult to excavate	Severe; very high shrink-swell potential	Severe; very high shrink-swell potential
FRASER - F	Slight to moderate; latter has seasonal water table	Slight to severe; latter has season-al water table	Slight to severe; latter has seasonal water table	Slight to moder-ate; latter has seasonal water table	Slight to moder-ate; latter has seasonal water table
GISCOME - GI	Slight	Severe; very porous	Severe; sidewall instability (gravelly)	Slight	Slight
GUNNIZA - GU	Slight	Severe; very porous to under-lying till	Severe; sidewall instability (gravelly) to underlying till	Slight	Slight
KLUK - KK	Slight; severe if till substratum close to surface	Severe; very porous to under-lying till	Severe; sidewall instability (gravelly)	Slight	Slight to moder-ate; slope
KNEWSTUBB - KB	Moderate; moderate permeability	Moderate to severe; moderate permeability	Slight	Moderate to severe; suscep- to frost action	Severe; suscep-tible to frost action, slope, erodibility
LANEZI - LZ	Severe; slow permeability, slope	Slight to moder-ate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; moder-ate shrink-swell potential, susceptible to frost action	Moderate; moder-ate shrink-swell potential, susceptible to frost action
MAPES - MS	Slight	Severe; very porous	Severe; sidewall instability (sandy)	Slight	Slight
MCGREGOR - MG	Moderate to severe; high water tables, flooding	Moderate to severe; high water tables, flooding	Moderate to severe; high water tables, flooding	Moderate to severe; high water tables, flooding	Moderate to severe; high water tables, flooding

Table 5: Interpretation of Engineering Properties of the Soils - Septic Tank Absorption Fields, Sewage Lagoons, (cont'd) Excavations, Dwellings with Basements, and Local Roads and Streets

Soil Association and Map Symbol	Degree and Kind of Limitations for: Septic Tank Absorption Fields	Sewage Lagoons	Shallow Excavations	Dwellings with basements	Local Roads and Streets
MOXLEY - MO	Severe; high water tables	Severe; high water tables	Severe; high water tables	Severe; high water tables, low bearing strength	Severe; high water tables, low bearing strength
NECHAKO - N	Slight to moderate; seasonal water tables	Moderate to severe; variable porosity, season-al water table	Moderate; sidewall instability (sandy in subsoil)	Slight	Slight
OONA - ON	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, stoniness, slope
ORMOND - OD	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope
PETA - PA	Slight	Severe; very porous	Severe; sidewall instability (sandy)	Slight	Slight
PINEVIEW - P	Severe; very slow permeability	Slight	Severe; difficult to excavate	Severe; high shrink-swell potential	Severe; high shrink-swell potential
POPE - PP	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope
RAMSEY - R	Slight	Severe; very porous, slope	Severe; sidewall instability (gravelly)	Slight	Slight
ROARING - RG	Severe; slope	Severe; very porous, slope	Severe; slope, side-sidewall instability (gravelly and sandy)	Severe; slope	Severe; slope
SAUNDERS - SD	Severe; slow permeability, slope	Slight to moder-ate; stoniness, variable slope	Moderate; stoniness, slope	Moderate; moder-ate shrink-swell potential, susceptibility to frost action	Moderate; moder-ate shrink-swell potential, susceptibility to frost action
SAXTON - SX	Slight	Severe; very porous	Severe; sidewall instability (sandy)	Slight	Slight

Table 5: Interpretation of Engineering Properties of the Soils - Septic Tank Absorption Fields, Sewage Lagoons,
(cont'd) Excavations, Dwellings with Basements, and Local Roads and Streets

Soil Association and Map Symbol	Degree and Kind of Limitations for: Septic Tanks Absorption Fields	Sewage Lagoons	Shallow Excavations	Dwellings with basements	Local Roads and Streets
SEEBACH - SB	Slight	Severe; very porous	Severe; sidewall instability (sandy)	Slight	Slight
SKINS - SK	Severe; shallow over rock, stoniness	Severe; shallow over rock, stoniness	Severe; shallow over rock, stoniness	Severe; shallow over rock, stoniness	Severe; shallow over rock, stoniness
SPAKWANIKO - SW	Moderare to severe; high water tables	Moderate to severe; high water tables	Moderate to severe; high water tables	Moderate to severe; high water tables	Moderate to severe; high water tables
STELLAKO - SL	Severe to moderate; high water tables, flooding	Severe; porous, high water tables, flooding	Moderate to severe; flooding, sidewall instability, high water tables	Moderate to severe; flooding, high water tables	Moderate to severe; flooding high water tables
TABOR LAKE - TR	Slight	Moderate to severe; variable stoniness and texture	Moderate; variable stoniness and texture	Slight	Slight
TONEKO - TO	Slight	Severe; very porous	Severe; sidewall instability (sandy)	Slight	Slight
TORPY RIVER - TP	Severe; slow permeability, slope	Slight to moderate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; moderate shrink-swell potential, susceptible to frost action	Moderate; moderate shrink-swell potential, susceptible to frost action
TWAIN - TW	Severe; slow permeability, slope	Slight to moderate; variable stoniness, slope	Moderate; stoniness, slope	Moderate; moderate shrink-swell potential, susceptible to frost action	Moderate; susceptible to frost action, moderate shrink-swell potential, slope
VANDERHOOF - V	Severe; slow permeability, slope	Slight	Moderate; difficult to excavate	Severe; high to very high shrink-swell potential	Severe; high to very high shrink-swell potential
WENDLE - WD	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope	Severe; shallow over rock, slope

Table 6: Interpretation of Engineering Properties of the Soils - Ponds and Reservoirs, Embankments, Dikes and Levees, and Road Fill, Gravel, Sand and Topsoil.

Soil Association and Map Symbol	Soil Features Affecting: Pond and Reservoirs	Soil Features Affecting: Embankments, Dikes and Levees	Suitability as a Source of: Road Fill	Gravel	Sand	Topsoil
ALIX - AX	Very rapid permeability	High shear strength, high permeability	Good; gravelly	Good	Poor to Fair	Poor; gravelly
AVERIL - AL	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
BARRETT - BA	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
BEAR LAKE - BE	Rapid permeability	High shear strength, high permeability	Good; sandy	Poor	Good	Poor; sandy
BEARPAW RIDGE - BR	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
BEDNESTI - B	Moderate permeability	Medium to low shear strength, moderate to slow permeability	Poor to fair; susceptible to frost action	Unsuited	Unsuited	Good; silty
BERMAN - BN	Moderate permeability	Medium to low shear strength, moderate to slow permeability	Poor to fair; susceptible to frost action	Unsuited	Unsuited	Fair to good
BOWRON - BO	Slow permeability	Low shear strength, slow permeability	Poor; high shrink-swell potential	Unsuited	Unsuited	Poor; clayey
CAPTAIN CREEK - CP	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
CHIEF - CF	Organic material, high water tables	Organic material, high water tables	Unsuited	Unsuited	Unsuited	Poor to fair; organic

Table 6: Interpretation of Engineering Properties of the Soils - Ponds and Reservoirs, Embankments, Dikes and Levees,
(cont'd) and Road Fill, Gravell, Sand and Topsoil.

Soil Association and Map Symbol	Soil Features Affecting: Pond and Reservoirs	Soil Features Affecting: Embankments, Dikes and Levees	Suitability as a Source of: Road Fill	Gravel	Sand	Topsoil
CLUCULZ - CZ	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
COBB - CB	Moderate permeability, stoniness, compact till 5 to 10' from surface	Medium shear strength, moderate permeability	Fair; stoniness, slope	Poor to fair	Poor	Poor; gravelly, stony
CRYSTAL - CR	Moderate permeability, stoniness, compact till 5 to 10' from surface	Medium shear strength, moderate permeability	Fair; stoniness slope	Poor to fair	Poor	Poor; gravelly, stony
DECKER - DR	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
DESERTERS - D	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
DEZAIKO - DZ	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
DOMINION - DO	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
DRAGON - DN	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony

Table 6: Interpretation of Engineering Properties of the Soils - Ponds and Reservoirs, Embankments, Dikes and Levees, (cont'd) and Road Fill, Gravel, Sand and Topsoil.

	Soil Features Affecting		Suitability as a Source of			
Soil Association and Map Symbol	Pond and Reservoirs	Embankments, Dikes and Levees	Road Fill	Gravel	Sand	Topsoil
DUNKLEY - DU	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
EENA - E	High permeability	High shear strength, high permeability	Good; sandy	Poor	Good	Poor; sandy
FONTANIKO - FN	High permeability	Medium to high shear strength, moderate to high permeability	Good	Fair to poor	Poor	Poor; gravelly, sandy
FORT ST. JAMES - FJ	Very slow permeability	High shrink-swell potential, low shear strength, fair to poor compaction characteristics	Poor; very high shrink-swell potential	Unsuited	Unsuited	Poor; clayey
FRASER - F	Variable permeability and textures, seasonal water tables	Medium to low shear strength, medium to low permeability	Poor to good; variable susceptibility to frost action, variable drainage	Poor; fair at depth in places	Poor; fair at depth in places	Fair to good
GISCOME - GI	High permeability	High shear strength, high permeability	Good; gravelly	Good	Poor; fair at depth	Poor; gravelly
GUNNIZA - GU	High permeability (underlain by till below 1-4')	High shear strength, high permeability	Good; gravelly	Good	Poor	Poor; gravelly
KLUK - KK	High permeability (underlain by till below 1-4')	High permeability, high shear strength	Good	Good to fair	Poor to fair	Poor; gravelly
KNEWSTUBB - KB	Moderate permeability	Medium shear strength, moderate permeability	Fair; susceptible to frost action	Unsuited	Unsuited	Fair to good

Table 6: (cont'd) Interpretation of Engineering Properties of the Soils - Ponds and Reservoirs, Embankments, Dikes and Levees, and Road Fill, Gravel, Sand and Topsoil.

	Soil Features Affecting		Suitability as a Source of			
Soil Association and Map Symbol	Pond and Reservoirs	Embankments, Dikes and Levees	Road Fill	Gravel	Sand	Topsoil
LANEZI - LZ	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, sandy
MAPES - MS	High permeability	High permeability, high shear strength	Good	Poor	Good	Poor; sandy
MCGREGOR - MG	Variable permeability and textures, high water tables	Medium to high shear strength, variable permeability	Poor; susceptible to frost action, drainage	Unsuited to good	Good to unsuited	Poor to good; variable texture, drainage
MOXLEY - MO	High water tables, organic material	High water tables, organic material	Unsuited	Unsuited	Unsuited	Poor to fair; organic
NECHAKO - N	Variable water table	Medium shear strength, moderate to high permeability	Poor; susceptible to frost action, drainage	Poor; fair at depth in places	Poor; fair at depth in places	Fair to good
OONA - ON	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
ORMOND - OD	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
PETA - PA	High permeability	High permeability, high shear strength	Good	Poor; fair at depth	Good	Poor; sandy
PINEVIEW - P	Very slow permeability	High shrink-swell potential, low shear strength, fair to poor compaction characteristics	Poor; high shrink-swell potential	Unsuited	Unsuited	Poor; clayey

Table 6: (cont'd) Interpretation of Engineering Properties of the Soils - Ponds and Reservoirs, Embankments, Dikes and Levees, and Road Fill, Gravel, Sand and Topsoil.

	Soil Features Affecting		Suitability as a Source of			
Soil Association and Map Symbol	Pond and Reservoirs	Embankments, Dikes and Levees	Road Fill	Gravel	Sand	Topsoil
POPE - PP	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
RAMSEY - R	High permeability	High shear strength	Good	Good	Poor to fair	Poor; gravelly
ROARING - RG	High permeability, slope	High shear strength, high permeability	Poor to good; slope	Good to fair	Good to poor	Poor; gravelly, sandy
SAUNDERS - SD	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
SAXTON - SX	High permeability	High shear strength, high permeability	Good; sandy	Poor near surface, fair to good at depth	Good	Poor; sandy
SEEBACH - SB	High permeability	High shear strength, high permeability	Good; sandy	Poor	Poor	Poor; sandy
SKINS - SK	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony
SPAKWANIKO - SW	High permeability, high water tables	Medium to high shear strength, moderate to high permeability	Poor; drainage	Poor	Poor	Poor; gravelly, sandy, drainage
STELLAKO - SL	Variable permeability and textures, high water tables	Variable shear strength and permeability	Poor to good; drainage	Unsuited to good	Good to unsuited	Poor; drainage
TABOR LAKE - TR	High permeability	Medium to high shear strength, moderate to high permeability	Good	Fair	Poor	Poor; gravelly, sandy

Table 6: (cont'd) Interpretation of Engineering Properties of the Soils - Ponds and Reservoirs, Embankments, Dikes and Levees, and Road Fill, Gravel, Sand and Topsoil.

	Soil Features Affecting		Suitability as a Source of			
Soil Association and Map Symbol	Pond and Reservoirs	Embankments, Dikes and Levees	Road Fill	Gravel	Sand	Topsoil
TONEKO - TO	High permeability	High shear strength, high permeability	Good; sandy	Poor	Good	Poor; sandy
TORPY RIVER - TP	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
TWAIN - TW	Slow permeability, slope	Medium to low shear strength, moderate to slow permeability	Fair to poor; susceptible to frost action, moderate shrink-swell potential, slope	Poor	Poor	Poor; gravelly, stony
VANDERHOOF - V	Slow permeability	High shrink-swell potential, low shear strength, fair to poor compaction characteristics	Poor; high shrink-swell potential	Unsuited	Unsuited	Poor; clayey
WENDLE - WD	Shallow over rock, stoniness, slope	Shallow over rock, stoniness, slope	Poor to fair; shallow over rock, stoniness, slope	Poor	Poor	Poor; shallow, gravelly, stony

SOIL INTERPRETATIONS FOR FORESTRY

Except for a few mountains to the southwest, southeast and northeast, the majority of the map area is less than 3,500' in elevation. However, the mountainous relief that occurs immediately to the east of the map area affects the climate, causing increased precipitation from the west to the east and northeast. As a result, at lower elevations, the dominant species change from predominantly lodgepole pine in the west to white spruce to the east. Less common species include trembling aspen, Douglas-fir, and alpine fir, with black cottonwood on river floodplains and black spruce in swamps.

Information on a number of forest management considerations is presented in Tables 7 and 8. The following explanations apply to the table.

Average Forest Capability

The potential capability of each soil to grow wood fibre was determined by locating and measuring forest productivity plots. The methodology of locating and measuring these plots, and assessing the capability of the soils, is outlined by Kowall (1971). The seven capability classes are based on a productivity range as follows:

Class 7 has a mean annual increment range of 0-10 cubic feet/acre/year; Class 6, 11-30; Class 5, 31-50; Class 4, 51-70; Class 3, 71-90; Class 2, 91-110; Class 1, 111-131; Class 1a, 131-150 and Class 1b, 151-170.

Subclasses are attached to capability classes 2 to 7 indicating the nature of the soil or climatic limitations which preclude attaining Class 1 productivity. Class 1 is assumed to have no limitations to tree growth and therefore has no subclasses. The subclasses used to indicate limitations to tree growth are:

- A - high evapotransporation due to southerly and westerly exposure;
- D - physical restriction to rooting by dense or unconsolidated layers, other than bedrock;
- H - low temperatures (soil and air);
- M - soil moisture deficiency;
- R - restriction to rooting by bedrock;
- S - a combination of soil factors which collectively lower the capability class; and
- W - excess soil moisture.

Dominant capabilities are listed first in Table 7, separated by a comma (e.g., 5M, 6M). Where increased precipitation towards the east and northeast causes a change in forest capability without a noticeable change in soil development, the more productive capabilities are separated from the dominant capabilities by a semi-colom. Capabilities that are bracketed occur occasionally, or occur with a species that is not recommended on the dominant sites.

Average Percent Slope

The percent slope is grouped into three categories: less than 30%; less than 60%; and greater than 60%.

Windthrow Hazard

Windthrow hazard ratings are based on characteristics that control the development of tree roots and thus affect wind firmness. These include soil texture, soil depth, slope and depth to water table. Specific rooting characteristics of different tree species are not taken into account. Three ratings are given:

Low (L) - Windthrow is unlikely. The effective rooting depth is generally greater than 36", the soils are usually coarse textured, and the topography reasonably level.

Moderate (M) - Factors indicate some susceptibility to windthrow, but major problems are not likely. The effective rooting depth is generally between 18 and 36", and the soils usually medium textured on fairly level topography or coarse textured on slopes greater than 30 percent.

High (H) - Major problems are likely during periods of wet soils and moderate and high winds. The effective rooting depth is generally less than 18", soil textures and topography are variable.

Brush Competition

This refers to the rate of invasion by unwanted trees and shrubs following harvesting. The ratings are based on soil characteristics, slope, aspect, climate and elevation. The three ratings are as follows:

Low (L) - Indicates that plant competition is not likely to prevent adequate establishment of a desirable stand of trees.

Moderate (M) - Indicates that plant competition may delay the establishment and slow the growth of seedlings, but is not likely to prevent the development of a desirable stand of trees.

High (H) - Indicates that plant competition is likely to prevent the adequate establishment of a desirable stand of trees unless site preparation is undertaken.

Natural Regeneration Potential

This interpretation indicates the potential for each soil association to regenerate to an acceptable stocking level. Factors included in evaluating this potential are soil characteristics, climate, aspect, elevation, frost potential, brush competition, and tree species. The three ratings are as follows:

Low (L) - This rating indicates the potential for regeneration is low with a limited probability of success. Major regeneration problems can be expected and reseeding or replanting may be required. Several years may elapse before an adequate stocking level is achieved.

Moderate (M) - This rating indicates that some problems will be encountered in attaining a satisfactory stocking level. Usually regeneration is spotty and some replanting or site preparation may be necessary.

High (H) - This rating indicates that regeneration has a high probability of success. Few problems should be encountered in attaining good stocking levels.

Limits to Regeneration

The main items retarding or restricting regeneration are indicated as follows:

(a) frost heaving - usually on finer textured soils such as clays and silts;
(b) low fertility due to coarse soil textures;
(c) droughty soils - very low water holding capacities and rapid percolation rates, or high climatic evapotransporation and low precipitation;
(d) soil moisture deficiency - mostly associated with coarse textured soils such as loamy sands and sand;
(e) excess soil moisture - limits aeration and seedling establishment;
(f) climatic limitations at high elevations - cold soil and air temperatures, short growing season, wind exposure;
(g) unstable soil surface - slopes over 30% on finer textured soils such as clays and silts;
(h) shallow soils - provide only a shallow rooting medium, usually less than 20" over bedrock;
(i) rocky rooting medium - coarse, fragmental and rubbly areas where there is a reduction in the volume of the soil rooting medium.

Recommended Tree Species to Plant

This column lists the tree species that soil, climate, and topographic factors indicate are likely best suited for planting. They include alpine fir - alF, black cottonwood - bCo, lodgepole pine - lP, black spruce - bS, and white spruce - wS.

Natural Regeneration

These are the indigenous species that are likely to regenerate naturally. In addition to the species listed under recommended for planting, they include trembling aspen - tA, and Douglas-fir - D.

Susceptibility of Soils to Damage by Timber Harvesting

Based on such factors as soil wetness, soil texture, coarse fragment percentage, slope and drainage, these ratings indicate the likelihood of soils and other resources to incur damage during timber removal, spur road and landing construction and use, slash burning, and other activities related to timber harvesting. Damage is caused to soils by disturbances which deteriorate soil structure, cause compaction and increase erosion. These may effect other resources through decreased site productivity, lower water quality and yield, and loss of fish habitat in streams.

The three ratings are as follows:

Low - minor damage is likely to occur
Moderate - moderate damage is likely to occur
High - major damage is likely to occur

Type of Damage Expected from Timber Harvest Operations

The following types of damage relate mainly to soil texture and structure, and the loss of soil by erosion.

(a) Soil Properties

1. Deterioration of soil structure - on fine to medium textured soils;
2. Increased soil compaction - on fine to medium textured soils;
3. Loss of soil organic matter - on gravelly coarse textured soils.

(b) Surface Soil Movement

4. Increased surface erosion - on finer textured soils on most slopes;
5. Soil damage from skidding - on finer textured soils, steeper slopes;
6. Loss of soil resource by skidding or erosion - especially on shallow soils overlying bedrock;
7. Damage to resources by road wastes - on steeper slopes;
8. Road construction damage - especially disruption of natural drainage.

(c) Soil Failure

9. Increased mass movement hazard - on steeper slopes;
10. Increased failure rate from spur road construction - on steeper slopes.

(d) Water

11. Stream sedimentation - on medium to coarse textured soils;
12. Stream siltation - from lacustrine silts and clays.

Slash Disposal Methods

Factors considered include soil properties, elevation, aspect, slope, litter thickness, drainage and the ability of the site to regenerate. Disposal methods recommended are:

(1) No treatment - slash is left on the ground with no burning;
(2) Scarification - preparation of the site without burning;
(3) Clean logging - culls and tops are brought to the landing, piled and burned;
(4) Machine Pile - slash is piled and then burnt;
(5) Broadcast burn - standard methods of burning.

Management Considerations

This column considers some management practices which best protect the soil and water resources. These considerations, directed toward the highest level of multiple use management, provide additional information that may be applied. Considered are such factors as season of operation, fertilization, harvest methods, restrictions to road construction and road construction season, slash disposal, and yarding.

Management practices to consider are:

(1) do not log - low productivity sites, including subalpine environments;
(2) do not log (or winter log) - on shallow soils;
(3) winter log - on fine textured soils;
(4) skid across slopes - on steep slopes; or,
(5) no special considerations.

Table 7 General Interpretations of the Soils for Forest Management - Average Forest Capability, Average Slope, Windthrow Hazard, Brush Competition, Natural Regeneration Potential, Limits to Regeneration, and Species to Plant.

SOIL ASSOCIATION (MAP SYMBOL)	AVERAGE FOREST CAPABILITY	AVERAGE SLOPE %	WIND - THROW HAZARD	BRUSH COMPETITION	NATURAL REGENERATION POTENTIAL	LIMITS TO REGENERATION	SPECIES TO PLANT
Alix (AX)	5M, 4M	<30	L	L	L	droughty, low fertility	1P
Averil (AL)	4^{M}_{R}, 5^{R}_{M}	<60	H	L	L	shallow, rocky soils, soil moisture deficiency	wS
Barrett (BA)	4^{M}_{D}, 3S	<30	H	L	M	soil moisture deficiency, some frost heaving	1P, wS
Bear Lake (BE)	5M, 4M	<30	L	L	L	droughty, low fertility	1P
Bearpaw Ridge (BR)	4^{M}_{R}, 5^{R}_{M}	<60	H	L	L	shallow, rocky soils, some high elevation climatic limitations	wS
Bednesti (B)	2S, 3M (1)	<30	M	H	H	frost heaving	wS, 1P, tA
Berman (BN)	4^{M}_{D}, 3^{M}_{D}	<30	M	M	M	frost heaving	1P, wS
Bluff Land Type (BF)	5^{M}_{D}, 4^{M}_{D}	>60	H	L	L	surface slides, soil moisture deficiency	1P, wS
Bowron (BO)	2S, 3^{D}_{M}	<30	M	M	M	frost heaving	1P, wS
Captain Creek (CT)	3S, 4M	<60	H	M-H	H-M	some frost heaving, some high elevation climatic limitations	wS, 1P

Table 7 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	AVERAGE FOREST CAPABILITY	AVERAGE SLOPE %	WIND - THROW HAZARD	BRUSH COMPETITION	NATURAL REGENERATION POTENTIAL	LIMITS TO REGENERATION	SPECIES TO PLANT
Chief (CF)	7W	<30	N/A	N/A	N/A	excess soil moisture	N/A
Cluculz (CZ)	5^{R}_{M}, 4^{M}_{R}	<60	H	L	L	shallow, rocky soils, some high elevation climatic limitations	lP
Cobb (CB)	3M, 4M	<30	L	L	M	soil moisture deficiency	lP, wS
Crystal (CR)	4M, 5M	<30	L	L	M	soil moisture deficiency	lP
Decker (DR)	5^{R}_{M}, 4^{M}_{R}	<60	H	L	L	shallow, rocky soils, soil moisture deficiency	lP
Deserters (D)	3S, 2S; 3D, 4^{M}_{D}	<30	M	M-H	H-M	some soil moisture deficiencies, some frost heaving	wS, lP
Dezaiko (DZ)	5^{H}_{R}, 6^{H}_{R}	<60	H	L	L	shallow, rocky soils, high elevation climatic limitations	alF
Dominion (DO)	3S, 2S	<30	M	M-H	H-M	some soil moisture deficiencies, some frost heaving	wS, lP
Dragon (DN)	4^{M}_{R}, 5^{R}_{M}	<60	H	L	L	shallow soils, rocky, some high elevation climatic limitations	lP, wS

Table 7 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	AVERAGE FOREST CAPABILITY	AVERAGE SLOPE %	WIND - THROW HAZARD	BRUSH COMPETITION	NATURAL REGENERATION POTENTIAL	LIMITS TO REGENERATION	SPECIES TO PLANT
Dunkley (DU)	3S, 2S	<30	M	M-H	H-M	some soil moisture deficiencies, some frost heaving	wS, 1P
Eena (E)	3M	<60	M-L	M	M	droughty, somewhat low fertility	wS, 1P
Fontaniko (FN)	4M, 3M	<30	L	L	L-M	soil moisture deficiency, low fertility	1P, wS
Fort St. James (FJ)	4^{D}_{M}, 3D	<30	H	M	M	frost heaving	1P, wS
Fraser (F)	3M	<30	M	M-H	M-H	frost heaving	wS, 1P
Giscome (GI)	5M, 4M	<30	L	L	L	droughty, low fertility	1P
Gunniza (GU)	4M	<30	L	L	M	soil moisture deficiency, low fertility	1P
Kluk (KK)	5M, 4M	<30	L	L	L	soil moisture deficiency, low fertility	1P
Knewstubb (KB)	4^{M}_{D}	<30	M	M	M	frost heaving	1P, wS
Lanezi (LZ)	3S, 2S (1)	<30	M	M-H	H-M	some soil moisture deficiencies, some frost heaving	wS, 1P
Mapes (MS)	5M, 4M	<30	L	L	M	droughty, low fertility	1P, wS

Table 7 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	AVERAGE FOREST CAPABILITY	AVERAGE SLOPE %	WIND - THROW HAZARD	BRUSH COMPETITION	NATURAL REGENERATION POTENTIAL	LIMITS TO REGENERATION	SPECIES TO PLANT
McGregor (MG)	3^{M}_{W}, 4M (1b)	<30	L	H	H,L	excess soil moisture	bCo, wS
Moxley (MO)	6W, 7W	<30	H	L	L	excess soil moisture	bS
Nechako (N)	3M (1b)	<30	L	H	H-M	frost heaving	bCo, wS
Oona (ON)	4^{M}_{R}, 5^{R}_{M}	<60	H	L	L	shallow, rocky soils, soil moisture deficiency	1P, wS
Ormond (OR)	5^{R}_{M}, 4^{M}_{R}	<60	H	L	L	shallow, rocky soils, soil moisture deficiency	1P
Peta (PA)	5M, 4M	<30	L	L	L	droughty, low fertility	1P, wS
Pineview (P)	4^{D}_{M}, 3D; 3D, 4^{W}_{D}	<30	H	L-M	M	frost heaving	1P, wS
Pope (PP)	5^{R}_{M}, 4^{M}_{R}	<60	H	L	L	shallow, rocky soils, soil moisture deficiency	1P
Ramsey (R)	5M, 4M	<30	L	L	L	droughty, low fertility	1P
Roaring (RG)	5M	<60	L-M	L	L	droughty, low fertility	1P
Rock Outcrop Land Type (RO)	6^{R}_{M} (7R)	<60	H	L	L	very shallow, rocky soils, soil moisture deficiency	1P

Table 7 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	AVERAGE FOREST CAPABILITY	AVERAGE SLOPE %	WIND - THROW HAZARD	BRUSH COMPETITION	NATURAL REGENERATION POTENTIAL	LIMITS TO REGENERATION	SPECIES TO PLANT
Saunders (SD)	4H, 5H	<60	H	L	L	some frost heaving, high elevation climatic limitations	alF
Saxton (S)	5M, 4M	<30	L	L	L	droughty, low fertility	lP
Seebach (SB)	3M, 4M (2S)	<30	L	L	M	droughty, somewhat low fertility	lP, wS
Skins (SK)	5^{H}_{R}, 6^{H}_{R}	<60	H	L	L	shallow, rocky soils, high elevation climatic limitations	alF
Spakwaniko (SW)	3W	<30	M	L	L	excess soil moisture	bS, wS
Stellako (SL)	3M (lb), 7W	<30	L to H	H	H to L	excess soil moisture in some cases	bCo, wS
Tabor Lake (TR)	5M, 4^{M}_{W}	<30	L	L	L-M	soil moisture deficiency, somewhat low fertility	lP, wS
Toneko (TO)	4M, 3M	<30	L	L	M	droughty, low fertility	lP
Torpy River (TP)	3S, 2S	<60	M	M-H	H-M	some frost heaving	wS, lP
Twain (TW)	3S, 4^{M}_{D}	<60	M	M-H	H-M	some frost heaving, some high elevation climatic limitations	wS, lP

Table 7 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	AVERAGE FOREST CAPABILITY	AVERAGE SLOPE %	WIND - THROW HAZARD	BRUSH COMPETITION	NATURAL REGENERATION POTENTIAL	LIMITS TO REGENERATION	SPECIES TO PLANT
Vanderhoof (V)	4^{D}_{M}, 3D	<30	H	L	M	frost heaving	1P, wS
Wendle (WD)	4^{M}_{R}, 5^{R}_{M}	<60	H	L	L	shallow, rocky soils, soil moisture deficiency	wS

Plate 16. Saxton soils being used for a forest nursery at Red Rock.

Table 8 General Interpretations of the Soils for Forest Management - Natural Regeneration, Soil Damage by Harvesting, Type of Damage, Slash Disposal, and Management Considerations

SOIL ASSOCIATION (MAP SYMBOL)	NATURAL REGENERATION	SOIL DAMAGE BY HARVESTING	TYPE OF DAMAGE	SLASH DISPOSAL	MANAGEMENT CONSIDERATIONS
Alix (AX)	lP	L	loss of soil organic matter	no treatment	no special consideration
Averil (AL)	wS, alF	H	loss of soil resource from skidding and erosion	no treatment	do not harvest (or winter log)
Barrett (BA)	lP, wS, tA	L	some deterioration of soil structure, some increased compaction, stream sedimentation	broadcast burn	no special consideration
Bear Lake (BE)	lP	L	loss of soil organic matter	no treatment	no special consideration
Bearpaw Ridge (BR)	wS, alF	H	loss of soil resource from skidding and erosion	no treatment	do not harvest (or winter log)
Bednesti (B)	lP, wS	M	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log
Berman (BN)	lP, wS	M	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log

Table 8 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	NATURAL REGENERATION	SOIL DAMAGE BY HARVESTING	TYPE OF DAMAGE	SLASH DISPOSAL	MANAGEMENT CONSIDERATIONS
Bluff Land Type (BF)	lP, wS	H	increased slide hazard and erosion, road waste damage to resource, soil damage from skidding, stream siltation	no treatment	do not harvest (winter log in some cases)
Bowron (BO)	lP, wS	M-H	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log
Captain Creek (CI)	wS, lP, alF	L-M	some increased compaction and erosion	broadcast burn	skid across slope or winter log
Chief (CF)	N/A	N/A	N/A	N/A	treeless
Cluculz (CZ)	lP	H	loss of soil resource by skidding and erosion	no treatment	do not harvest (or winter log)
Cobb (CB)	lP, wS	L	-	no treatment	no special consideration
Crystal (CR)	lP	L	-	no treatment	no special consideration
Decker (DR)	lP	H	loss of soil resource by skidding and erosion	no treatment	do not harvest (or winter log)
Deserters (D)	wS, lP	L	stream sedimentation	broadcast burn	no special consideration
Dezaiko (DZ)	alF	H	loss of soil resource by skidding and erosion	no treatment	do not log - subalpine environment

Table 8 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	NATURAL REGENERATION	SOIL DAMAGE BY HARVESTING	TYPE OF DAMAGE	SLASH DISPOSAL	MANAGEMENT CONSIDERATIONS
Dominion (DO)	wS, lP, alF	L	stream sedimentation	broadcast burn	no special consideration
Dragon (DN)	lP, wS	H	loss of soil resource by skidding and erosion	no treatment	do not harvest (or winter log)
Dunkley (DU)	wS, lP, alF	L	stream sedimentation	broadcast burn	no special consideration
Eena (E)	wS, lP, D	L-M	loss of soil organic matter, road construction damage, skidding damage	no treatment	limit skid roads
Fontaniko (FN)	lP, wS	L	loss of soil organic matter	no treatment	no special consideration
Fort St. James (FJ)	lP, wS	H	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log
Fraser (F)	wS, lP	M	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log
Giscome (GI)	lP	L	loss of soil organic matter	no treatment	no special consideration
Gunniza (GU)	lP	L	loss of soil organic matter	no treatment	no special consideration
Kluk (KK)	lP	L	loss of soil organic matter	no treatment	no special consideration

Table 8 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	NATURAL REGENERATION	SOIL DAMAGE BY HARVESTING	TYPE OF DAMAGE	SLASH DISPOSAL	MANAGEMENT CONSIDERATIONS
Knewstubb (KB)	lP, wS	M	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log
Lanezi (LZ)	wS, lP	L	stream sedimentation	broadcast burn	no special consideration
Mapes (MS)	lP, wS	L	loss of soil organic matter	no treatment	no special consideration
McGregor (MG)	wS, bCo	L	stream sedimentation	clean log	no special consideration
Moxley (MO)	bS	L	-	no treatment	do not log - no commerical trees
Nechako (N)	wS, bCo	L	stream sedimentation	clean log	no special consideration
Oona (ON)	lP, wS	H	loss of soil resource by skidding and erosion	no treatment	do not harvest (or winter log)
Ormond (OR)	lP, wS	H	loss of soil resource by skidding and erosion	no treatment	do not harvest (or winter log)
Peta (PA)	lP, wS	L	loss of soil organic matter	no treatment	no special consideration
Pineview (P)	lP, wS	H	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log

Table 8 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	NATURAL REGENERATION	SOIL DAMAGE BY HARVESTING	TYPE OF DAMAGE	SLASH DISPOSAL	MANAGEMENT CONSIDERATIONS
Pope (PP)	lP	H	loss of soil resource by skidding and erosion	no treatment	do not harvest (or winter log)
Ramsey (R)	lP	L	loss of soil organic matter	no treatment	no special consideration
Roaring (RG)	lP	L-M	loss of soil organic matter, road construction damage, skidding damage	no treatment	limit skid roads
Rock Outcrop Land Type (RO)	lP	H	loss of any soil resource by skidding and erosion	no treatment	do not harvest
Saunders (SD)	alF	H	some increased compaction and erosion, stream sedimentation	no treatment	do not log - subalpine environment
Saxton (S)	lP	L	loss of soil organic matter	no treatment	no special consideration
Seebach (SB)	lP, wS	L-M	loss of soil organic matter	no treatment	no special consideration
Skins (SK)	alF	H	loss of soil resource by skidding and erosion	no treatment	do not log - subalpine environment
Spakwaniko (SW)	bS, wS	L	-	no treatment	winter log
Stellako (SL)	wS, bCo	L	stream sedimentation	clean log	no special consideration
Tabor Lake (TR)	lP, wS	L	loss of soil organic matter	no treatment	no special consideration

Table 8 (Cont'd)

SOIL ASSOCIATION (MAP SYMBOL)	NATURAL REGENERATION	SOIL DAMAGE BY HARVESTING	TYPE OF DAMAGE	SLASH DISPOSAL	MANAGEMENT CONSIDERATIONS
Toneko (TO)	lP, wS	L	loss of soil organic matter	no treatment	no special consideration
Torpy River (TP)	wS, lP	L	stream sedimentation	broadcast burn	no special consideration
Twain (TW)	wS, lP alF	L-M	some increased compaction and erosion, stream sedimentation	clean log or broadcast burn	skid across slope or winter log
Vanderhoof (V)	lP, wS, tA	H	deterioration of soil structure, increased compaction and erosion, stream siltation	clean log	winter log
Wendle (WD)	wS, alF	H	loss of soil resource by skidding and erosion	no treatment	do not harvest (or winter log)

SOIL INTERPRETATIONS FOR RECREATION

A more widespread use of outdoor recreation resources is expected in the map area because of both the increased influx of tourists and people's awareness of recreational needs. This will require better planning and management of recreational facilities in the future.

In the Central Interior of British Columbia where the map area is situated, sport fishing and hunting are probably the two most important recreational activities. Numerous lakes and rivers make this among the best sport fishing areas in the province. It is also one of the best areas for moose hunting. Picnicking and camping, although seasonal, are important forms of recreation in the area. The potential for hiking and scenic viewing is not high, but some parts of the area are satisfactory for such activities.

Soil Limitations for Recreation

In planning sites for recreational purposes such as camp sites, tent sites, roads, hiking trails, buildings, playgrounds, or cottages, soil properties should be considered. Soil texture, structure, consistence, depth, stoniness or rockiness, drainage, flooding, permeability and slope, are factors to be considered in the choice of a suitable recreation site. The same soil property may have a varying effect on different recreational uses, but most soil properties' influence all uses.

Coarse textured soils have severe limitations for intensive play areas, but moderate limitations for paths and trails and no limitations for building sites. Clayey soils have severe limitations for almost all recreational uses because they have very slow permeability and are sticky and slippery when wet. Poorly drained soils are severely limiting for most recreational facilities; the same is true for soils subject to frequent flooding. Droughty soils have severe limitations for intensive recreational uses such as playgrounds because of difficulties in establishing and maintaining a good sod. Gravel, cobbles, stones and boulders limit soil use for recreation to differing degrees, depending on their quantity and the proposed use.

Steep and very steep slopes are limiting factors for most facilities disregarding other soil properties (scenic trails and paths being an exception). Intensive recreational areas should have sanitary facilities. Poorly drained, slowly permeable and shallow soils have severe limitations for septic tank waste disposal. Level or nearly level soil of sandy loam or loam texture, well drained, stone and gravel free are well suited for most recreational uses (and agricultural uses!).

Interpretations for recreational uses are shown in Table 8. Soils were rated for different recreational purposes into one of three basic groupings according to limitations imposed by the soil and terrain features as listed in the last column of the table. Limitations and ratings are based on soil properties, without considering other aspects such as aesthetic and economic values, vicinity of lakes, and proximity to population centres. The criteria used to establish the limitations for the interpretations in Table 8 are found in Montgomery and Edminster (1966).

The ability of a soil to produce and maintain vegetation, closely connected with soil fertility, is important in maintaining the environmental character of recreational sites. This capability is reflected in the Ecological Damage Hazard rating.

A description of the rating classes is as follows:

None indicates that the soil has no limitations for a particular use.

Slight soil limitations indicate that the soil is suitable for a particular use or that limitations such as slight stoniness or gentle slopes can be easily overcome.

Moderate soil limitations indicate that the soil can be used satisfactorily for a particular purpose with correct planning and good management. The main limitations include: somewhat poor drainage, moderately steep slopes, silty or sandy texture, stoniness, somewhat high or intermittent water tables, restricted soil depth, occasional flooding, seepage or ponding, moderately slow permeability.

Severe soil limitations effectively exclude use of the soil for the stated purpose. In certain cases a particular limitation can be overcome, but often only with major reclamation work. Severe limitations include: steep or very steep slopes, high water tables, poor drainage, common or frequent flooding, serious ponding and seepage, unfavorable texture (loose sand, clay), excessive stoniness and rockiness, shallow depth, very slow permeability and organic deposits.

A detailed soil survey would be necessary for the precise placement of soils in recreational classes. A reconnaissance soil survey, such as that conducted in the Prince George - McLeod Lake map area, is less reliable but still provides a good foundation for generally locating and planning recreational facilities. Tables 9 and 10 indicate the limitations of the soil associations for various recreational uses.

Plate 17. Terraces along the Nechako River on which Nechako soils have developed.

Table 9 Limitations of the Soils for Recreational Uses - Camp and Picnic Areas, Building and Cottage Sites, Paths and Trails, and Intensive Play Areas.

SOIL ASSOCIATION		SOIL LIMITATIONS			
NAME	COMPONENT SYMBOL(S)	CAMP & PICNIC AREAS	BUILDING AND COTTAGING SITES	PATHS AND TRAILS	INTENSIVE PLAY AREAS
Alix	AX1-3	none to slight	none	none to moderate	moderate
Averil	AL1,2	severe	severe	moderate	severe
Barrett	BA1-4	moderate	moderate	none to slight	moderate to severe
Bear Lake	BE	slight to moderate	none	none to moderate	moderate
Bearpaw Ridge	BR	severe	severe	moderate to severe	severe
Bednesti	B1-4	moderate	moderate to severe	moderate	moderate to severe
Berman	BN1,2	moderate	moderate	moderate	moderate to severe
	BN5	severe	severe	severe	severe
Bowron	BO1-4	severe	severe	severe	severe
	BO5	severe	severe	severe	severe
Captain Creek	CT	severe	severe	moderate to severe	severe
Chief	CF1, 2	severe	severe	severe	severe
Cluculz	CZ	severe	severe	moderate	severe
Cobb	CB1, 2	moderate	moderate to slight	none to slight	severe
Crystal	CR1-3	moderate	moderate to slight	none to slight	severe
Decker	DR1, 2	severe	severe	moderate	severe
Deserters	D1-5	moderate	moderate	none to slight	moderate to severe
	D6	moderate	severe	moderate	severe
Dezaiko	DZ	severe	severe	moderate to severe	severe
Dominion	DO1-4	moderate	moderate	none to slight	moderate to severe
	DO5	moderate	severe	moderate	severe

Table 9 (Cont'd)

SOIL ASSOCIATION		SOIL LIMITATIONS			
NAME	COMPONENT SYMBOL(S)	CAMP & PICNIC AREAS	BUILDING AND COTTAGING SITES	PATHS AND TRAILS	INTENSIVE PLAY AREAS
Dragon	DN1, 2	severe	severe	moderate	severe
Dunkley	DU1-4	moderate	moderate	none to moderate	moderate to severe
	DU5	moderate	severe	moderate	severe
Eena	E1-4	slight to moderate	none	none to moderate	moderate
Fontaniko	FN	slight to moderate	slight to moderate	slight to moderate	moderate
Fort St. James	FJ	severe	severe	severe	severe
Fraser	F1, 2	moderate to slight	slight to moderate	moderate to slight	moderate
Giscome	GI1, 2	none to slight	none	none to moderate	moderate
Gunniza	GU	moderate	slight	moderate	severe
Kluk	KK1, 2	moderate	slight	moderate	severe
Knewstubb	KB	moderate	moderate to severe	moderate	moderate to severe
Lanezi	LZ2, 4	moderate	moderate	none to slight	moderate to severe
Mapes	MS	slight to moderate	none	none to moderate	moderate
McGregor	MG1, 2	moderate to slight	moderate to slight	moderate to slight	moderate to slight
	MG3, 4	severe	severe	severe	severe
Moxley	MO1, 2	severe	severe	severe	severe
Nechako	N1, 2	moderate to slight	slight	moderate to slight	moderate
Oona	ON1, 2	severe	severe	moderate	severe
Ormond	OD3, 4	severe	severe	moderate	severe
Peta	PA1, 2	slight to moderate	none	none to moderate	moderate

Table 9 (Cont'd)

SOIL ASSOCIATION		SOIL LIMITATIONS			
NAME	COMPONENT SYMBOL(S)	CAMP & PICNIC AREAS	BUILDING AND COTTAGING SITES	PATHS AND TRAILS	INTENSIVE PLAY AREAS
Pineview	P1-4, 6, 7	severe	severe	severe	severe
	P5	severe	severe	severe	severe
Pope	PP	severe	severe	moderate	severe
Ramsey	R1, 2	none to slight	none	none to moderate	moderate
Roaring	RG1-3	moderate to severe	moderate	moderate	moderate to severe
Saunders	SD1	moderate to severe	moderate to severe	moderate to severe	severe
	SD2, 3	severe	severe	severe	severe
Saxton	S	slight to moderate	none	none to moderate	moderate
Seebach	SB	slight to moderate	none	none to moderate	moderate
Skins	SK1	severe	severe	moderate to severe	severe
Spakwaniko	SW	severe	severe	severe	severe
Stellako	SL1, 3	moderate	moderate to severe	moderate	moderate
	SL2, 4	severe	severe	severe	severe
Tabor Lake	TR	slight to moderate	slight to moderate	slight to moderate	moderate
Toneko	TO1, 2	slight to moderate	none	none to moderate	moderate
Torpy River	TP	moderate to severe	moderate to severe	none to moderate	severe
Twain	TW1-5, 7	moderate to severe	moderate to severe	none to moderate	severe
	TW6	severe	severe	severe	severe
Vanderhoof	V1, 2	moderate	moderate to severe	moderate	moderate to severe
Wendle	WD1	severe	severe	moderate	severe

Table 10 Limitations of the Soils for Recreational Uses - Ecological Damage Hazard, and Soil Features Affecting Use.

SOIL ASSOCIATION		ECOLOGICAL DAMAGE HAZARD	SOIL FEATURES AFFECTING USE
NAME	COMPONENT SYMBOL(S)		
Alix	AX1-3	moderate	rapid permeability, gravelly coarse textures, gently sloping
Averil	AL1,2	moderate	shallow soil depth, rock outcrops, very steep topography
Barrett	BA1-4	slight	slow permeability, medium textures, rolling to hilly topography
Bear Lake	BE	moderate	rapid permeability, coarse textures, dusty when dry, subject to wind erosion, gently sloping
Bearpaw Ridge	BR	moderate to severe	shallow soil depth, rock outcrops, very steep and steep topography
Bednesti	B1-4	moderate	moderate permeability, slippery and sticky when wet, inclusions of adverse topography
Berman	BN1,2	moderate	moderate permeability, slippery and sticky when wet, inclusions of adverse topography
	BN5	moderate	poor drainage, high water tables
Bowron	BO1-4	moderate	very slow permeability, very sticky and slippery when wet, fine to very fine textures
	BO5	moderate	as for BO1-4, plus high water tables, shallow organic surfaces
Captain Creek	CT	moderate to severe	shallow soil depth, rock outcrops, very steep and steep topography
Chief	CF1, 2	severe	very poorly drained, high water tables, organic soils
Cluculz	CZ	moderate	shallow soil depth, rock outcrops, very steep and steep topography
Cobb	CB1, 2	slight	well to rapidly drained, moderate to rapid permeability, gravelly coarse textures, generally stony, variable topography
Crystal	CR1-3	slight	well to rapidly drained, moderate to rapid permeability, gravelly coarse textures, generally stony, variable topography

Table 10 (Cont'd)

SOIL ASSOCIATION		ECOLOGICAL DAMAGE HAZARD	SOIL FEATURES AFFECTING USE
NAME	COMPONENT SYMBOL(S)		
Decker	DR1, 2	moderate	shallow soil depth, rock outcrops, very steep and steep topography
Deserters	D1-5	slight	slow permeability, medium texture, rolling to hilly topography
	D6	moderate	as for D1-5, with seasonally high water tables
Dezaiko	DZ	moderate to severe	shallow soil depth, rock outcrops, very steep and steep topography
Dominion	DO1-4	slight to severe	slow permeability, medium textures, rolling to hilly topography
	DO5	moderate	as for DO1-4, with seasonally high water tables
Dragon	DN1, 2	moderate	shallow soil depth, rock outcrops, very steep and steep topography
Dunkley	DU1-4	slight	slow permeability, medium textures, rolling to hilly topography
	DU5	moderate	as for DU1-4, with seasonally high water tables
Eena	E1-4	moderate	rapid permeability, coarse textures, dusty and subject to wind erosion when dry, inclusions of adverse topography
Fontaniko	FN	moderate	variable permeability, gravelly coarse textures, high water tables on fan aprons, gently sloping
Fort St. James	FJ	moderate	very slow permeability, very sticky and slippery when wet, very fine textures
Fraser	F1, 2	moderate	moderate permeability, slippery and sticky when wet, gently sloping
Giscome	GI1, 2	moderate	rapid permeability, gravelly coarse textures, gently sloping
Gunniza	GU	moderate	rapid permeability, gravelly coarse textures, gently rolling to hilly topography

Table 10 (Cont'd)

SOIL ASSOCIATION		ECOLOGICAL DAMAGE HAZARD	SOIL FEATURES AFFECTING USE
NAME	COMPONENT SYMBOL(S)		
Kluk	KK1, 2	moderate	rapid permeability, gravelly coarse textures, gently to moderately rolling topography
Knewstubb	KB	moderate	moderate permeability, slippery and sticky when wet, inclusions of variable topography
Lanezi	LZ2, 4	slight	slow permeability, medium textures, rolling to hilly topography
Mapes	MS	moderate	rapid permeability, coarse textures, dusty and subject to wind erosion when dry, gently sloping to rolling topography
McGregor	MG1, 2	moderate	variable permeability, high water tables and flooding associated with spring run-off
	MG3, 4	moderate	variable permeability, prolonged high water tables and flooding during spring run-off
Moxley	MO1, 2	severe	very poorly drained, high water tables, organic soils
Nechako	N1, 2	moderate	moderate permeability, slippery and sticky when wet, gentle topography
Oona	ON1, 2	moderate	shallow soil depth, rock outcrops, very steep and steep topography
Ormond	OD3, 4	moderate	shallow soil depth, rock outcrops, very steep and steep topography
Peta	PA1, 2	moderate	rapid permeability, coarse textures, dusty and subject to wind erosion when dry, gently sloping
Pineview	P1-4, 6, 7	severe	very slow permeability, very sticky and slippery when wet, very fine textures
	P5	moderate	as for P1-4, plus high water tables, shallow organic surfaces
Pope	PP	moderate	shallow soil depth, rock outcrops, very steep and steep topography
Ramsey	R1, 2	moderate	rapid permeability, gravelly coarse textures, gently sloping

Table 10 (Cont'd)

SOIL ASSOCIATION NAME	COMPONENT SYMBOL(S)	ECOLOGICAL DAMAGE HAZARD	SOIL FEATURES AFFECTING USE
Roaring	RG1-3	moderate	rapid permeability, gravelly coarse textures, very steep and steep topography
Saunders	SD1	moderate	slow permeability, medium texture, steeply to extremely sloping topography
	SD2, 3	moderate	as for SD1, plus high water tables, poor drainage
Saxton	S	moderate	rapid permeability, coarse textures, dusty and subject to wind erosion when dry, gently sloping
Seebach	SB	moderate	rapid permeability, coarse textures, gently sloping
Skins	SK1	moderate to severe	shallow soil depth, rock outcrops, very steep and steep topography
Spakwaniko	SW	moderate	high water tables, poor drainge, shallow organic surfaces in places
Stellako	SL1, 3	moderate	variable permeability, high water tables and flooding associated with spring run-off
	SL2, 4	moderate	high water tables, subject to flooding and ponding, poor drainage, shallow organic surfaces in places
Tabor Lake	TR	moderate	variable permeability, gravelly coarse textures, high water tables on fan aprons, gently sloping
Toneko	TO1, 2	moderate	rapid permeability, coarse textures, gently sloping
Torpy River	TP	slight	slow permeability, medium textures, strongly to very steeply sloping topography
Twain	TW1-5, 7	slight	slow permeability, medium textures, rolling, hilly and steeply sloping topography
	TW6	moderate	slow permeability, poor drainage, high water tables
Vanderhoof	V1, 2	moderate	slow permeability, very sticky and slippery when wet, fine textures
Wendle	WD1	moderate	shallow soil depth, rock outcrops, hilly and strongly to very steeply sloping topography

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GLOSSARY

ablation (glacial) till - Materials deposited directly from melting glacier ice.

acid soil - A soil having a pH of less than 7.0.

aeolian deposits - Material carried and laid down by wind.

alluvium - A general term for all deposits of modern rivers and streams.

association, soil - A sequence of soils of about the same age, derived from similar parent material, and occurring under similar climatic conditions but having different characteristics due to variations in relief and drainage.

available nutrient - That portion of any element or compound in the soil that can be readily absorbed and assimilated by growing plants.

available water (soil moisture) - The portion of water in a soil that can be readily absorbed by plant roots, generally considered to be that water held in the soil up to approximately 15 bars tension.

basal till - Compact, unsorted and unstratified materials deposited by glaciers at the base of the ice.

bedrock - The solid rock underlying soils and the regolith, or exposed at the surface.

bisequa - Two sequa in one soil; that is, two sequences of eluvial horizons and their related illuvial horizons.

bog - An aera covered or filled with peat materials; water table is generally high and the bog surface is generally slightly elevated. The peat materials are generally of moss or ericaceous origin.

boulders - Stones larger than 24" in diameter.

calcareous soil - Soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce visibly when treated with cold 0.1N hydrochloric acid.

capability class (soil) - A rating that indicates the general capability of a soil for some specified use.

capability subclass (soil) - A grouping of soils with similar kinds of limitations and hazards.

cation exchange capacity - The sum of total exchangeable cations that a soil can absorb. Expressed in millequivalents per 100 grams of soil.

cemented (indurated) - Having a hard, brittle consistency because the particles are held together by cementing substances such as humus, calcium carbonate, or the oxides of silicon, iron, and aluminum. The hardness and brittleness persist even when wet.

classification, soil - The systematic arrangement of soils into categories and classes on the basis of general characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties.

clay - As a soil separate, the mineral soil particle les than 0.002 mm in diameter; usually consisting largely of clay minerals. As a soil textured class, soil materials that contain 40 or more percent clay, less than 45% sand and less than 40% silt.

climax - A plant community of the most advanced type capable of development under, and in dynamic equilibrium with, the prevailing environment.

coarse fragments - Rock or mineral particles more than 2 mm in diameter.

cobbles - Rock fragments 3 to 10" in diameter.

colluvium - Deposits of rock fragments and soil material deposited on and at the base of slopes as a result of gravitational action.

colour - Soil colours are compared with a Munsell colour chart. The Munsell system specifies the relative degrees of the three simple variables in colour; hue, value and chroma.

compaction - The packing together of soil particles by external forces resulting in increased soil density.

complex (soil) - A mapping unit used in detailed and reconnaissance soil surveys where two or more defined soil units are so intimately intermixed geographically that it is impractical, because of the scale used, to separately delineate them.

consistence (soil) - The property of soil materials that related to the degree and kind of cohesion and adhesion, or their resistance to separation or deformation. It is described in terms such as loose, soft, friable, firm, hard, sticky, plastic, or cemented.

creep - Slow, continuous downslope movement of soil and soil material, usually on relatively steep slopes, primarily under the influence of gravity, but facilitated by saturation with water and alternative freezing and thawing.

crevasse fillings - Ridges or hummocks formed from glacial sediments deposited by water in the cracks and crevasses of glacial ice.

crust - A surface layer on soils, ranging in thickness from a few millimeters to perhaps as much as an inch, that is much more compact, hard and brittle, when dry, than the material immediately beneath it.

degradation - The changing of soil to a more highly leached and more highly weathered condition, usually accompanied by morphological changes such as the development of an eluviated, light coloured (Ae) horizon.

delta - A fan shaped, fluvial or glaciofluvial deposit occurring at the mount of a stream as it enters a lake or ocean.

deposit - Material deposited in a new position by transporting agents such as water, wind, ice, gravity, or by activity of man.

drainage (soils) - (1) The rapidity and extent of the removal of water from the soil by runoff and flow through the soil. (2) As a condition of the soil, it refers to the frequency and duration of period when the soil is free of saturation.

The soil drainage classes used in this report are defined as follows:

Rapidly drained - The soil moisture content seldom exceeds field capacity in any horizon except immediately after water additions.

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

Moderately well drained - Soil moisture in excess of field capacity remains for a small but significant period of the year.

Imperfectly drained - Soil moisture in excess of field capacity remains in subsurface horizons for moderately long period during the year.

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

Very poorly drained - Free water remains at or within 12" of the surface most of the year.

drumlin - An elongated or oval hill composed of glacial till, with its long axis parallel to the direction of ice movement.

dryland farming - The practice of crop production in low rainfall areas without irrigation.

dunes - Wind deposited ridges, mounds and hills of fine to medium sand.

eluvial horizon - A soil horizon that has been formed by the process of eluviation.

eluviation - The removal of soil material in suspension or in solution from a layer of soil.

erosion - The wearing away of the land surface by running water, wind, ice or other geological agents.

esker - A sinuous ridge of irregularly stratified sand, gravel and cobbles deposited under glacial ice by a rapidly flowing glacial stream.

evapotranspiration - The combined loss of water from a given area, and during a specific period of time, by evaporation from the soil surface and transpiration from plants.

fan - A gently to steeply sloping, fan-like landform occurring where a stream runs onto a level plain or meets a slower stream.

fertility, soil - The status of a soil with respect to the amount and availability to plants of elements necessary for plant growth.

floodplain - The land bordering a stream, built up of sediments from overflow of the stream and subject to inundation when the stream is at flood stage.

fluted - Level to gently irregular topography (0-25% slope) marked by shallow, straight, parallel troughs.

frost action - Freezing and thawing of moisture in mateirals and the resultant effects on these materials and on structures of which they are a part, or with which they are in contact.

frost-free period - The average number of days between the last spring temperature of 32°F and the first fall temperature of 32°F.

fluvial deposits - Materials laid down by recent streams and rivers.

genetic - Resulting or produced by soil-forming processes.

glacial till - Unsorted and unstratified materials deposited by glacial ice.

glaciofluvial deposits - Materials moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice.

gleyed (soil) - An imperfectly or poorly drained soil in which the material has been modified by reduction or alternating reduction and oxidation. These soils have lower chromas and/or more prominent mottling in some horizons that the associated well drained soils.

gravel - Rock fragments 2 mm to 3" in diameter.

ground water - Water in the soil beneath the soil surface, usually under conditions where the pressure is greater than atmospheric pressure and the voids are completely filled. Also water that is passing through or standing in the soil and in the underlying strata.

growing degree-days - The number of cumulative degrees above 42°F during the growing season.

horizon (soil) - A layer in the soil profile approximately parallel to the land surface with more or less well defined characteristics that have been produced through the operation of soil forming processes.

Organic horizons - May be found at the surface of mineral soils or at any depth beneath the surface in buried soils, or overlying geologic deposits. They contain more than 30 percent organic matter (17% organic carbon). Two groups of these layers are recognized:

O - An organic layer or layers developed under poorly drained conditions, or under conditions of being saturated most of the year, or on wet soils that have been artificially drained. The degree of decomposition is indicated by the suffixes f (poorly decomposed), m (partially decomposed) and h (well decomposed).

L,F,H - These are organic layers developed under imperfectly to well drained conditions. The original structures are easily discernible in the L layer, partially decomposed in the F layer and highly decomposed in the H layer.

Master mineral horizons and layers - Mineral horizons are those that contain less organic matter than that specified for organic horizons.

A - A mineral horizon or horizons formed at or near the surface in the zone of removal of materials in solution and suspension, and/or of maximum accumulation or organic matter. Included are: (1) horizons in which organic matter has accumulated as a result of biologic activity (Ah); (2) horizons that have been eluviated of clay, iron, aluminum, and/or organic matter (Ae); (3) horizons having characteristics of (1) and (2) above but transitional to underlying B or C (AB or A and B); (4) horizons markedly disturbed by cultivation (Ap).

B - A mineral horizon or horizons characterized by one or more of the following: (1) an enrichment in silicate clay, iron, aluminum or humus, alone or in combination (Bt, Bf, Bfh, Bhf, and Bh); (2) a prismatic or columnar structure that exhibits pronounced coatings or stainings and significant amounts of exchangeable sodium (Bn); (3) an alteration by hydrolysis, reduction or oxidation to give a change in colour or structure from horizons above and/or below, and so does not meet the requirements of (1) and (2) above (Bm, Bng).

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

R - Underlying consolidated bedrock, such as granite, sandstone, limestone, etc. The boundary between the R layer and any overlying unconsolidated material is called a lithic contact.

hummocky - A hilly, uneven landscape resulting from deep seated soil movement.

illuvial horizon - A soil layer or horizon in which material carried from an overlying layer has been precipitated from solution or deposited from suspension. It is the layer of accumulation of silicate clay, iron and aluminum hydrous oxides, and/or organic matter.

igneous rock - Rock formed by solidification of hot, mobile material (magma); if it solidifies at depth, cooling is slow and large crystals can form (intrusive or plutonic rock); volcanic or extrusive rock cools quickly at the surface of the eart, large crystals do not have time to grow, and the rock is fine-grained.

inclusions, map - Soil types within a mapping unit which are not extensive enough to be mapped separately or as part of a soil complex.

irrigation - The artificial application of water to the soil for the benefit of growing crops.

kame - An irregular ridge or hill composed of stratified glacial deposits. They formed where stream sediments were deposited in depressions on the glacier surface, after which the ice melted.

kettle - A small hollow or depression formed in glacial deposits where outwash was deposited around a residual block of glacier ice that later melted.

lacustrine deposits - Material deposited in lakes and later exposed either by lowering of the water level or by uplifting of the land.

landform - Structural configuration of the topography as a result of past and present geological activity. Defined in terms of size, shape, and slope patter; the subsurface materials of which they are composed; and their mode of origin.

leaching - The removal of materials in solution from the soil. See eluviation.

liquid limit (upper plastic limit) - (1) The water content corresponding to an arbitrary limit between the liquid and plastic states of consistency of a soil. (2) The water content at which a pat of soil, cut by a groove of standard dimensions, will flow together for a distance of 12 mm under the impact of 25 blows in a standard liquid limit apparatus.

loess - Material transported and deposited by wind and consisting of predominantly silt-sized particles.

mapping unit - Any delineated area shown on a soil map that is identified by a symbol, letter, or number.

mean annual increment - The total yield (volume) of a forest stand divided by the age of the stand.

meltwater channel - A channel formed by streams (or rivers) flowing from and alongside glaciers. They are typically steep-sided and flat-bottomed and often appear oversized for the present stream which occupies them.

metamorphic rock - Rocks which have formed in the solid state by modification of pre-existing rocks in response to pronounced changes of temperature, pressure and chemical environment, usually deep within the earth's crust; examples include quartzite, slate, schist, phyllite.

mottles (soil) - Spots or blotches of different colour or shades of colour interspersed with the dominant colour of the soil. They are described in order of abundance (few, common, many), size (fine, medium, coarse) and contrast (faint, distinct, prominent). Mottling in soils indicates poor aeration and lack of good drainage.

outwash - Sediments "washed out" by flowing water beyond the glacier and laid down in thin foreset beds. Particle size may range from boulders to silt.

parent material - The unconsolidated and more or less chemically unweathered mineral or organic matter from which the solum of a soil is developed by pedogenic processes.

pedology - Those aspects of soil science involving the constitution, distribution, genesis and classification of soils.

percolation, soil water - The downward movement of water through the soil.

permeability - The ease with which water and air pass through a bulk mass of soil or a layer of soil. Classes are rapid, moderate and slow.

pH, soil - The negative logarithm of the hydrogen-ion activity, indicating the intensity of acidity or alkalinity of a soil.

physiography - The description of topography and relief, bedrock type and structure, geological history, and surficial materials.

plastic limit - (1) The water content corresponding to an arbitrary limit between the plastic and the semi-solid states. (2) Water content at which a soil will just begin to crumble when rolled into a thread approximately 3 mm in diameter.

plasticity index - The numerical difference between the liquid and the plastic limit. The plasticity index gives the range of moisture contents within which a soil exhibits plastic properties.

porosity - The total volume of pore space present in a given volume of materials; it is a measure of the amount of water that can be held in storage.

profile, soil - A vertical section of the soil through all its horizons and extending into the parent material.

reaction, soil - The degree of acidity or alkalinity of a soil, usually expressed as a pH value. Descriptive terms commonly associated with certain ranges in pH are: extremely acid, <4.5; very strongly acid, 4.5 - 5.0; strongly acid, 5.1 - 5.5; moderately acid, 5.6 - 6.0; slightly acid, 6.1 - 6.5; neutral, 6.6 - 7.3: slightly alkaline, 7.3 - 7.8; moderately alkaline, 7.9 - 8.4; strongly alkaline, 8.5 - 9.1; and very strongly alkaline, >9.1.

relief - The difference in elevations or irregularities of the land surface when considered collectively.

sand - (1) A soil particle between 0.05 and 2.0 mm in diameter. (2) The textural class name for any soil containing 87% or more sand and not more than 10% clay.

sedimentary rock - Rocks formed by accumulation and cementation of sediment that has been moved by water, air or ice, or precipitated from solution; characterized by layered structure known as bedding or stratification. Examples: conglomerate, shale, limestone.

seepage - (1) The escape of water downward through the soil. (2) The emergence of water from the soil along an extensive line of surface in contrast to a spring where the water emerges from a local spot.

shrink-swell potential - That quality of a soil that determines its volume change with moisture content. The volume change of a soil is influenced by the amount of moisture change and by the amount and type of clay.

silt - (1) A soil separate consisting of particles between 0.05 and 0.002 mm in equivalent diameter. (2) Soils of the silt textured class contain at least 80% silt and less than 12% clay.

soil - The unconsolidated mineral material on the immediate surface of the eart that serves as a natural medium for the growth of land plants. Soil has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including moisture and temperature effects), macro-and microorganisms, and topography, all acting over a period of time.

soil genesis - The mode of origin of the soil with special reference to the processes or soil-forming factors responsible for the development of the solum, or true soil, from the unconsolidated parent material.

soil structure - The combination or arrangement of primary soil particles into secondary soil particles, units or peds, which are separated from adjoining aggregates by surfaces of weakness. Aggregates differ in grade (distinctness) of development. Grade is described as weak, moderate, and strong. The aggregates vary in class (size) and are described as fine, medium, coarse, and very coarse. The size classes vary according to the type (shape) of structure. The types of structure mentioned in this report are:

Granular - having more or less rounded aggregates without smooth faces and edges.

Platy - having thin, plate-like aggregates with faces mostly horizontal.

Blocky - having blocklike aggregates with sharp, angular corners.

Subangular blocky - having blocklike aggregates with rounded and flattened faces and rounded corners.

Where there is no observable aggregation or no definite orderly arrangement, two forms of a structureless condition may be recognized: amorphous (or massive) if the mass is coherent, single grained if the mass is incoherent.

By convention an aggregate is described in the order of grade, class, and type, e.g. strong, medium, blocky and moderate, coarse, granular. In the parent material of soils the material with structural shapes may be designated as pseudeblocky, pseudoplaty, etc. In stratified materials a bed is a unit layer distinctly separate from other layers and is one or more cm thick, but a lamina is a similar layer less than 1 cm thick.

soil survey - The systematic examination, description, classification, and mapping of soils in an area.

soil texture - The relative proportions of the various soil separates in a soil as described by the classes of soil textures.

For convenience, soil textures are grouped together into five classes as follows:

Very coarse textured - sand, loamy sand
Moderately coarse textured - sandy loam, fine sandy loam
Medium textured - loam, silt loam, silt
Moderately fine textured - clay loam, silty clay loam, sandy clay loam
Fine textured - sandy clay, silty clay, clay
Very fine textured - heavy clay (more than 60% clay)

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

stoniness (classes) - The classes of stoniness are defined as follows:

Slightly stony land - There are some stones, but they offer only slight or no hindrance to cultivation.

Moderately stony land - There are enough stones to cause some interference with cultivation.

Very stony land - There are enough stones to constitute a serious handicap to cultivation and some clearing is required.

Exceedingly stony land - There are enough stones to prevent cultivation until considerable clearing is done.

Excessively stony land - This land is too stony to permit any cultivation (boulder or stone pavement).

terrace - A level, usually narrow plain bordering a river, lake, or the sea. Rivers sometimes are bordered by a number of terraces at different levels.

till - See glacial till.

topography - The shape of the soil surface such as hills, mountains or plateaus. The soil slopes may be smooth or irregular. The slope classes used in this report are defined as follows:

Simple topography Single slopes (smooth surface)		Complex topography Multiple slopes (irregular surface)		% Slope
A	depressional to level	a	nearly level	0 to 0.5
B	very gently sloping	b	gently undulating	0.5+ to 2
C	gently sloping	c	undulating	2+ to 5
D	moderately sloping	d	gently rolling	5+ to 9
E	strongly sloping	e	moderately rolling	9+ to 15
F	steeply sloping	f	strongly rolling	15+ to 30
G	very steeply sloping	g	hilly	30+ to 60
H	extremely sloping	h	very hilly	over 60

varve - A distinct band representing the annual deposit in sedimentary materials regardless of origin. It usually consists of two layers, one thick, light coloured layer of silt and fine sand laid down in the spring and summer, and the other a thin, dark coloured layer of clay laid down in the fall and winter.

water-holding capacity - The ability of a soil to hold water. The water-holding capacity of sandy soils is usually considered to be low, while that of clayey soils is high. It is often expressed in inches of water per foot depth of soil.

water table - The upper limit of the part of the soil or underlying rock material that is wholly saturated with water.

weathering - The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric agents.

APPPENDIX A

LABORATORY ANALYSES

One to several representative soil profiles of most of the soil associations were sampled for laboratory analyses. The results of the analyses are not included in this report but are available from the B.C. Soil Information Systems, Surveys and Resource Mapping Branch, Ministry of Environment and Parks, Parliament Buildings, Victoria, British Columbia, V8V 1X5.

ANALYTICAL METHODS

pH measurements were made on 1:1 soil - water suspensions for mineral soils, and 1:5 soils - water suspensions for organic soils (8)*. pH was also determined using a 1:5 soils - 0.01M calcium chloride solution (7), modified by shaking one half hour instead of 5 days. An IL 245 pH meter and a combination electrode were used for all pH measurements.

Soil organic matter was determined by the wet combustion method as des:ribed by Grewelling and Peach (8).

Boron analyses were made following the method of Grewelling and Peach(8).

Total nitrogen was determined using the method described by Bremner (5).

Laverty's method (6) modified by John (6) was used to determine acid soluble and available phosphorus. Colour development was made following John's procedure.

Exchange capacity was determined using the method described for Peach et al (1). The ammonium acetate extract was analysed for exchangeable cations using a Techtron AA4 atomic absorption spectrophotometer.

Oxalate-extractable iron and aluminum were determined using the method of McKeague and Day (3) and pyrophosphate-extractable iron and aluminum were determined following procedures described by McKeague (3).

Sulphur analyses were made following the procedure of Bardsley and Lancaster (9).

Manganese values were obtained by analysing the extract from 1:5 soil - 0.01M calcium chloride suspensions used for pH determination.

The perchloric-nitric acid digestion for copper and zinc were made following the procedure of Lundbald (2) and analyses were made using a Techtron AA4 atomic absorption spectrophotometer.

References for Chemical Analyses

(1) Cation Exchange Capacity and Exchangeable Cations
Peach, M., L.T. Alexander, L.A. Dean, and J.F. Reed. Methods of soil analysis for soil fertility investigation. U.S.D.A., Circular No. 757, Washington, B.C., 1957.

* References for methods of chemical analyses follow.

(2) Copper and Zinc

Lundblad, K.O., Svanberg, and P. Edman. Availability and fixation of copper in Swedish soils. Plant and Soil, Volume 1, No. 4, April, 1949.

(3) Iron and Aluminum

McKeague, J.A. and J.D. Day. Dithionite and oxalate-extractable Fe and Al as aids in differentiating various classes of soils. Canadian Journal of Soil Science, Volume 46, No. 1, pp. 13-22, 1966.

McKeague, J.A. An evaluation of 0.1M pyrophosphate and pryophosphte dithionite in comparison with oxalate as extractants of the accumulation products in Podzols and some other soils. Canadian Journal of Soil Science, Volume 47, No. 1, pp. 95-99, 1967. Modified by analysing the extracts using a Techtron AA4 atomic absorption spectrophotometer.

Bascomb, C.L. Distribution of pyrophosphate extractable iron and organic carbon in soils of various groups. J. Soil Science, Volume 19, No. 2, pp. 251-268, 1958.

(4) Manganese

The centrifugate from the 1:5 soil - 0.01M $CaCl_2$ solution used for pH measurement was analyzed for manganese using the Techtron AA4 atomic absorption spectrophotometer.

(5) Nitrogen

Bremner, J.M. Determination of nitrogen in the soil by the Kjeldahl method. Journal of Agricultural Science, Volume 55, No. 1, 1960.

(6) Phosphorus

John, M.K. Soil Analysis procedure in use in Kelowna for determination of available phosphorus. British Columbia Department of Agriculture, Kelowna, B.C., 1963.

Colorimetric determination of phosphorous in soil and plant material with ascorbic acid. Soil Science, Volume 109, No. 4, pp. 214-220, 1970.

Laverty, J.C. The Illinois method (Bray No. 1) for determining available phosphorous in soils. University of Illinois, College of Agriculture, Department of Agronomy, Urbana, Illinois, 1961.

(7) pH soil: 0.01M $CaCl_2$

Clark, J.S. The extraction of exchangeable cations from soils. Canadian Journal of Soil Science, Volume 45, No. 3, pp. 322. 1965. Modified by shaking for one half hour.

(8) pH 1:1 and 1:5 Soil - Water Ratio, Organic Matter, Boron

Grewelling, Thomas and Michael Peach. Chemical soil tests. Cornell Experiment Station Bulletin 960. New York State College of Agriculture, Ithaca, New York.

(9) Sulphur

Bardsley, C.L. and D. Lancaster. Determinations of reserve sulphur and soluble sulphates in soils. Soil Science Society of America Proceedings. Volume 24, No. 4, 1960.

APPENDIX B

CLIMATIC DATA

Table B.1 Mean and Extreme Temperatures[2] for Long-term Stations Within or Near the Prince George - McLeod Lake Map Area.

Station	Elevation (ft.)	Mean Jan. °F	Mean Jan. °C	Mean July °F	Mean July °C	Mean Ann. °F	Mean Ann. °C	Extreme Min. °F	Extreme Min. °C	Extreme Max. °F	Extreme Max. °C
Ft. St. James	2250	8.7	-12.9	58.2	14.6	36.2	2.3	-57.0	-49.4	98.0	36.7
Vanderhoof	2093	10.6	-11.3	58.5	14.7	36.9	2.7	-61.0	-51.7	104.0	40.0
Pr. George A.	2218	10.7	-11.8	58.9	14.9	37.9	3.3	-58.0	-50.0	94.0	34.4
Aleza Lake	2050	9.6	-12.4	59.3	15.2	37.5	3.1	-54.0	-47.8	95.0	35.0
Quesnel A.	1787	11.6	-11.3	61.5	16.4	40.0	4.4	-52.0	-46.7	98.0	36.7

Table B.2 Average Precipitation, Growing Degree-Days and Frost-Free Period for Long-term Stations Within or Near the Prince George - McLeod Lake Map Area.

Station	May-Sept Rainfall (in.)	Annual Rainfall (in.)	Annual Snowfall (in.)	Total ppt. (in.)	Growing[2] Degree-Days	Frost-Free Period	Last Spring Frost[3]	First Fall Frost[3]
Ft. St. James	8.52	11.21	73.1	18.52	1769	73	June 14	Aug. 27
Vanderhoof	7.72	10.75	72.2	17.97	1835	52	June 23	Aug. 15
Pr. George A.	11.20	15.24	91.9	24.43	1930	78	June 10	Aug. 28
Aleza Lake	13.23	21.91	147.4	36.65	1935	88	June 8	Sept 5
Quesnel A.	10.19	13.72	75.9	21.31	2350	99	June 4	Sept 12

1 Temperature and Precipitation, 1941-70, British Columbia, Atmospheric Environment Service.

2 Climate and Data Services, E.L.U.C. Secretariat.

3 Frost Data, 1941-70. G.M. Hemmerick and G.R. Kendall. Atmospheric Environment - Environment Canada. ODC: 551.524.37(71).

APPENDIX C

AREA SUMMARIES

Table C.1 Area Summary (Acres) of the Soil Associations

Soil Association	Component Symbol	Acres			% of Map Area
		Pure Units*	Map Complexes**	Total	
Alix	AX1	1,881	13,764		
	AX2	2,722	700		
	AX3	6,712	4,624	30,403	0.8
Averil	AL1	1,472	76,959		
	AL2	-	3,872	82,303	2.3
Barrett	BA1	20,778	23,351		
	BA2	22,963	1,261		
	BA3	41,208	11,028		
	BA4	78,431	24,719	223,739	6.2
Bear Lake	BE	2,947	-	2,947	<0.1
Bednesti	B1	12,539	26,114		
	B2	7,861	8,335		
	B3	-	2,384		
	B4	11,632	16,612	85,477	2.4
Berman	BN1	20,621	36,334		
	BN2	11,168	23,646		
	BN5	-	268	92,037	2.6
Bowron	BO1	-	2,152		
	BO2	2,796	-		
	BO3	-	24,764		
	BO4	-	9,296		
	BO5	848	800	40,656	1.1
Bearpaw Ridge	BR	1,432	27,684	29,116	0.8
Captain Creek	CT	584	6,040	6,624	0.2
Chief	CF1	14,644	21,734		
	CF2	4,354	4,394	45,126	1.3

* Map areas which consist only of the indicated soil association component.

** Map areas which consist of 2 or 3 soil association components but are dominated by the indicated soil association component.

Table C.1 (Continued)

Soil Association	Component Symbol	Acres			% of Map Area
		Pure Units*	Map Complexes**	Total	
Cluculz	CZ	960	18,911	19,871	0.6
Cobb	CB1	32,203	-		
	CB2	5,642	23,695	61,540	1.7
Crystal	CR1	-	1,436		
	CR2	3,148	59,626		
	CR3	21,124	47,900	133,234	3.7
Decker	DR1	4,975	13,012		
	DR2	2,951	3,344	24,282	0.7
Deserters	D1	39,052	34,736		
	D2	596,707	114,558		
	D3	41,825	10,296		
	D4	121,284	10,724		
	D5	23,620	37,872		
	D6	-	832	1,031,508	28.5
Dezaiko	DZ	4,712	-	4,712	0.1
Dominion	DO1	1,634	1,314		
	DO2	131,645	119,574		
	DO3	-	780		
	DO4	-	5,520		
	DO5	640	-	262,907	7.3
Dunkley	DU1	76	1,068		
	DU2	12,512	7,600		
	DU3	1,200	12,028		
	DU4	-	11,756		
	DU5	-	9,796	56,036	1.6
Dragon	DN1	-	7,752		
	DN2	212	3,240	11,204	0.3
Eena	E1	1,004			
	D2	19,065	47,003	67,072	1.9
Fort St. James	FJ	21,595	-	21,595	0.6
Fraser	F1	9,280	1,600		
	F2	4,694	5,470	21,044	0.6

Table C.1 (Continued)

Soil Association	Component Symbol	Acres			% of Map Area
		Pure Units*	Map Complexes**	Total	
Fontaniko	FN	192	-	192	<0.1
Giscome	GI1	22,728	19,518		
	GI2	-	604	42,850	1.2
Gunniza	GU	21,105	16,732	37,837	1.1
Kluk	KK1	-	3,336		
	KK2	4,831	3,311	11,478	0.3
Lanezi	LZ2	-	5,288		
	LZ4	-	1,144	6,432	0.2
Mapes	MS	7,789	-	7,789	0.2
McGregor	MG1	3,520	296		
	MG2	12,467	4,307		
	MG3	6,060	1,004		
	MG4	-	232	27,886	0.8
Moxley	MO1	10,113	16,505		
	MO2	11,830	16,384	54,832	1.5
Nechako	N1	1,108	2,104		
	N2	1,587	3,100	7,899	0.2
Oona	ON1	252	3,711		
	ON2	1,528	4,368	9,859	0.6
Ormond	OD3	935	3,399		
	OD4	-	1,948	6,282	0.2
Peta	PA	3,749	3,711	7,460	0.2
Pineview	P1	18,868	26,637		
	P2	239,931	74,132		
	P3	55,724	36,564		
	P4	37,449	9,671		
	P5	6,725	20,319		
	P6	15,962	4,925		
	P7	2,252	1,871	551,040	15.2
Pope	PP	1,033	-	1,033	<0.1

Table C.1 (Continued)

Soil Association	Component Symbol	Acres			% of Map Area
		Pure Units*	Map Complexes**	Total	
Ramsey	R1	21,069	6,790		
	R2	992	32	28,883	0.8
Roaring	RG1	7,320	1,552		
	RG2	4,214	-		
	RG3	2,988	476	16,550	0.5
Saxton	S	5,548	3,556	9,104	0.3
Seebach	SB	2,068	-	2,068	<0.1
Saunders	SD3	-	1,280	1,280	<0.1
Skins	SK1	9,268	20,080	29,348	0.8
Stellako	SL1	14,976	10,483		
	SL2	20,417	17,947		
	SL4	2,148	2,508	68,479	1.9
Spakwaniko	SW	452	5,724	6,176	0.2
Toneko	TO1	564	2,968		
	TO2	532	1,484	5,548	0.2
Torpy River	TP	500	6,188	6,688	0.2
Tabor Lake	TR	2,088	492	2,580	<0.1
Twain	TW2	536	-		
	TW3	4,324	7,044		
	TW4	20,464	12,280		
	TW6	-	484		
	TW7	-	47,304	92,436	2.6
Vanderhoof	V1	12,001	17,358		
	V2	43,207	18,600	91,166	2.5
Wendle	WD1	432	5,052	5,484	0.2
Bluff Land Type	BF	22,188	-	22,188	0.6
Water (lakes, rivers, etc)	-	103,046		103,046	2.9
Total Map Area Acreage				3,617,326	

Table C.2 Area Summary (Acres) of the Soil Capability for Agriculture Classes

Class & Subclass	Acres: Single Class* Rating	Acres: Complex Class** Rating	Acres: Total	% of Map Area
2C	172	11,711	11,883	
Total Class 2	172	11,711	11,883	0.3
3C	3,160	15,165	18,325	
3M	3,629	23,232	26,861	
3T	-	476	476	
3X	3,536	13,168	16,704	
3W	892	380	1,272	
Total Class 3	11,217	52,421	63,638	1.8
4C	1,161	16,513	17,674	
4D	17,144	188,698	205,842	
4^{D}_{T}	1,041	-	1,041	
4M	1,052	14,868	15,920	
4T	3,740	96,551	100,291	
4^{T}_{D}	-	880	880	
4^{T}_{M}	-	1,704	1,704	
4W	132	2,488	2,620	
4X	2,631	3,568	6,199	
Total Class 4	26,901	325,270	352,171	9.7
5C	604	24,560	25,164	
5D	20,172	41,379	61,551	
5^{D}_{T}	528	18,505	19,033	
5^{D}_{W}	1,073	7,672	8,745	
5I	-	920	920	
5M	32,098	17,041	49,139	
5^{M}_{P}	7,289	33,895	41,184	
5^{P}_{M}	17,801	-	17,801	

* Map areas which consist only of the indicated capability class.

** Map areas which consist of 2 or 3 capability classes but are dominated by the indicated capability class.

Table C.2 (Continued)

Class & Subclass	Acres: Single Class Rating	Acres: Complex Class Rating	Acres: Total	% of Map Area
5P	1,206	6,056	7,262	
5^{M}_{T}	3,309	960	4,269	
5^{T}_{M}	2,558	21,493	24,051	
5T	20,921	162,696	183,617	
5^{T}_{D}	8,770	161,449	170,219	
5^{T}_{P}	17,924	12,263	30,187	
5^{P}_{T}	-	320	320	
5^{T}_{W}	96	740	836	
5X	25,161	31,080	56,241	
5W	3,508	3,964	7,472	
5^{W}_{D}	548	17,436	17,984	
Total Class 5	163,566	562,429	725,995	20.1
6T	5,100	76,674	81,774	
6^{T}_{P}	1,102	1,104	2,206	
6^{T}_{M}	2,876	51,585	54,461	
6^{T}_{R}	1,719	-	1,719	
6^{P}_{M}	3,344	-	3,344	
6I	4,090	1,224	5,314	
6^{I}_{M}	1,320	-	1,320	
6^{I}_{W}	4,277	4,741	9,018	
6W	2,823	1,915	4,738	
6^{W}_{I}	1,106	11,081	12,187	
Total Class 6	27,757	148,324	176,081	4.9
7T	37,279	28,517	65,796	
7^{T}_{C}	1 ,110,096	511,860	1,621,956	
7^{T}_{E}	2,246	8,244	10,490	

Table C.2 (Continued)

Class & Subclass	Acres: Single Class Rating	Acres: Complex Class Rating	Acres: Total	% of Map Area
7^{T}_{P}	16,395	16,584	32,979	
7^{T}_{M}	3,822	-	3,822	
7M	928	-	928	
7^{T}_{R}	182,524	-	182,524	
7^{R}_{T}	87,155	-	87,155	
7R	10,959	-	10,959	
7P	343	4,010	4,353	
7I	132	4,300	4,432	
7^{I}_{W}	4,337	-	4,337	
7W	5,143	3,487	8,630	
7^{W}_{I}	1,246	8,472	9,718	
Total Class 7	1,462,605	585,474	2,048,079	56.6
O (organic)	116,898	8,741	125,639	3.5
Water			113,840	3.1
Total Map Area Acreage			3,617,326	100.0