Soil Survey of the
PEMBERTON VALLEY
British Columbia

RAB Bulletin 16

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RESOURCE ANALYSIS BRANCH

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SOIL SURVEY OF THE PEMBERTON VALLEY, BRITISH COLUMBIA

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TABLE OF CONTENTS

Page

Page

Page

LIST OF FIGURES

Page

Page

LIST OF MAPS

LIST OF PLATES

LIST OF TABLES

SUMMARY

SUMMARY

The primary objective of the Pemberton Valley soil survey and report was to map at a scale of 1:20 000 and to describe, in detail, the soils and agricultural capability of the Lillooet River, Birkenhead River, Gates River, and Blackwater Creek valleys. Secondary objectives were to interpret the data for specified land uses.

Four major terrain types were identified in the study area. The primary type is composed predominantly of Lillooet River flood plain deposits which grade from gravels and sands near Meager Creek through sands and sandy loams to silt loams between Pemberton and Lillooet Lake. Where major tributaries enter the main valley, gravelly and sometimes bouldery fluvial fans of significant size have been deposited. Organic accumulations occur along the margins of the valley floor. A second terrain type, found in the Green River area and in the Birkenhead River, Poole Creek, Gates River valleys, is composed of bouldery to very bouldery, gravelly fluvial and colluvial fan deposits. These valleys also contain some bouldery, gravelly flood plain deposits and minor organic deposits as well as two large landslide deposits. The Blackwater Creek and Birkenhead Lake areas are predominantly composed of large colluvial fans which have formed by repeated avalanche activity. There are also minor morainal deposits and some large, bouldery, and gravelly fluvial fans associated with Phelix and Sockeye creeks. A fourth major terrain type is found in the Birkenhead River canyon area. This area is characterized by steep bedrock outcrops and associated talus slopes. On the upper slopes the materials are primarily morainal.

The soils exhibit characteristics which reflect the effects of climate and soil water regime as determined by relief and vegetation, which have been active since deposition. Cross-sectional and oblique diagrams illustrate the relative positions of the various soils in the landscape. Detailed morphological, chemical and physical data for some of the more important soil series are presented in the appendices. The upland soils of the Birkenhead River, Gates River, and Blackwater Creek valleys are predominantly well drained Orthic Eutric Brunisols. In the Gates Lake to Anderson Lake area many of the soils are Orthic Eutric Brunisol:calcareous phase due to the high calcium carbonate levels. Active avalanche areas and active talus accumulation areas tend to be well drained Orthic or Cumulic Regosols. Soils of the flood plains are mainly imperfectly drained Gleyed Regosols, or poorly to very poorly drained Rego or Rego Humic Gleysols with lesser amounts of poorly to very poorly drained Organic soils.

The soils of the Green River valley and the uplands near Pemberton are generally well drained Orthic Dystric Brunisols, except on the active talus slopes which are Orthic Regosols. Bedrock outcrops (non-soil areas) are also common.

The soils of the Lillooet River valley are predominantly poorly to very poorly drained Rego Gleysols:cumulic phase and Rego Gleysols and imperfectly drained Gleyed Regosols. There are also minor but significant areas of Orthic Regosols, Rego Gleysols:peaty phase, and Terric Fibrisols. In this particular section of the study area substantial changes in soil characteristics have been and are occurring as a result of the major diking, drainage and river training program initiated in 1946. As a result of river straightening and lowering of the level of Lillooet Lake, soil drainage has improved when compared to reports of Faulknor (1951) and Day (1946).

Maps derived from the soil maps include those showing the location and extent of the various land capability for agriculture ratings, soil textural classes, and soil drainage classes. The land capability for agriculture maps indicate that the best agricultural lands occur in the Lillooet River valley and are predominantly Classes 2, 3, or 4 with lesser areas of Classes 1, 5, 6, or 7. Conversely, in the Green River, Birkenhead River, Blackwater Creek, Gates River valleys and on the uplands, the lands are predominantly Classes 5, 6, or 7 with few areas of Classes 2, 3, or 4.

Interpretations of the soils data for selected engineering uses (settlement suitability) and outdoor recreational carrying capacity were compiled. These indicate that Yvonne series and Yantzie series soils on slopes of less than 9% are the most suitable for these uses. The other upland soils are limited by one or more factors including excessive soil perviousness, excessive slopes, stoniness, rockiness, shallowness to bedrock and mass movement hazard. On the other hand, soils in the valley bottoms are most often limited by shallow depths to the water table, potential flooding hazards, poor drainage, unsuitable soil textures and potential for ground water contamination.

Other interpretations can potentially be developed using the soils information in conjunction with other resource information. For example, improved recreational carrying capacity interpretations can be developed when recreation features, wildlife, vegetation and climate data collection is completed. Forest capability ratings can be derived with additional forest plot measurement and climatic data. Wildlife capability maps can be developed by combining the soils data with wildlife and vegetation inventory information.

HOW TO USE THIS SOIL SURVEY REPORT

HOW TO USE THIS SOIL SURVEY REPORT

1. Locate area of interest on index to map sheets (Fig. 1).
2. Note the number of the map sheet and turn to that sheet.
3. Locate your specific area of interest on the map sheet.
4. List the mapping symbols found in your area, and find the corresponding name in the map legend.
5. Turn to the "Table of Contents" which lists the names of each soil series and the page where that series is described.
6. See the "List of Tables" or the "Appendices" for additional data on a specific soil.

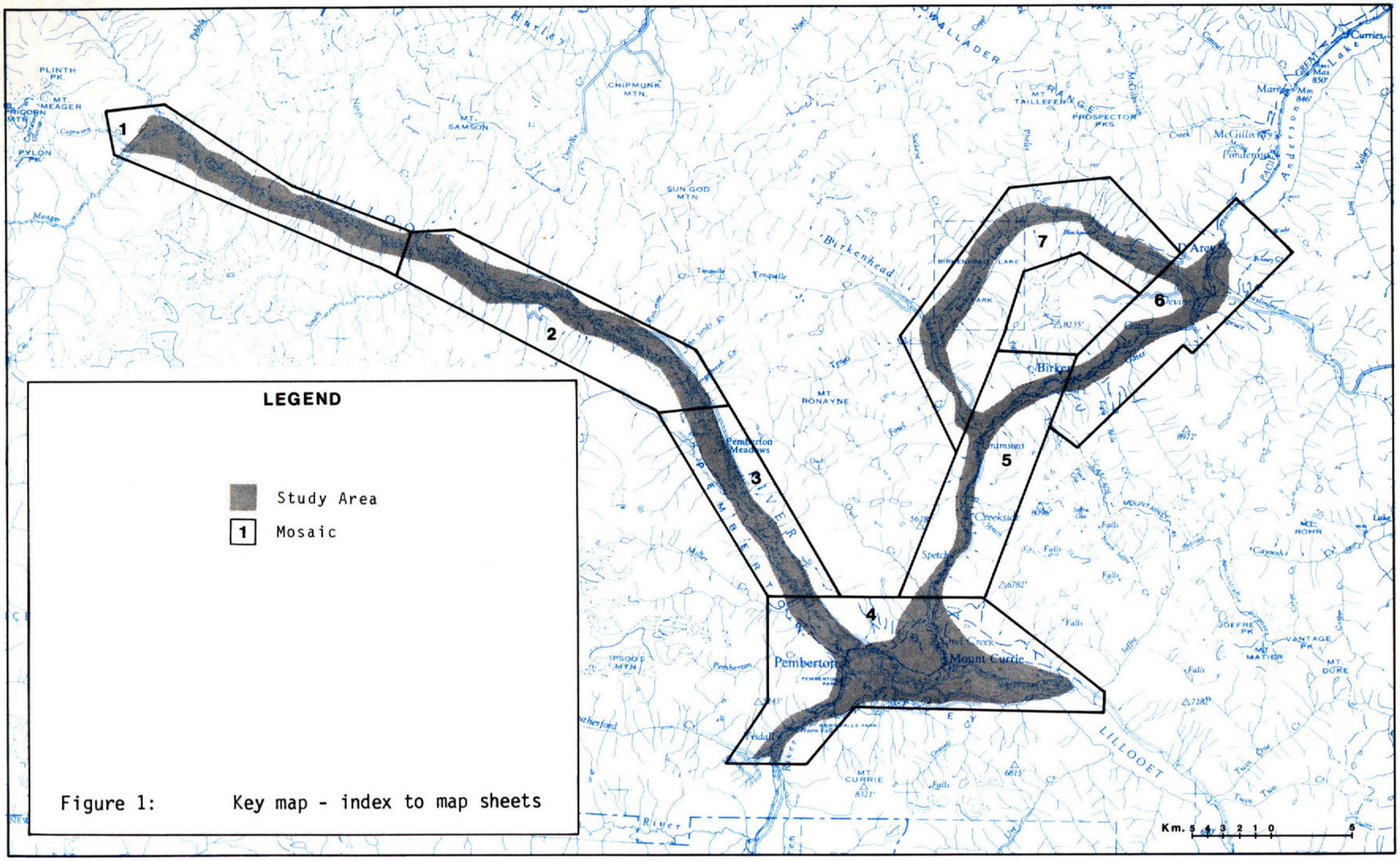


Figure 1: Key map - index to map sheets

chapter 1

INTRODUCTION

1 INTRODUCTION

The Resource Analysis Branch of the Ministry of Environment undertook during 1976-77 a detailed soil survey of the Pemberton Valley (Lillooet River Valley) at the request of the Ministry of Agriculture. Historically, development pressure has been toward agricultural use of the land in the valley bottom. The geographical isolation of this valley from other agricultural areas has enabled it to become the primary virus-free seed potato growing area within British Columbia. The Pemberton Valley and its tributary valleys also maintain highly productive first growth forests which are presently being harvested. Wildlife, fisheries and recreational values of the Pemberton Valley and its environs are also significant resources. Agricultural use of the valley has developed to such a point that, in order to improve productivity and maintain or increase economic returns to the farmer, further information about the physical environment is required.

1.1 Objectives

Objectives of the soil survey are:

1. To provide a detailed (1:20 000 scale) soil map of the Pemberton Valley.
2. To refine and redefine the existing land capability for agriculture ratings of the Pemberton Valley, from a map scale of 1:50 000 to a map scale of 1:20 000.
3. To develop interpretations of the capability and/or suitability of the soils for selected uses.
4. To provide soils information for uses other than agriculture and to identify further resource information which (if used in conjunction with the soils information) will complement the soil survey information.

1.2 Description of Study Area

The Pemberton Valley is located in the southwestern corner of British Columbia. It lies approximately 160 km* northeast of Vancouver, approximately 100 km northeast of Squamish and approximately 100 km* southwest of Lillooet (Fig. 2). The study area extends west and north from the north end of Lillooet Lake along the Lillöoet River valley to the junction with Meager Creek, which is approximately 80 km. Along the Birkenhead River it extends from the north end of Lillooet Lake

*metric units are used throughout this report, a conversion table is presented in Appendix 1.

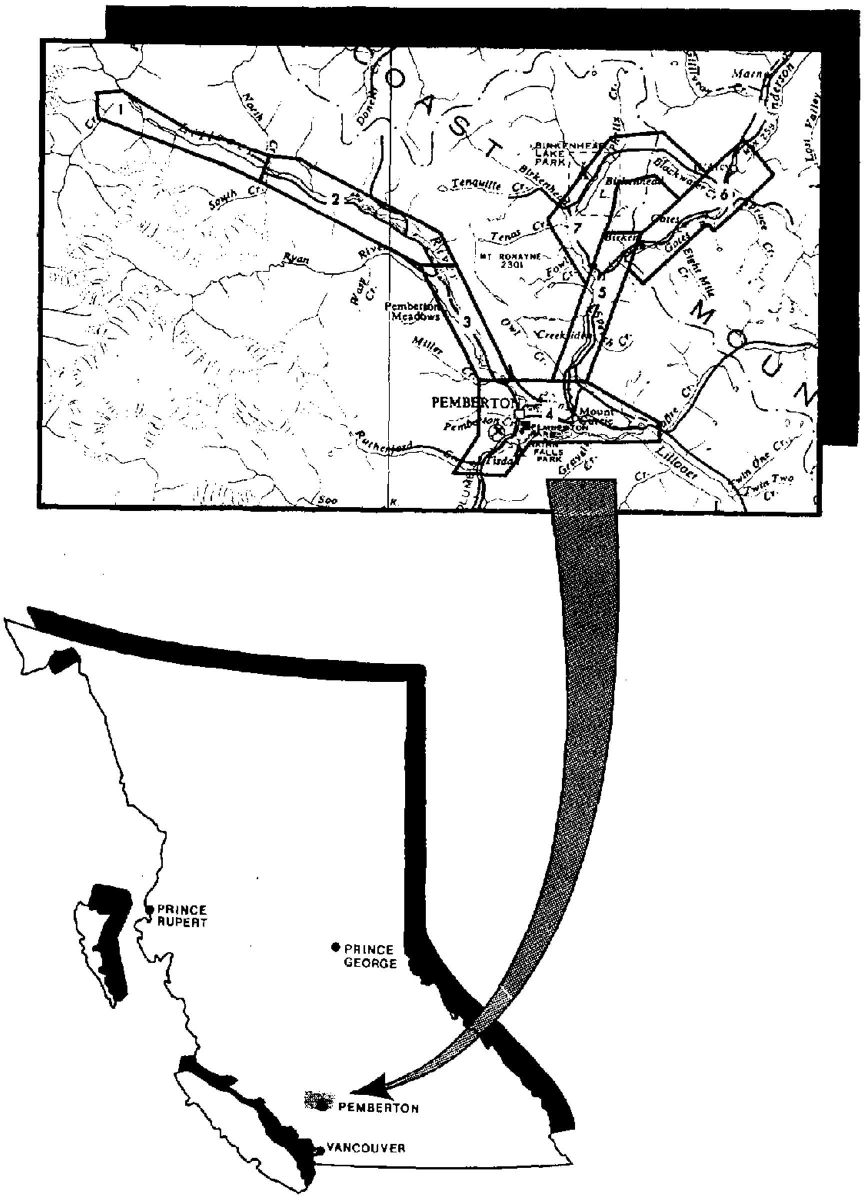


Figure 2: Project area location

westward and northward to Birkenhead Lake then swings northeast along Gates River as far as Anderson Lake and includes the Blackwater Creek valley from Birkenhead Lake to Gates River. Also included are the upland areas adjacent to Pemberton and Mt. Currie. The Pemberton (Lillooet River)Valley is approximately 3.2 km wide at the widest point. The Birkenhead River area from the Mt. Currie village to Gates Lake is approximately 24 km long and 0.4 km wide at its widest point. The Green River section is approximately 8 km from its junction with the Lillooet River to its junction with Rutherford Creek and is 0.8 km wide at is widest point. In total the study area covers approximately 20 000 ha.

1.3 History

The settlement of the Pemberton Valley has proceeded in stages as the result of major transportation developments connecting the valley to other parts of the province. This is discussed in detail by Decker, Fougberg, and Ronayne, 1977.

The first inhabitants of the valley were native Indian people who belong to a branch of the Interior Salish Tribe. Hudson's Bay Company traders, in 1827, were the first known white men to enter the valley and may have introduced the first cultivated potatoes. By 1859, gold rush traffic was passing through the Pemberton Valley by way of Harrison, Lillooet and Anderson Lakes on their way to the Klondike, and fresh vegetables were in high demand. As a result, Chief Justice Begbie gave seasonal permits for the use of land for growing vegetables. Following this came the pre-emptive use of lands up the valley for farming. By 1863, twelve farmers were present as noted by Lillooet's Anglican priest. With the completion of the Cariboo Wagon Road through Fraser Canyon in 1863, most of the settlers and farmers began moving on to the Cariboo and other areas. In the early 1900's there were few farmers, although there were 68 landowners registered on the tax rolls. In 1907 the farming was limited primarily to beef cattle because of the large amount of clearing needed to bring the land into production (although farmers were experimenting with growing peas, wheat, clover, oats, peas, turnips, and potatoes as well as some cabbages, plums and currants). Prior to the coming of the railroad, most of the farm produce was grown for local consumption.

A second stage of settlement was initiated with the completion of the B.C. Electric Railroad from Squamish to Lillooet in 1914. The coming of the railroad resulted in an increase in the acreages of wheat, oats and peas, as well as an increase in dairying. Dairying was an important source of income for the farmers for some years but, eventually, farmers turned to potato growing as the main source of livelihood. A major problem of the valley's livestock industry was the loss of 50% of the newborn calves, 80% of the foals and 95% of young pigs. Years of observation by farmer Jack Ronayne resulted, in 1917, in the discovery that iodine deficiency was the major cause of these losses. Later it was determined that selenium deficiency also exists within the valley. In 1922 production of relatively disease-free Netted Gem seed potatoes began. The success of the disease-free produce was attributed to the comparative isolation of the valley from other parts of the province. Production of Early Rose (also relatively disease-free) seed potatoes followed in 1926. In 1924 the Pemberton Valley Farmer's Institute was formed. The aims of the institute were:

1. "To promote conditions of rural life so that settlement may be permanent and prosperous;
2. To promote the theory and practice of agriculture and other educational methods;
3. To stimulate interest by exhibitions, prizes, and other means; and
4. To arrange on behalf of its members for the purchase, distribution or sale of commodities. (Decker, Fougberg, Ronayne, 1977)."

In 1933 the first Illustration Station was established on the E. Blakeway farm under the supervision of R. M. Hall from the Federal Experimental Farm at Aggasiz. In the 30's the sale of oats, wheat, turnips, carrots, potatoes and beef were restricted primarily to the local market. However, at the same time, the Ronaynes, Deckers and Taylors were producing prize-winning potatoes, field peas and turnips. By 1936, the marketing of Pemberton turnips and commerical potatoes was under the control of the B.C. Coast Marketing Board. Then, in 1941, the Pemberton and District Board of Trade was formed and became active in marketing farm crops.

In 1940, a major flood throughout the valley incited the citizens to action. The Pemberton Drainage and Reclamation Committee was formed by the Board of Trade and supported by the Farmer's Institute. A brief was presented to the Post-War Rehabilitation Council which called for diking and straightening the Lillooet River and its tributaries of Ryan and Miller Creeks and the lowering of Lillooet Lake. In 1946, the federal government agreed to carry out the proposed reclamation project under the Prairie Farm Rehabilitation Program, which ironically, had been developed to deal with drought conditions. In 1947, the Pemberton and District Commission was officially formed and, in 1948, a Tri-Partite Agreement was signed with the federal government agreeing to carry out the construction of the project, the provincial government to provide access roads and rights-of-way, and local government to carry out general maintenance. The reclamation and diking project was completed in 1954. During this time potato production was gaining in momentum and in 1949 a Seed Potato Control Area had been formed restricting plantings to locally grown seed. Also, during this time, dairy operators began converting to beef production. Turnips were grown for a limited market. Hay was grown for a good local market but available labour was limited. Carrots were grown for local sale and some grains were grown as hay for farm consumption.

With completion of a passable road to Pemberton from Squamish (now called Highway 99) in 1964, the Pemberton Valley entered its present era. In 1965 seed potato prices reached a record high for that era and Pemberton was chosen as one testing ground for the virus-free seed potatoes which had been developed by Agriculture Canada at their University of British Columbia Research Station. In 1966 and 1967 test plots were planted in the valley and today the majority of farmers grow virus-free seed potatoes as their primary crop. Finally, the era of development resulting from completion of the highway connection to Vancouver leaves Decker, Fougberg, and Ronayne (1977) to ponder with fond sadness:

> "And what of the future? The seed potatoe (sic) business has brought prosperity to the farms; the logging industry offered jobs and a solid income, particularly to the young men; employment opportunities had increased in the village in cafes, stores, banks, offices, and forestry. The road to Vancouver was now all blacktop and being improved year by year bringing both goods and tourists to the valley. A radio transmitter in the village had provided local reception; and one shaky T.V. channel brought in news, police shows, and commercials to amuse and aggravate the population. Pemberton was now part of the lower mainland. Its citizens bought their groceries in Squamish or Vancouver and had every modern convenience. And yet, with all these advantages of more industry, more of the older residents look back on the old days with affection. The inconveniences forgotten they remember the closeness of an isolated community. Tenquille Lake in its splendid pre-tourist virgin beauty; the family picnics by the Birkenhead, the summer trips to D'Arcy when a dozen families would gather by the lake; the impromptu swimming parties at Salmon Slough or One Mile Lake, or skating parties in winter whenever there was a patch of ice on a field. They remember too, the instant help in time of trouble; the chores done, the children cared for, any neighbour's car available as an ambulance to the station; and the train would always wait. They forgot the hard work of churning and remember the good taste of summer butter; they forget the milking and remember the home-made ice cream. Land clearing had brought wonderful bonfires but baled hay saw the end of the childrens hayrides."

Some of that closeness still remains and it is hoped, will always continue, for Squamish is still 100 km away and a winter's snowstorm can make those 100 km seem a very long way. Looking toward the future it seems that pressures for development will continue. The need for information on the physical environment, specifically soils, is pressing as the need for rational long-range regional planning and short-term site-specific problem solving becomes increasingly evident.

chapter 2

THE FORMATION, MORPHOLOGY AND CLASSIFICATION OF SOILS

2 THE FORMATION, MORPHOLOGY AND CLASSIFICATION OF SOILS

Soil has many meanings to many people depending on their inclination, training and experience. To a planner soil is a natural resource critical for sustenance of a certain human population. To an engineer it is unconsolidated material which may be manipulated for construction purposes. To a forester or an agriculturist soil is a medium for plant growth. To a farmer soil is his livelihood, his "life blood". To a pedologist soil is all of these things and much more.

2.1 Soil Development

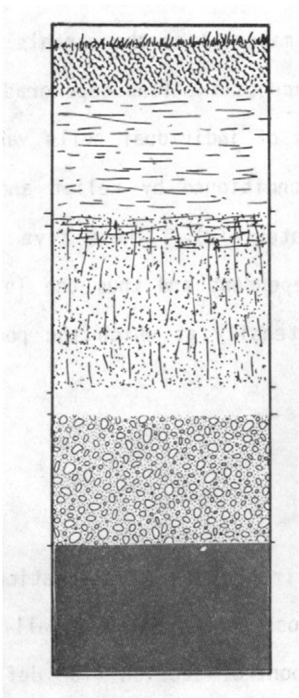
Soil is a naturally occurring, dynamic, three-dimensional body at the earth's surface which has been formed by nature and has recorded its own history expressed in recognizeable morphological, physical, and chemical characteristics. Pedologists have defined soil in general terms as the naturally-occurring, unconsolidated, mineral or organic material at the earth's surface which is capable of supporting plant growth. Soils are a continuum across the landscape grading one into another but having highly variable properties. The properties of individual soils vary with depth and are the product of climatic factors and organisms, as conditioned by relief and water regime, acting through time on geologic materials (soil parent materials). These five factors (climate, organisms, relief, time, and parent materials) are interdependent and thus the intensity of expression of one or all determines the rate, direction and intensity at which the pedogenic processes proceed.

2.2 Soil Profile

A soil profile is produced by additions to, losses from, and translocations and transformations within the soil. A soil profile is a vertical cross-section through all of the distinguishable horizons or layers of the soil to the depth of the control section (for definition see Glossary of Terms).

A soil horizon is a layer of mineral or organic soil material approximately parallel to the earth's surface, with characteristics which have been affected by the processes of soil formation. A horizon differs from adjacent soil materials or other horizons in features such as colour, structure, texture, consistence, chemical and biological properties. A generalized diagram in Figure 3 shows the relationship of horizons within a soil profile. All horizons may not necessarily be present in any one soil profile and horizons may also be subdivided as required. Table 1 lists the definitions of those horizons and layers identified in the soils of the Pemberton Valley. A more complete list of horizons and definitions can be found in The System of Soil Classification for Canada (1974, 1978).

Soil horizons develop in a soil profile as the result of pedogenic processes proceeding in soils at a rate and intensity determined by the soil forming factors mentioned earlier. Since these



LFH or Of — Organic horizons developed primarily from the accumulation of leaves, twigs, and woody materials.

Om, Oh — Organic horizons developed mainly from mosses, rushes, and woody materials.

A — Zone of leaching or eluviation of materials in solution or suspension or of maximum in situ accumulation of organic matter or both.

AB — Transition zone.

B — Zone of enrichment in organic matter, sesquioxides, or clay, or by the development of soil structure; or by a change of colour denoting hydrolysis, reduction or oxidation.

BC — Transition zone.

C — Mineral horizon comparatively unaffected by the pedogenic processes operative in A and B except the process of gleying and the accumulation of calcium and magnesium carbonates and more soluble salts.

R — A consolidated bedrock layer that is too hard to break with the hands or to dig with a spade when moist.

Figure 3: Generalized diagram of a soil profile

Table 1: Definitions of soil layer and horizon terminology*

Mineral Horizons and layers

Mineral horizons are those that contain 17% or less organic carbon (about 30% organic matter) by weight.

A - a mineral horizon formed at or near the surface, in the zone of leaching or eluviation of materials in solution or suspension or of maximum in situ accumulation of organic matter or both.

B - a mineral horizon characterized by enrichment in organic matter, sesquioxides, or clay, or by the development of soil structure; or by a change of colour denoting hydrolysis, reduction or oxidation.

C - a mineral horizon comparatively unaffected by the pedogenic processes operative in A and B, (C), excepting (i) the process of gleying, (Cg), and (ii) the accumulation of calcium and magnesium carbonates (Cca), and more soluble salts (Cs, Csa). Marl and diatomaceous earth are considered to be C horizons.

R - a consolidated bedrock layer that is too hard to break with the hands (>3 on Mohs scale) or to dig with a spade when moist, and that does not meet the requirements of a C horizon. The boundary between the R layer and any overlying unconsolidated material is called a lithic contact.

Lowercase Suffixes

b - a buried soil horizon.

g - a horizon characterized by gray colours, or prominent mottling, or both, indicative of permanent of periodic intense reduction. Chromas of the matrix are generally 1 or less. It is used with A and e (Aeg), with B alone (Bg), with B and f (Bfg, Bgf), with B, h, and f (Bhfg), with B and t (Btg), with C alone (Cg), with C and k (Ckg), and several others. In some reddish parent materials, matrix colours of reddish hues and high chromas may persist despite long periods of reduction. In these soils, horizons are designated as g if there is gray mottling or if there is marked bleaching on ped faces or along cracks.

h - a horizon enriched with organic matter. It is used with A alone (Ah); or with A and e (Ahe); or with B alone (Bh); or with B and f (Bhf). Ah - a horizon enriched with organic matter that either has a colour value at least one unit lower than the underlying horizon or contains 0.5% more organic carbon than the IC, or both. It contains less than 17% organic carbon by weight.

j - a modifier of suffixes e, f, g, n, and t to denote an expression of, but failure to meet, the specified limits of the suffix it modifies. It must be placed to the right and adjacent to the suffix it modifies. For example Bfgj means a Bf horizon with weak expression of gleying; Bfjgj means a B horizon with weak expression of both 'f' and 'g' features.

m - a horizon slightly altered by hydrolysis, oxidation, or solution or all three, to give a change in colour or structure, or both. This suffix can be used as Bm, Bmgj, Bmk, and Bms.

p - a horizon disturbed by man's activities, such as cultivation, logging, habitation, etc. It is used with A and O.

Organic Horizons

Organic horizons are found in Organic soils, and commonly at the surface of mineral soils. They may occur at any depth beneath the surface in buried soils, or overlying geological deposits. They contain more than 17% organic carbon (approximately 30% organic matter) by weight. Two groups of these horizons are recognized, O horizons and L, F and H horizons.

O - an organic horizon developed mainly from mosses, rushes, and/or woody materials. It is divided into the following subhorizons:

Of - an O horizon cosisting dominantly of well-preserved fibres that are readily identifiable as to botanical origin, and is called a fibric horizon.

Om - an O horizon at a stage of decomposition intermediate between fibric and humic materials. The material is partly altered both physically and biochemically. It does not meet the requirements of either a humic or a fibric horizon, and is called a mesic horison.

Oh - an O horizon at an advanced stage of decomposition. It has the lowest amount of fibre, the highest bulk density, and the lowest saturated water-holding capacity of the O horizons. It is very stable and changes very little physically or chemically with time unless it is drained. This is called a humic horizon.

L, F and H - These are organic horizons developed primarily from the accumulation of leaves, twigs, and woody materials with or without a minor component of mosses. Usually they are not saturated with water for prolonged periods.

L - an organic horizon characterized by an accumulation of organic matter, derived mainly from leaves, twigs and woody materials, in which the original structures are easily discernible.

F - an organic horizon characterized by an accumulation of partly decomposed organic matter derived mainly from leaves, twigs and/or woody materials. Some of the original structures are difficult to recognize. The material may be partly comminuted by soil fauna, as in moder, or it may be a partly decomposed mat permeated by fungal hyphae, as in mor.

H - an organic horizon characterized by an accumualtion of decomposed organic matter in which the original structures are indiscernible. This material differs from the F horizon by its greater humification due chiefly to the action of organisms. It is frequently intermixed with mineral grains, expecially near the junction with a mineral layer.

*After the Canadian System of Soil Classification, 1978.

factors of soil formation vary widely across the landscape it follows that the resultant soils and their properties also vary widely across the landscape. Because soils occur at the surface of the earth as a continuum having highly variable properties, it is necessary to define a basic unit of soil to be described, sampled, analysed and classified. This basic unit, called a pedon, is the smallest three-dimensional unit which can be considered a soil. The lateral dimensions of the pedon are 1 m^2, if the ordered variation in genetic horizons can be sampled within that distance. The vertical dimensions of the pedon extend from the surface of the earth to a minimum of 10 cm and at a maximum to the depth of the control section.

2.3 Soil Classification in Canada

The System of Soil Classification for Canada is hierarchial and is based on the characteristics of the pedon. There are five taxonomic levels which are the Soil Order at the highest or most general level proceeding with increasing complexity through Soil Great Group, Soil Subgroup and Soil Family to Soil Series at the lowest or most specific level.

There are nine Orders defined in the Canadian classification system, and these are Brunisolic Order, Chernozemic Order, Cryosolic Order, Gleysolic Order, Luvisolic Order, Organic Order, Podzolic Order, Regosolic Order and Solonetzic Order. The soils of the Pemberton Valley study area are mainly within the Gleysolic and Regosolic Orders; soils of the Brunisolic and Organic Order occur but are less common. Soils of the Brunisolic Order have sufficient development to exclude them from the Regosolic Order, but they lack the degree or kind of horizon development specified for soils of other Orders. The central concept of the Brunisolic Order is that of soils formed under forest vegetation having brownish coloured Bm horizons. Gleysolic soils have features indicative of periodic or prolonged saturation with water and reducing conditions. In areas of subhumid climate Gleysolic soils commonly occur in shallow depressions and on level lowlands that are saturated with water for long periods of time. In more humid areas they also occur on slopes and undulating terrain. Soils of the Organic Order are composed largely of organic materials. They include most of the soils commonly known as peat, muck or bog soils. Most Organic soils are saturated with water for prolonged periods. They occur widely in poorly and very poorly drained depressions and level areas in regions of subhumid to perhumid climate, and are derived from the vegetation that grows or has grown in such sites. Regosolic soils have no or weakly developed soil horizons. The lack of development may be due to youthfulness of the soil as in recent alluvium, or instability of the material as in colluvium on slopes subject to mass wasting. Regosolic soils vary from rapidly to imperfectly drained and occur under a wide range of vegetation types and climates. Definitions of the other Soil Orders previously mentioned but not discussed can be found in "The Canadian System of Soil Classification", Agriculture Canada, 1978.

The soils of the study area were classified at the series or specific level of taxonomy. The soil series is based on the differentiating criteria of the soil order plus the soil great group, soil subgroup, and the soil family as well as detailed features of the pedon. The detailed features of the pedon utilized in differentiation of the soil series include similar kinds and arrangements of horizons whose colour, texture, structure, consistence, thickness, reaction, and composition fall within a narrow range of variability. Soil series is a taxonomic unit to which a name or number is assigned and which is specific to that soil as defined. Names are generally derived from geographical place names within the soil survey region.

chapter 3

METHODOLOGY

3 METHODOLOGY

3.1 Field Mapping

Firstly, the most recent (1973) black and white 20 chain aerial photographs were obtained. These photographs were examined stereoscopically and preliminary map units outlined on them. The map units were then checked extensively by surveyors on foot traverses across fields, digging and describing approximately 1 m deep observation pits. In some places access to areas surveyed was by truck or helicopter with limited foot transects. Figure 4 gives a general indication of the accessibility of the area to field observation. When detailed field checking was completed, the final legend was compiled, soil boundary lines were finalized, symbols were assigned to map units and the maps then submitted for drafting. In areas where field checking was limited by accessibility, the composition of some units was extrapolated by aerial photograph interpretation using information derived from similar adjacent units.

The terrain units (soil parent materials) identified within the study area are classified and defined according to the "Terrain Classification System" (ELUC Secretariat, Resource Analysis Branch, 1976).

The soils identified within the study area are classified according to "The Canadian System of Soil Classification" Agriculture Canada, 1978. The textural class groupings utilized are those defined for the soil family in the "System of Soil Classification for Canada" Agriculture Canada, 1974. The soils are classified at the series level of soil taxonomy. Therefore, the soils described in the report and the soil map legend are taxonomic units. The soils legend groups the soils on the basis of parent material, soil development, soil texture and soil drainage.

A soil mapping unit which bears the name of a taxonomic unit, as is the case in this survey, consists of the defined taxonomic unit plus small inclusions of other soils (generally less than 15%) which are included because of the limitations imposed by the scale of the mapping and the number of points that could be examined. Thus, any single soil name stands for a specially defined taxonomic unit, but that same name, applied to a mapping unit, stands for that defined taxonomic unit plus a small proportion of other soils, that cannot be shown because of cartographic limitations. A variant of some taxonomic units was used as a mapping unit where a soil was identified as

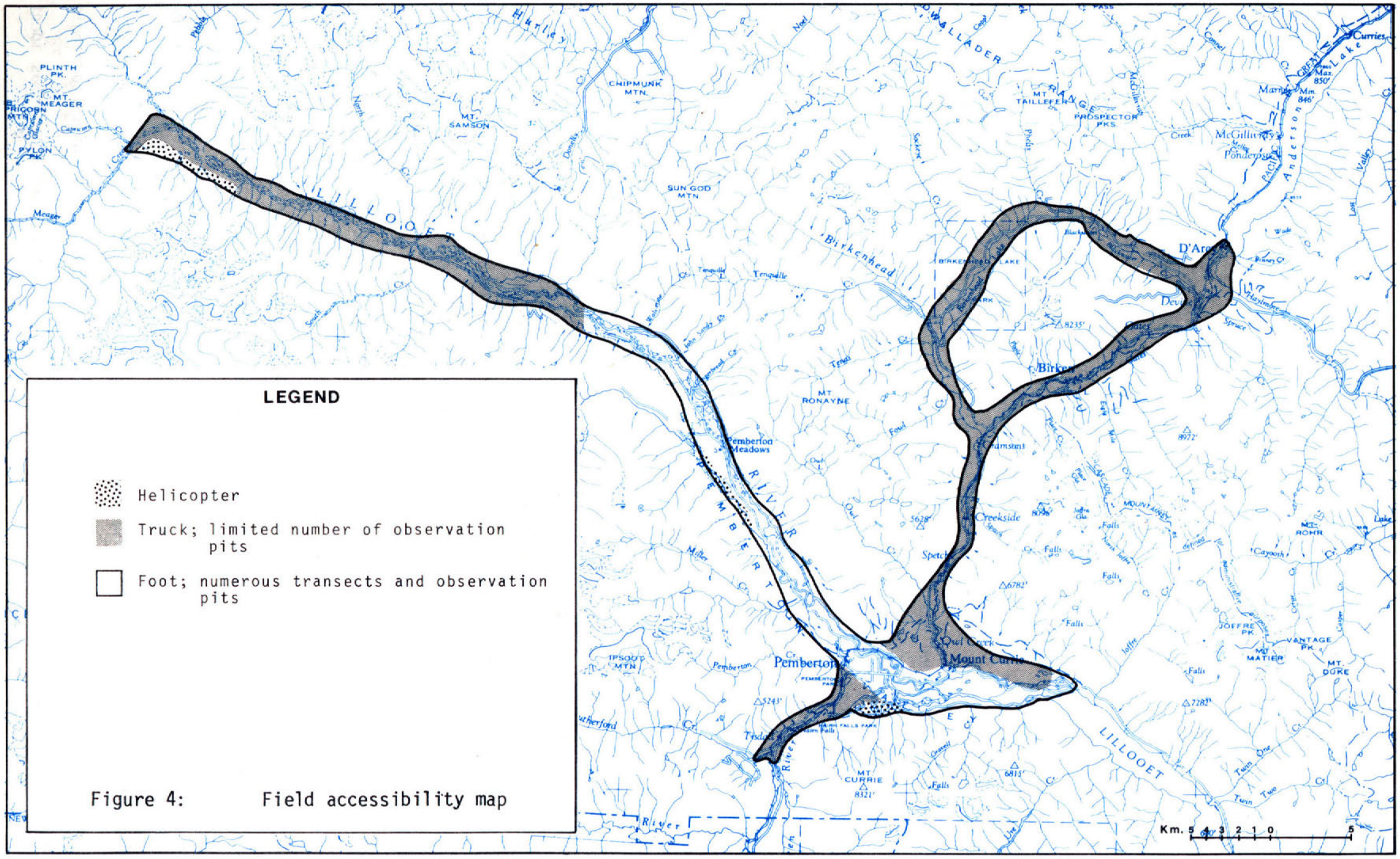


Figure 4: Field accessibility map

different from another but was similar in most characteristics. These variants were reserved for soils which had limited acreage and for which it was impractical to define new series.

When plotting soil boundaries on a map, the pattern of some taxonomic units may be too intricate to be shown accurately and clearly as separate map units and therefore are shown as one mapping unit. This mapping unit, called a soil complex, is defined in terms of the taxonomic units making it up, their proportions, and their pattern. The complex consists of the names of the occuring soil series in decreasing order of dominance, joined by hyphens.

Miscellaneous land types are used as mapping units to indicate those areas which contain no or very little soil, such as rock land areas or urban and other man-modified areas where the original soil characteristics have been so altered as to be unrecognizeable.

3.2 Soil Sampling

A representative soil profile was described and sampled in order to characterize the majority of the mapped soil series. Each soil profile was sampled to at least 100 cm depth for selected chemical analysis. Some soil layers or horizons, which were less than 5 cm thick and discontinuous, were described but not sampled. The surface 50 cm were also sampled by horizon or soil layer for available water storage capacity (AWSC) and, occasionally, for particle size analysis. For AWSC determinations, horizons of similar texture were composited in order to reduce the number of samples. Bulk density samples were taken from surface horizons and at a depth of 1 m or greater. Engineering samples were taken from a depth of 1 m or greater. Soil saturated hydraulic conductivity determinations were conducted in situ, in those soils where the water table was at less than 1.8 m depth, using the auger hole method (van Beers, 1963).

In addition to the selected detailed soil profile descriptions and analyses included in this report (Appendix 2) all morphological soil descriptions and analyses are available from the B.C. Soil Data File by contacting:

Director
Resource Analysis Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C. V8V 1X4

Include in your request a geographical description of the area of interest, i.e. latitude and longitude or National Topographic mapsheet (NTS) number such as 92J/7. Additional useful information to be included in the request would be the name of the soil series for which information is required.

3.3 Laboratory

Laboratory analyses of the soil samples were conducted in the Resource Analysis Branch laboratory, at Kelowna, B.C., under the direction of V.E. Osborne. The specific methods used are presented in Table 2.

Table 2: List of laboratory analyses and references

Analyses	References
Available sulphur	Johnson, C.M., and Nishita, H., 1970 Johnson, C.M. and Ulrich, A., 1959
Available phosphorus	John, M.K., 1963, 1970
Boron	Grewelling, T. and Peech, M., 1960
Carbon	Carbon Analysis by Leco Analyzer, 1969
Cation Exchange Capacity	McKeague, J.A., ed., 1976
Exchangeable Cations	McKeague, J.A., ed., 1976
pH	McKeague, J.A., ed., 1976
Pyrophosphate iron and aluminum	McKeague, J.A., ed., 1976
Sieve analysis	McKeague, J.A., ed., 1976
Copper, cobalt	Black, C.A., et al, 1965
Particle-size analysis, pipette method	Black, C.A., et al, 1965
Bulk density	Black, C.A., et al, 1965
Kjeldahl nitrogen	Atkinson, H.J., et al, 1958; Bremner, J.M., 1960
Atterberg limits	Lambe, T.W., 1951
Water holding capacity	Richards, L.A., ed, 1954

3.4 Land Use Interpretations

3.4.1 Agricultural Capability Ratings

Land capability for agriculture ratings were determined following the Canada Land Inventory (1965) and British Columbia Land Inventory (1973) guidelines for determining the capability of land to sustain agriculture. Climatic capability for agriculture ratings (Williams, 1977) were used in conjunction with the soils information, to derive the land capability ratings. The climatic capability ratings follow the guidelines outlined in the "Climatic Capability Classification for Agriculture in British Columbia", Resource Analysis Branch (1978).

3.4.2 Suitability for Engineering Uses

Interpretations to assess the suitability of the soils of the Pemberton Valley for selected urban development factors were made following a modified version (Resource Analysis Branch, 1978) of the U.S. Department of Agriculture (1971) "Guide for Engineering Interpretations of Soils". A discussion of, and the specific guidelines used are appended in Appendix 3.

3.4.3 Physical Carrying Capacity for Outdoor Recreation

Interpretations assessing the physical carrying capacity of the Pemberton area soils for outdoor recreation were made following the guidelines outlined in the publication "Recreation Capability Inventory: (1) Canada Land Inventory; (2) Resource Analysis Unit" (ELUC Secretariat, Resource Analysis Branch, 1976).

chapter 4

FACTORS AFFECTING SOIL FORMATION

4 FACTORS AFFECTING SOIL FORMATION

Soil forms as a result of the interaction of five major factors: climate, plant and animal life, parent materials, relief and time. Therefore, the characteristics of the soil at any place are determined by the physical and mineralogical composition of the original geological material, the climate under which the soil material has accumulated and existed, the plant and animal life that has inhabited it (within and on the soil), the relief or topography and moisture relationships resulting from the topography, and the length of time these forces have been in action.

4.1 Climate

The climate of the Pemberton area is within the zone of transition from coastal to interior as it is somewhat modified by elevation, distance from the sea and the influence of being surrounded by high mountains. The recorded annual mean temperature at Pemberton Meadows is 7.2°C (Atmospheric Environment Service, 1975a) with a mean daily midsummer temperature of 17.2°C and an extreme maximum of 37.8°C in 51 years of record. The average freeze-free period at Pemberton Meadows is 150 days (Hemmerick and Kendall, 1972), from April 29 to September 29. The longest period without frost is 189 days and the shortest is 61 days. Most of the 1024 cm mean total precipitation (Atmospheric Environment Services, 1975b) occurs from October 1 to April 30, with only 187 mm falling from May to September. Snowfall varies greatly from year to year and location to location. The mean annual snowfall at Pemberton Meadows is 282.4 cm with the greatest amount falling in a 24 hour period being 101.6 cm. The maximum recorded snowfall is 508 cm with 210 cm the most found on the ground at any one time. An example of the wide range of temperature and precipitation values which have been recorded at Alta Lake and Pemberton Meadows over 30 years is given in Figure 5 (after Gilbert, 1972).

Figure 6: Drainage basins tributary to north Lillooet Lake. The location of stream gauging and climate stations are indicated (after Gilbert, R. 1972, 1973)

4.3 Hydrology

The hydrologic regime of a river is influenced primarily by the morphology of the river, the watershed characteristics, including the presence or absence of glacier ice and/or snow fields, the soils, land uses in the watershed, and the climate of the area. The study area is located to a large extent on the flood plains of the Lillooet, Birkenhead and Gates rivers and the soils and uses of this land are directly affected by the hydrologic regimes of these rivers. The headwaters of the Lillooet River occur in the glacier ice and snow fields of the Coast Mountains whereas the Green and Birkenhead rivers rise in annual snow fields. The regional climate of the area exerts a strong influence on the hydrologic regime of the major streams as these rivers react rapidly to heavy rain storms and warm temperatures in the spring and summer. Warm rains can cause accelerated melting of the glacier ice and snow and thus maintain the spring runoff for extended periods. Heavy, early fall rains may cause extremely high discharges, especially following heavy, wet snowfall. A heavy rainfall on fresh snow appears to have been a causative factor in the 1948 flood of the Pemberton valley.

Daily stream discharges were monitored on the Lillooet River (1923-1968), Green River (1914-1951) and Birkenhead River (1946-1969). The mean values for these years of recording are presented in Figure 7 (after Slaymaker and Gilbert, 1972, Gilbert 1973). The location of the stream gauging and climate stations within the study area are indicated on the drainage basin map in Figure 6. The hydrographs indicate the influence that the large ice and snow fields of the watersheds have on flow characteristics of these rivers. They extend the spring runoff peak into early September. A secondary peak due to rain events occurs in early fall (October-November) on the Lillooet River, but this secondary peak is very small or almost non-existant in the hydrographs for the Green and Birkenhead Rivers whose headwaters do not originate in permanent ice and snow fields.

Flow velocities of rivers are affected by the morphology of the valleys. The headwater streams, Meager, Capricorn, Pebble, North and South creeks as well as the Lillooet River itself enter the Lillooet River valley from steep side valleys carrying a heavy load of sediment. As they enter the upper valley the gradient is reduced to approximately 150 m in about 48 km. From below Railroad Creek, to Lillooet Lake the gradient is further reduced to approximately 75 m in 48 km. Consequently, the coarser particles, the gravels, are deposited in a wide channel between Meager and

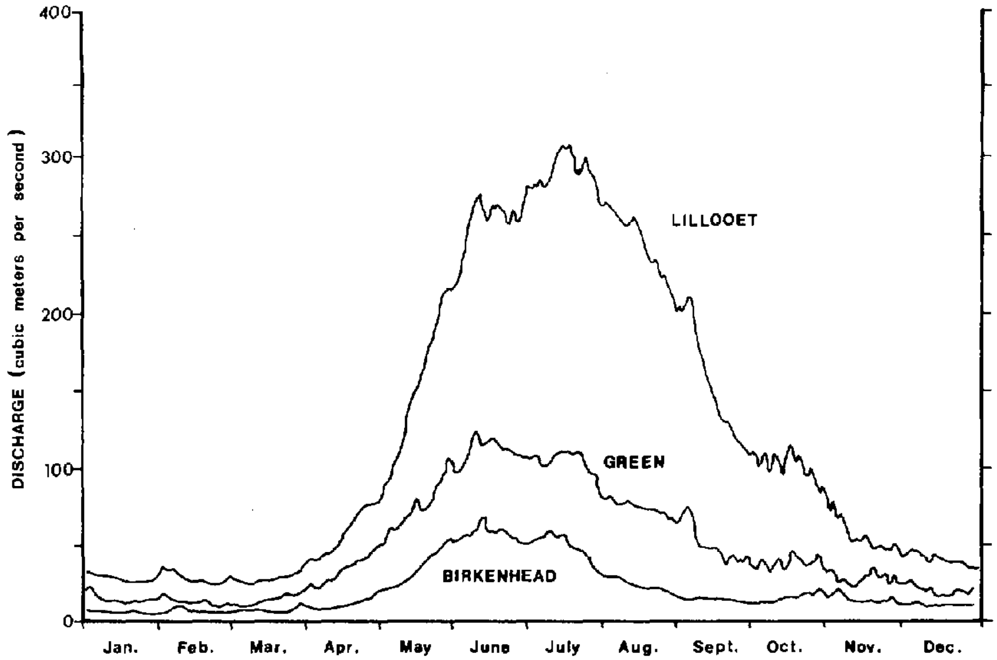


Figure 7: Average of mean daily discharge for Lillooet River (1923-1968), Green River (1914-1951) and Birkenhead River (1946-1969), for years of nearly complete record (after Gilbert, R., 1972, 1973)

Railroad Creek while below Railroad Creek the lower gradient gives rise to a narrow, meandering stream channel where the finer particles, the silts and clays, are deposited and organic materials are accumulating in depressions.

The Birkenhead and Green River flood plains are similar to that of the upper Lillooet flood plain in having very gravelly channels. These high velocity streams located within steep gradient channels change rapidly to lower gradient channels and the subsequent lower velocity flows result in the deposition of coarse gravel and boulder size particles within their flood plains. The finer textured particles are deposited as the Birkenhead River enters the lower gradient Lillooet River valley although these materials are significantly more sandy than those deposited by the Lillooet River.

The hydrology of streams affects and is effected by the land uses which are present within the watershed. For example, logging of watershed slopes and increased amounts of road surface may have contributed to increased peak flows and sediment transport in the Lillooet River and tributary streams during the past 23 years (Slaymaker and Gilbert, 1972). The development of land within the flood plains for urban and industrial purposes is limited by the high flood hazard, unless special precautions are taken.

4.4 Vegetation

Krajina (1969-1970) describes the Pemberton Valley and the south aspects of the mountains from Ryan Creek to Lillooet Lake as well as the Birkenhead River, Gates River and Blackwater Creek valleys as part of the Interior Douglas-fir biogeoclimatic zone. This biogeoclimatic zone is characterized by Rocky Mountain Douglas-fir, ponderosa pine, western white pine, grand fir, lodgepole pine, western larch, white spruce, and western red cedar, frequently accompanied by trembling aspen, black cottonwood, Rocky Mountain maple, and common paper birch (common names after Taylor and MacBryde, 1977). Dry, hot summers and cold winters of the interior climate are characteristic of this zone. In the Pemberton Valley the wetter subzone of the Interior Douglas-fir zone predominates. This wetter subzone is characterized by lodgepole pine, western white pine, alpine fir, white spruce, Engelmann spruce, western larch, western red cedar and grand fir. Travelling north along the Birkenhead - Gates River valleys toward Anderson Lake, the vegetation zone trends towards the drier subzone of the Interior Douglas-fir zone. The drier subzone in this area is characterized mainly by ponderosa pine and Rocky Mountain Douglas-fir.

The Pemberton Valley north from Ryan Creek and the north aspects of the valley south of Ryan Creek are described by Krajina (1969-1970) as part of the Coastal Western Hemlock biogeoclimatic zone. This biogeoclimatic zone is the wettest zone in British Columbia and is characterized by mild winters and cool summers. The section of the Lillooet River valley which is located within this biogeoclimatic zone appears to be predominantly within the drier subzone which is characterized by the presence of coast Douglas-fir, western hemlock, western red cedar, grand fir, Sitka spruce, western white pine, and lodgepole pine.

In the Pemberton Valley the climatic climaxes of each of the biogeoclimatic zones are seldom found due to the prevailing high water table on the Lillooet River flood plain. An edaphic climax vegetation of western red cedar or black cottonwood, and some red alder, common paper birch, western white pine, Rocky Mountain maple, and willows is predominant. The larger trees often occur in a narrow band on the natural levees of the Lillooet River where the lower water table permits good root growth. Where the water table is favourable, mature western red cedar and black cottonwood become quite large, as is the case in the upper Lillooet River valley above Railroad Creek. Willow, because of its tolerance of wet soils, is found on the lower fringes of the levees. Tree growth is limited where the water table occurs near or above the soil surface, and sedge and other marsh vegetation predominates. In depressional areas where open water exists, lilies and common cattails are common.

The native vegetation of the main Pemberton Valley from Lillooet Lake to Railroad Creek has been largely cleared and the land cultivated or allowed to regenerate to successional species such as black cottonwood, red alder, common paper birch, and willows with some western red cedar.

Above Railroad Creek large portions of the valley bottom have been logged of western red cedar, coast Douglas-fir and western hemlock but have not been put under cultivation. Regeneration is mainly black cottonwood where not replanted to coniferous species.

4.5 Soil Parent Material

Parent material is the geological material from which a soil forms. In the Pemberton Valley, the parent materials generally consist of Pleistocene or Recent age unconsolidated fluvial and glacial deposits. These unconsolidated materials are either derived from or have been influenced by the local (within the watershed) bedrock.

4.5.1 Bedrock

The bedrock types found within the study area have been described in detail by Roddick and Hutchison (1973). Figure 8 indicates the general distribution of the main types. The main bedrock in the Pemberton Valley is intrusive in the form of quartz diorite. The upper elevations on the north side of the valley consist mainly of volcanics, commonly andesite breccia, tuff and flows, and greenstone. Minor inclusions of metavolcanics, such as rhyolite breccia and flows, and metasedimen-

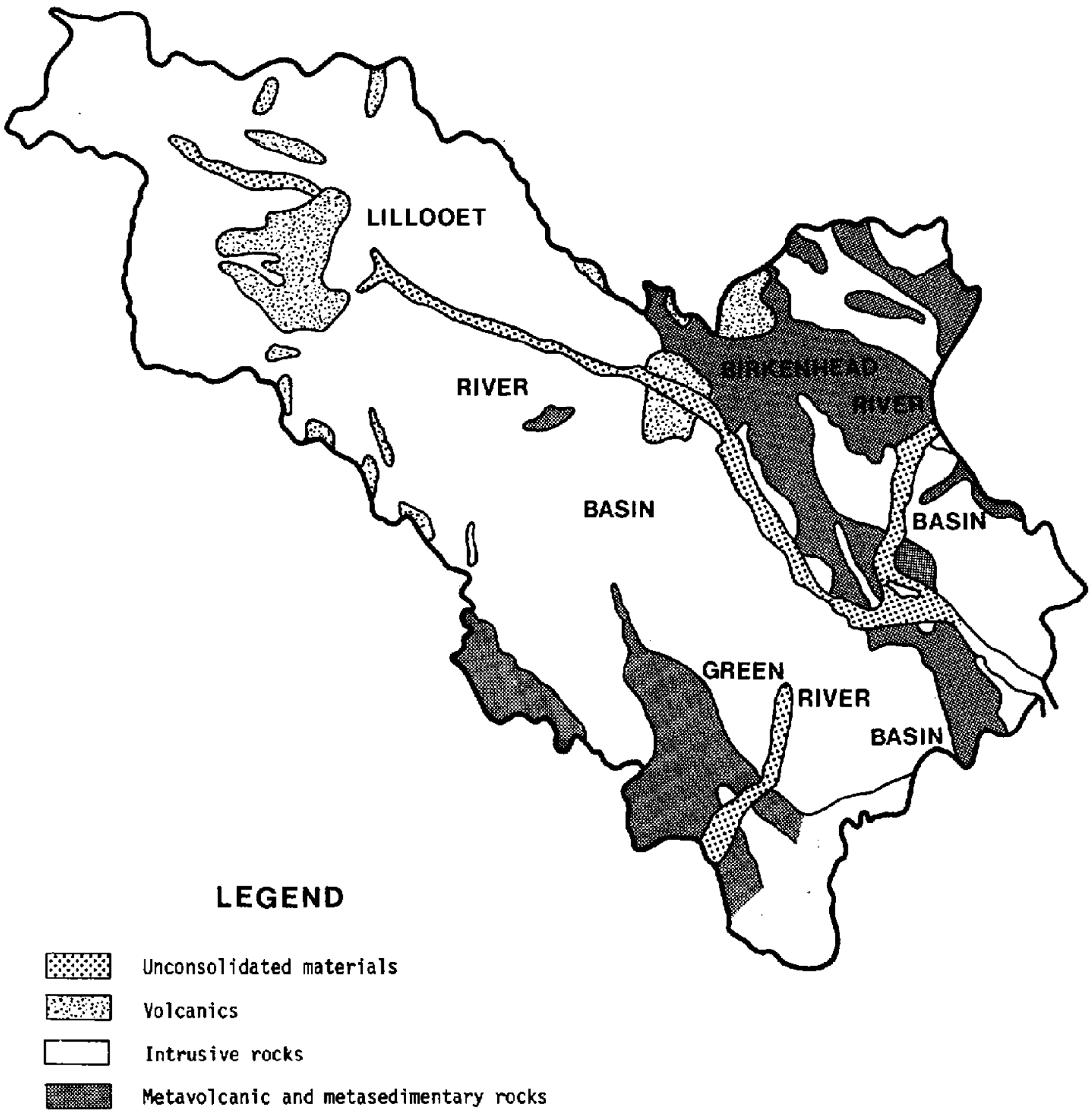


Figure 8: Generalized bedrock geology of basins tributary to north Lillooet Lake summarized from Roddick and Hutchinson (1973) Mathews (unpublished), and Woodsworth (1977) (modified after Gilbert, R. 1973)

taries, such as slate, argillite, limestone and conglomerate also occur. A localized pocket of volcanic andesite flows and breccia with some basalt and minor dacite, occurs west of Wolverine Creek. In the vicinity of North and South Creeks intrusions of granodiorite are encountered which grade into quartz diorite up-valley towards Mt. Meager.

Bedrock types found along the Birkenhead River Valley are generally similar to those found in the Pemberton Valley. From Spetch to near Gates Lake intrusives of medium to coarse grained granodiorite are encountered. In the vicinity of Gates Lake, Gates River and Blackwater Creek, metasedimentaries, such as argillite, limestone, tuff and conglomerate which are distinctly calcareous occur. These have a distinct influence on the characteristics of the unconsolidated materials and soils of the area. In this area there are also some outcrops of intrusive quartz diorite, particularly near the north end of Birkenhead Lake, and on the east side of Gates River between Gates Lake and Devine.

In general, the bedrock types of the study area can be separated into two groups, acidic and calcareous. These groupings are reflected in the derived unconsolidated materials and subsequent soil development. The bedrock of the Pemberton Valley is predominantly acidic, with only minor calcareous types. The bedrock of the Birkenhead River, Blackwater Creek and Gates River area are predominantly calcareous with minor proportions of acidic types.

The nature of these bedrock types strongly influences the mineralogy and chemical nature of the soils in the study area, such that the Pemberton Valley soils are acidic, while those in the Birkenhead, Gates, and Blackwater valleys are mainly calcareous in the subsoil.

For the purposes of this report bedrock is defined according to the "Terrain Classification Scheme", (ELUC Secretariat, Resource Analysis Branch, 1976) as "outcrops and rock covered by a thin mantle (less than 10 cm thick) of unconsolidated materials." Thus, all bedrock types occur in one mapping category on the terrain map.

Steep and/or hummocky bedrock outcrops occur on the uplands near Pemberton, adjacent to Mt. Currie village, and along the valley walls of the Birkenhead and Gates River valleys. Small, hummocky outcrops occur in the main Lillooet River valley, approximately half-way between Pemberton and Mt. Currie village on the north side of the valley.

4.5.2 Unconsolidated Geologic Deposits

Five types of unconsolidated geologic deposits or soil parent material have been identified in the study area. The distribution and extent of these materials is illustrated on the terrain maps (Figures 9 - 15).

A. Anthropogenic deposits

"Man-made or man-modified materials; including those associated with mineral exploitation and waste disposal, and excluding archaeological sites. These materials have either been constructed by man or are geological material which have been so modified by man that their initial physical properties, including topography, cannot be recognized" (ELUC Secretariat, 1976).

Within the Pemberton study area the anthropogenic areas consist of urban areas, including the villages of Pemberton and Mt. Currie; landfill areas; and other man-modified areas such as a gravel pit near Mt. Currie village and salmon spawning channels. These deposits comprise a relatively minor component of the study area.

B. Colluvial deposits

"Products of mass-wastage; materials that have reached their present position by direct, gravity-induced movement. The character of the colluvial deposits depend upon first, the nature of the material from which it was derived and secondly, the specific mass wastage process whereby it was moved" (ELUC Secretariat, 1976).

Colluvium is derived both from bedrock and unconsolidated materials. Colluvial landforms in the Lillooet River valley consist of avalanche debris tracks and fans which are generally gravelly and sandy and mostly actively forming. Also present are small discrete areas of rubbly and/or blocky talus fans and aprons locally derived from bedrock. Similar landforms occur in the Gates River and Blackwater Creek valleys, however, here the fans tend to be larger and somewhat finer textured with less gravel. In the Birkenhead River valley and on the uplands near Pemberton and Mt. Currie villages the colluvial deposits are largely derived from bedrock and occur as talus fans and aprons as well as veneers and blankets. One large landslide composed of extremely large rock blocks derived from bedrock is located north of Owl Creek near Spetch. Colluvial deposits in the Green River valley are dominated by a large landslide deposit south of Nairn Falls known locally as Suicide Hill, which is primarily composed of gravels and boulders in a matrix of fines derived from unconsolidated materials.

C. Fluvial deposits

"Materials transported and deposited by streams and rivers" (ELUC Secretariat, 1976).

Fluvial deposits are the most extensive sediments in the study area and occupy the floors of the Lillooet, Green, Birkenhead, and Gates river and Blackwater creek valleys. The fluvial landforms are primarily flood plains, with a significant number of large and small fans and a minor extent of terraces. The soils formed in many of these materials, particularly on the flood plains, show evidence of frequent, periodic flooding in the form of buried organic layers and layers of strongly contrasting textures.

The fluvial sediments deposited by the Lillooet River show a distinctive gradation in texture from gravelly at the head of the valley to increasingly silty at Lillooet Lake. The influence of tributary streams is evident where they enter the main valley by the presence of gravelly fan and sandy flood plain deposits at these points. Fluvial materials within the upper Lillooet River valley are primarily gravelly, with some sands in the braided channels. These grade to sands overlying gravels and sands in the vicinity of Railroad Creek. The sands become deeper (>1 m) and gradually are interspersed with silts between Railroad and Miller Creeks. The deposits are mainly silty from approximately Miller Creek to Lillooet Lake with the exception of a large sandy area near Pemberton which was deposited during the 1948 flood. Near Lillooet Lake, the fluvial materials include a sandy delta which is rapidly building into Lillooet Lake. The speed of this delta accretion is primarily the result of increased velocities and volumes of flow in the Lillooet River due, in major part, to channel straightening, diking and the lowering of Lillooet Lake as documented by Slaymaker and Gilbert (1972 and Gilbert, 1973).

Other fluvial landforms occurring within the Lillooet River valley are fans formed where tributary streams join the main valley. These streams generally originate in steep side valleys and the resultant decrease in water velocity on entering the nearly level floor of the Lillooet River valley results in the deposition of their coarser particle load. The fans of the larger streams such as North, South and Ryan creeks are bouldery and gravelly while those of smaller streams such as Railroad, Wolverine, Miller and One Mile creeks tend to be gravelly. The fluvial deposits in the main valley, where Ryan Creek and the Lillooet River share the flood plain, are complex deposits of interbedded sands and silts with some gravels at depth.

Fluvial deposits in the Green River valley are bouldery and gravelly fluvial fans. These occur at the junction of Rutherford Creek and Green River and where the Green River enters the Lillooet River valley below Nairn Falls.

The fluvial deposits of the Birkenhead River valley are bouldery and gravelly and occur as either fan or flood plain deposits. Fan deposits occur primarily near Birkenhead Lake where the river enters that valley, where the Birkenhead River leaves its canyon, and at the confluence of Owl Creek and the Birkenhead River. The flood plain deposits of the Birkenhead River tend to be gravelly, eventually becoming sandy after joining the main Lillooet River valley.

Blackwater Creek and Gates River fluvial deposits are primarily sand, with some minor silty flood plain deposits. However, large fluvial fans enter the Gates River valley between Blackwater Creek and Anderson Lake. At Blackwater Creek there exists a large, gravelly delta which is exposed in a road cut. Nearby, a bouldery and gravelly fluvial fan originating from Haylmore Creek enters the valley and extends nearly to Anderson Lake.

D. Morainal deposits

"The material transported beneath, beside, on, within, and in front of a glacier; deposited directly from the glacier and not modified by any intermediate agent. Morainal material generally consists of well-compacted material that is non-stratified and contains a heterogeneous mixture of particle sizes, often in a matrix of sand, silt and clay" (ELUC Secretariat, 1976).

The major areas of morainal deposits in the study area are on the uplands near Pemberton, on the uplands of Mt. Currie Indian Reserve, and on the walls of the Birkenhead River, Gates River and Blackwater Creek valleys. They are primarily gravelly with some boulders in a matrix of predominantly sand. Between Birkenhead Lake and D'Arcy, pockets of moderately to strongly calcareous compact till occur, apparently related to the local bedrock which is composed of argillite, limestone, tuff, and conglomerate bedrock (Roddick and Hutchison, 1973).

E. Organic deposits

"Materials resulting from vegetative growth, decay and accumulation in and around closed basins or on gentle slopes, where the rate of accumulation exceeds that of decay. Organic deposits contain at least 30% organic matter, by weight, and are greater than 40 cm deep in sedge peats or greater than 60 cm deep in bog peats" (ELUC Secretariat, 1976).

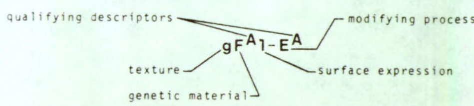
Organic deposits occur throughout the study area in wet depressions and in seepage sites on the valley bottoms. Some occur in areas where seepage water from the valley walls is present and the underlying mineral material is coarse textured. Examples are: part of the large organic deposit on the north side of the Lillooet River west of North Creek, the organic deposits between Wolverine and Railroad Creeks, and the more shallow deposits northwest of Ryan Creek. Others, such as those near Pemberton and on the Mt. Currie Indian Reserve near the Old Town, are associated with very poorly drained fine textured fluvial deposits. This is also the case for the organic deposits in the Gates River and Blackwater Creek valleys.

The organic deposits in the entire study area are generally quite shallow (< 1 m) but occasionally they are deeper as are those south of Miller Creek, and west of Wolverine Creek.

Legend for Figures 9 - 15: Terrain Maps

EXPLANATION OF LETTER NOTATION

A combination of letters is used to designate each map unit. The relative position of letters within the symbol indicates the characteristic that they represent.



Units consisting of two or more types of terrain are designated by two or more groups of letters separated by dots and slashes:-

e.g. **gFt/dCf** (See Composite Units below)

Material underlying the surface unit is shown by a symbol that is written beneath the surface unit symbol and separated from it by a horizontal line:-

e.g. $\frac{\mathbf{sEv}}{\mathbf{gFt}}$

TEXTURE

letter symbol	name	particle size (mm)	description
Specific Clastic Terms			
b	bouldery	> 256	rounded or subrounded particles
k	cobbly	64-256	rounded or subrounded particles
s	sandy	.062-2	rounded or angular particles
s̸	silty	.0039-.062	rounded or angular particles
Common Clastic Terms			
a	blocky	> 256	angular and subangular particles
r	rubbly	.062-256	angular and subangular particles, may include interstitial sand
g	gravelly	> 2	rounded and subrounded particles
f	fines	< .062	a mixture of silt and clay size particles, may contain a minor fraction of fine sand
Specific Organic Terms			
f	fibric		the least decomposed of all organic materials; there is a large amount of well-preserved fibre that is readily identifiable as to botanical origin; fibres retain their character upon rubbing
m	mesic		organic material in an intermediate stage of decomposition; intermediate amounts of fibre are present that can be identified as to their botanical origin

Notes:- (1) The absence of a textural term from a unit symbol indicates that texture of the material was not observed in the field and cannot be reliably interpreted from air photos. The reader is referred to the general textural descriptions under the heading Genetic Materials (below).

(2) Where two textural terms are used together, they are written in order of increasing importance. e.g. s̸s is silty sand.

GENETIC MATERIALS

letter symbol	name (process status*)	
A	anthropogenic (A)	man-made or modified materials including those associated with mineral exploitation and waste disposal.
C	colluvial (A)	products of mass wastage; includes rubbly bedrock-derived material and material derived from unconsolidated Quaternary sediments; includes earthflow, mudflow and landslide deposits and talus material. - generally consists of massive to moderately well-stratified sediments with a great range of particle sizes.
F	fluvial (I)	material transported and deposited by streams and rivers; alluvial materials. - generally consists of moderately to well-bedded and moderately to well-sorted gravels and/or silt.
M	morainal (I)	material deposited directly by glaciers; till. - generally consists of compact, non-sorted and non-stratified material that contains a wide range of particle sizes and a matrix of silt or clay.
O	organic (A)	material resulting from the accumulation and decay of vegetative matter. - generally consists of peat, unstratified and locally containing minor amounts of marl and inorganic detritus.
O^F	organic (fen) (A)	peat material consisting of well to moderately decomposed sedges (Carex spp.); water table is commonly at the surface; vegetation dominantly consists of sedges, grasses and reeds with some shrub cover.
R	bedrock (I)	outcrops and rock covered by less than 10 cm of unconsolidated material.

*See QUALIFYING DESCRIPTORS - for definition of PROCESS STATUS

QUALIFYING DESCRIPTORS

letter symbol	name	description
B,F,S	bog, fen, swamp	- used where possible to supply additional information about units of organic material. (See O^B, O^F and O^S above.)
A,I	active, inactive process status descriptors	- used to qualify genetic materials and modifying processes with regard to their current state of activity. Active: there is evidence that a modifying process is either operating continuously or is of a recurrent nature at the present time; there is evidence that the process of formation of a genetic material is operative at the present time. Inactive: there is no evidence to suggest that a modifying process is continuing or recurrent; the process of formation of a genetic material has ceased. A process status descriptor is designated for each genetic material and for each modifying process on the basis of their most common state of activity at the present time. (See process status column in Genetic Materials and Modifying Processes above.) Process status descriptors are shown in unit symbols on the map only where the current state of activity is contrary to the designated state.

SURFACE EXPRESSIONS

letter symbol	name	description
a	apron	a relatively gentle slope at the foot of a steeper slope, and formed by materials derived from the steeper slope
b	blanket	a mantle of unconsolidated material which has no constructional form of its own, but derives its general surface expression from the topography of the unit which it overlies; it masks minor topographic irregularities in the underlying unit and is more than 1 m thick. - if the underlying unit consists of unconsolidated materials, it is shown in the unit symbol; if no underlying unit is shown, it may be assumed to be bedrock.
f	fan	a surface that is the sector of a cone.
h	hummocky	steep-sided hillocks and hollows that are rounded or irregular in plan; slopes of 15 to 35° predominate on unconsolidated materials, and slopes of 15 to 90° predominate on bedrock; local relief is greater than 1 m.
l	level	a flat or gently inclined (less than 5°) surface with uniform slope and local relief of less than 1 m.
s	steep	steeply inclined erosional slopes (scarps) with gradients commonly greater than 35° on unconsolidated materials and greater than 35° on bedrock.
t	terrace	scarp face and the horizontal or gently inclined surface (tread) above it; usually applied to both the scarp and the flat tread - to the whole feature of the landscape
v	veneer	a mantle of unconsolidated material which has no constructional form of its own, but derives its surface expression from the topography of the underlying unit; it reflects minor irregularities of the underlying surface, is generally between 10 cm and 1 m in thickness, and outcrops of the underlying unit are common. - if the underlying material is unconsolidated, it is included in the unit symbol; if no underlying unit is indicated, it is assumed to be bedrock.

*See QUALIFYING DESCRIPTORS - for definition of PROCESS STATUS

MODIFYING PROCESSES

letter symbol	name (process status*)	description
A	Avalanched (A)	the modification of slopes by frequent avalanche acitivity. Avalanches are rapid downslope movements of snow, ice, and other incorporated debris, commonly associated with areas of high relief and moderate to heavy snowfall.
E	Channelled (I)	the modification of surfaces by a channel or channels; applied to fluvial plains, terraces, and fans; abandoned channels on fluvial deposits
V	Gullied (A)	the modification of surfaces by fluvial erosion, resulting in the development of parallel and subparallel, steep sided and narrow ravines in both consolidated and unconsolidated materials.
W	Washed (I)	Modification of a deposit or feature by wave action in a body of standing water, resulting in lag deposits, beaches of lag materials and wave-cut platforms.

COMPOSITE UNITS

Composite units are employed where two or three types of terrain are intermixed or occupy such small areas that they cannot be designated as separate units at the scale of mapping. Symbols (defined below) are used to indicate the relative amounts of each terrain type, and the components are always written in decreasing order of importance.

: the components on either side of this symbol are approximately equal

/ the component in front of the symbol is more extensive than the one that follows

// the component in front of the symbol is considerably more extensive than the one that follows

e.g. Mb//R — Mb is considerably more extensive than R

Mb//R:Cv — Mb is considerably more extensive than R; R and Cv are of roughly equal extent

Mb/R//Cv — R is less extensive than Mb; Cv is considerably less than R

1:20 000 mapping available from:
The Librarian
Resource Analysis Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X4

Reference:
"Terrain Classification System", (RAB 1976)

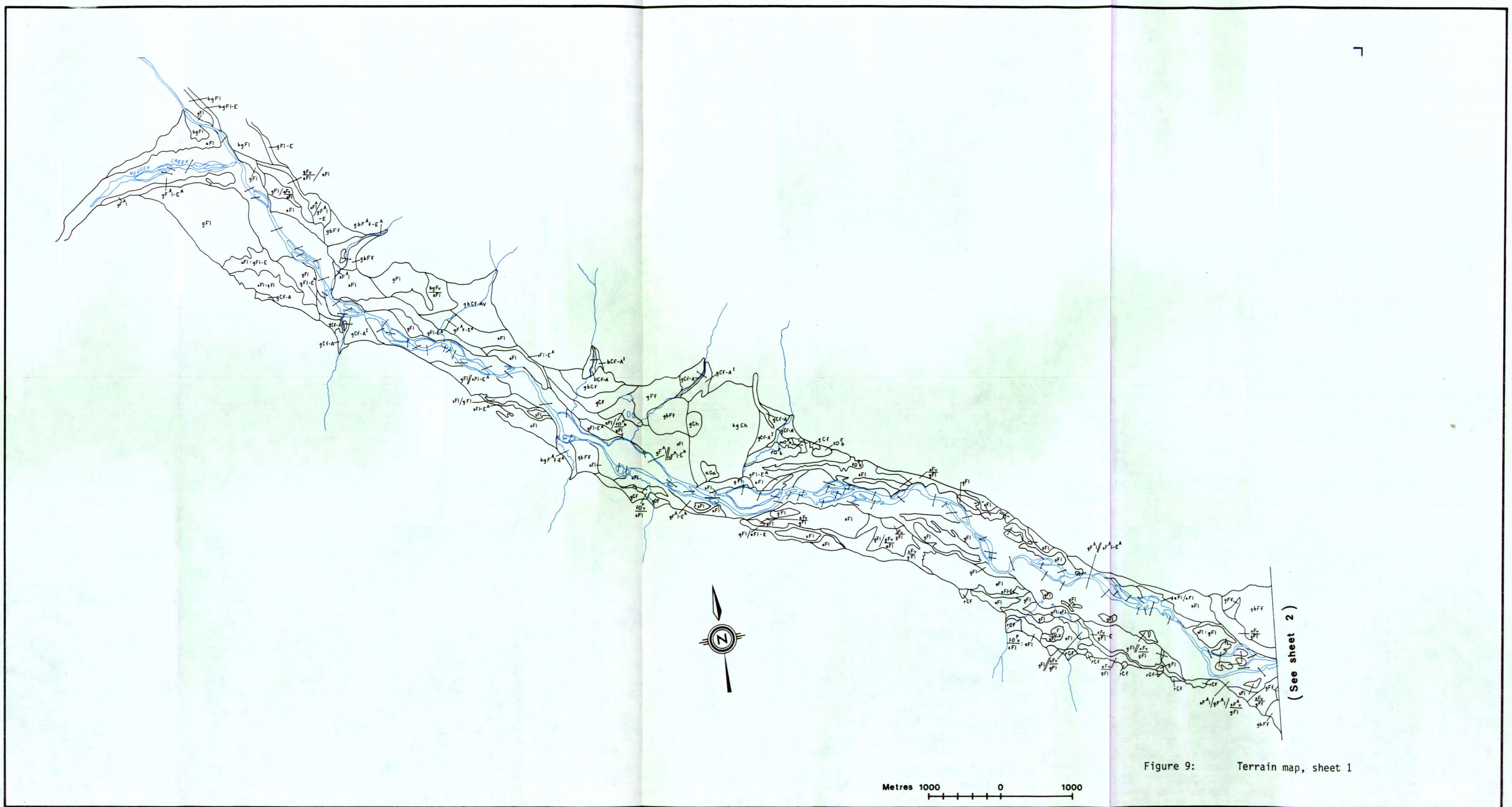


Figure 9: Terrain map, sheet 1

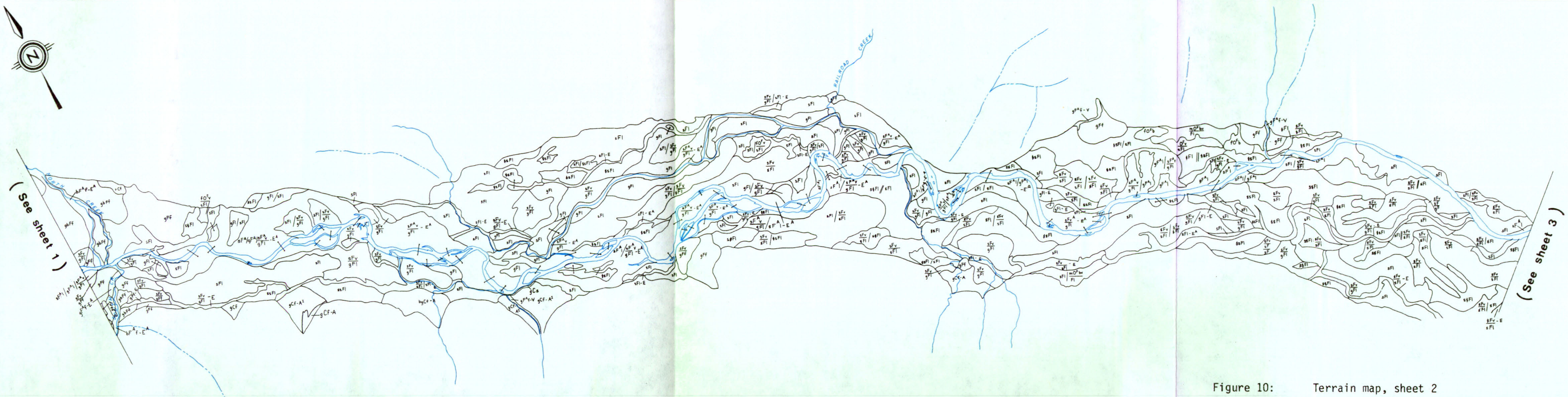


Figure 10: Terrain map, sheet 2

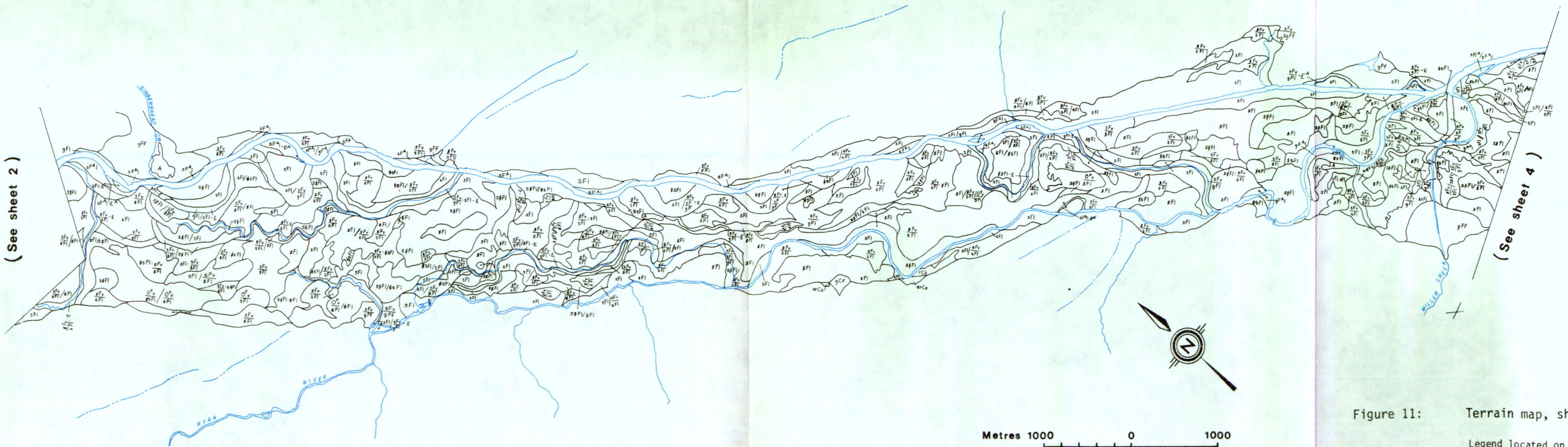


Figure 11: Terrain map, sheet 3

Legend located on page 32

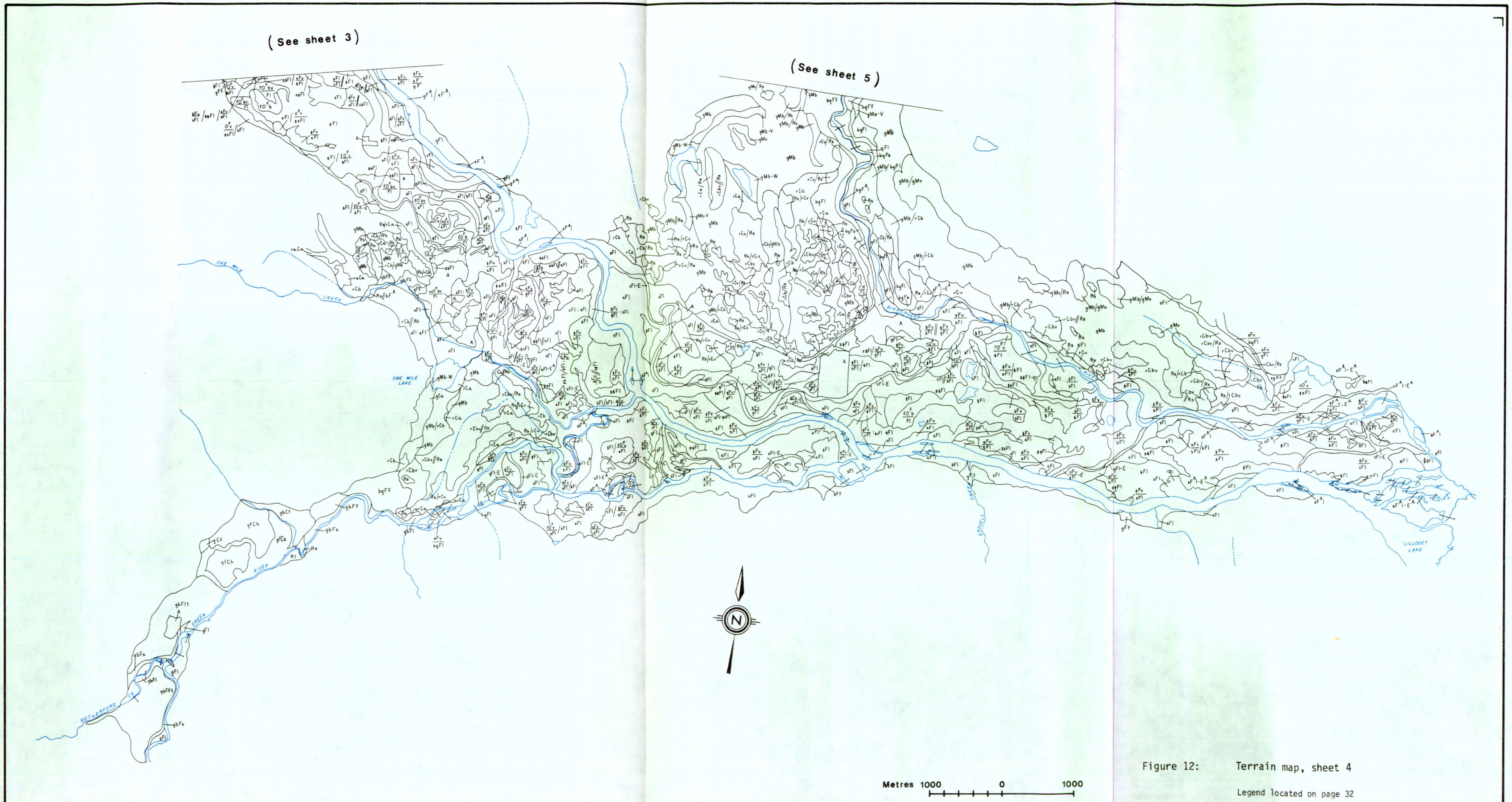


Figure 12: Terrain map, sheet 4

Legend located on page 32

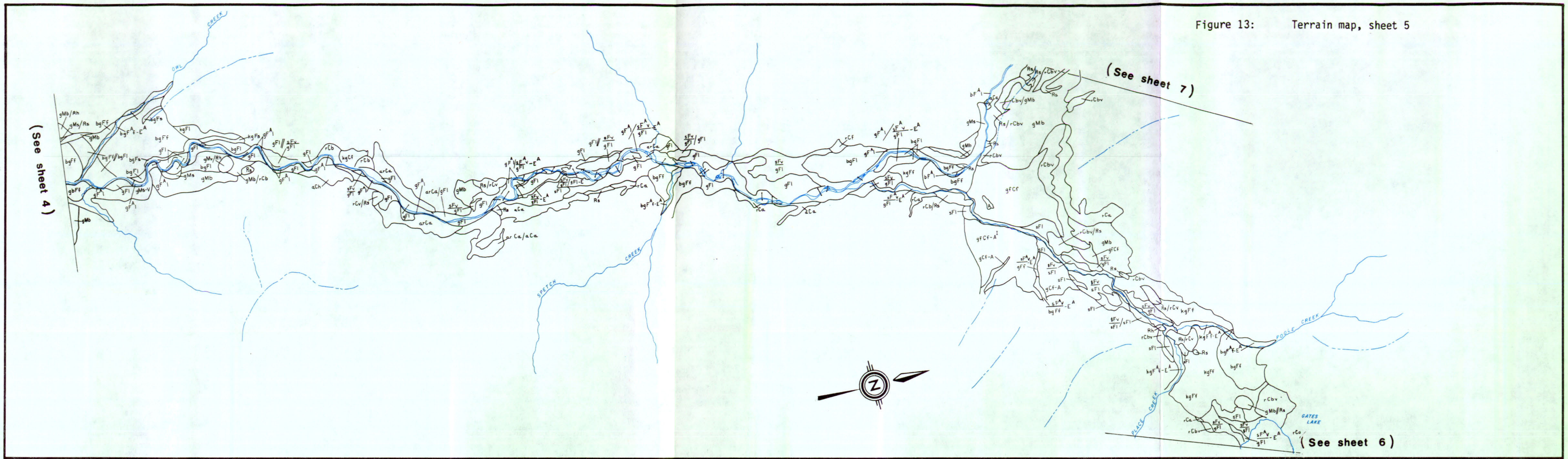


Figure 13: Terrain map, sheet 5

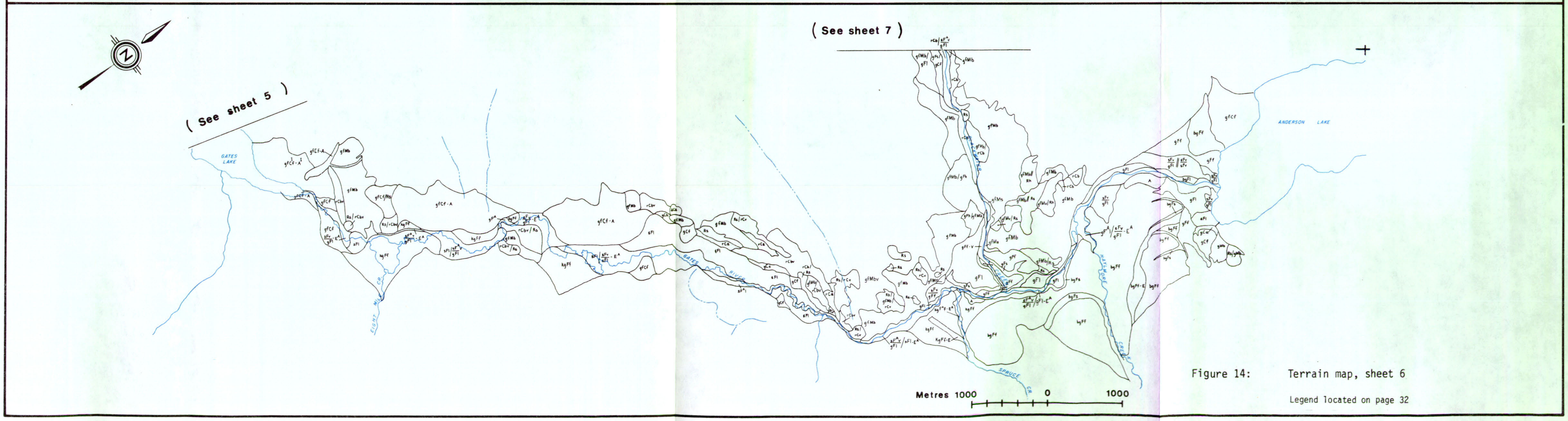


Figure 14: Terrain map, sheet 6

Legend located on page 32

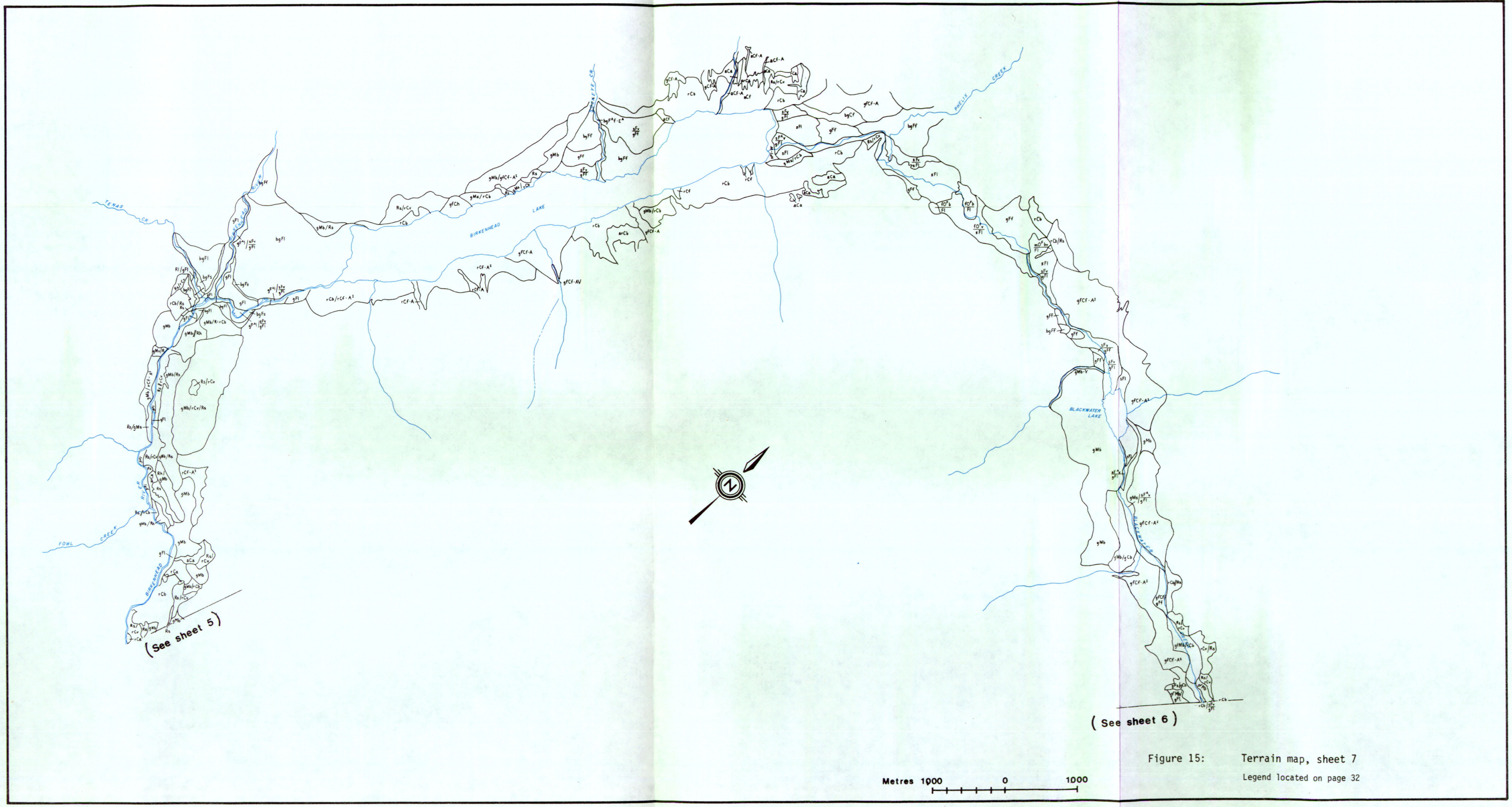


Figure 15: Terrain map, sheet 7

Legend located on page 32

chapter 5

SOILS OF THE STUDY AREA

5 SOILS OF THE STUDY AREA

As previously discussed, soils are the product of climate acting through vegetation and animal life as conditioned by relief or topography and subsequent moisture relationships on geologic materials over time. Table 3 indicates the relationship between bedrock, unconsolidated geologic deposits (soil parent materials), soil profile development (soil classification) and the identified soil series.

5.1 Description of Soil Series

The characteristics of the named soil series in Table 3 are described individually in the section following. In this section each soil is described as to selected morphological, chemical, and physical attributes. Representative detailed soil profile descriptions and attendant analyses of the more common soil series of the study area are located in Appendix 2. Those soils which are described in the appendix are asterisked. Detailed descriptions of the less common soil series are available from the B.C. Soil Data File referenced earlier.

The soil series descriptions in this section are grouped according to soil parent material and relative geographical location within the study area. The terminology used is defined either in the "System of Soil Classification for Canada", (1978), the CANSIS "Manual for Describing Soils in the Field", (1975), or in the "Glossary of Terms."

5.1.1 Soils formed in Colluvial Materials

A. Lillooet River area

Callaway series (CA)

The Callaway series are formed generally in actively accumulating, intrusive bedrock derived, colluvial deposits in the Lillooet River valley. Callaway soils are acid, rapidly drained, rapidly pervious, and moderately stony, angular, very gravelly sand; angular, very gravelly loamy sand; or angular, very gravelly sandy loam throughout the control section. These soils are found primarily on very strong to very steep slopes (for slope class definition see Glossary of Terms). They are classified as Orthic Regosol and have little or no horizon development with only a trace of organic litter formed primarily from moss vegetation covering the surface.

Table 3: Relationships of parent materials to soil development and soil series identified

PARENT MATERIALS*	Bedrock	SOIL DEVELOPMENT													
		Orthic Regosol	Gleyed Regosol	Orthic Dystric Brunisol	Eluviated Dystric Brunisol	Gleyed Melanic Brunisol	Orthic Eutric Brunisol	Rego Gleysol	Rego Gleysol: cumulic phase	Rego Gleysol: peaty phase	Rego Humic Gleysol	Rego Humic Gleysol: cumulic phase	Terric Fibrisol	Terric Mesic Fibrisol	Terric Mesisol: cumulo phase
Rubbly, sandy colluvial apron and fan deposits	acidic calcareous	Callaway Chumley													
Cobbly, rubbly, sandy colluvial (landslide and mudflow) fan deposits	acidic			Clausen											
Blocky, rubbly, sandy colluvial apron, blanket and fan deposits	acidic calcareous	Cloutier Combow													
Rubbly, sandy colluvial veneer deposits							Collister								
Rubbly, sandy colluvial blanket deposits	acidic calcareous			Conroy			Cosulich								
Rubbly, sandy colluvial avalanche track and fan deposits	acidic calcareous			Cottingham			Cowell								
Gravelly, sandy fluvial fan deposits	acidic	Farmer													
Cobbly, gravelly, sandy fan deposits	calcareous						Fougberg								
Twenty to 50 cm of sandy fluvial veneer overlying bouldery and/or gravelly fluvial fan deposits	calcareous						Franks								
Bouldery, gravelly, sandy fluvial fan deposits	acidic calcareous	Frontier					Flichel								
Twenty to 50 cm of sandy fluvial veneer overlying gravelly morainal or fluvial deposits which have been reworked by wave action of adjacent lakes							Fotsch								
Sandy flood plain deposits	acidic	Gates Lake	Wolverine					Ranson Scobie							
Gravelly, sandy, flood plain deposits	acidic calcareous	Gilmore Giguere	Whitehead Wuschke												
Bouldery, gravelly, sandy fluvial terrace deposits	acidic calcareous			Grundy			Guthrie								

*Terms used are those defined in the "Terrain Classification System", R.A.B., 1976.

Table 3 cont'd: Relationships of parent materials to soil development and soil series identified

PARENT MATERIALS*	Bedrock	SOIL DEVELOPMENT Orthic Regosol	Gleyed Regosol	Orthic Dystric Brunisol	Eluviated Dystric Brunisol	Gleyed Melanic Brunisol	Orthic Eutric Brunisol	Rego Gleysol	Rego Gleysol: cumulic phase	Rego Gleysol: peaty phase	Rego Humic Gleysol	Rego Humic Gleysol: cumulic phase	Terric Fibrisol	Terric Mesic Fibrisol	Terric Mesisol: cumulo phase
Fifteen to 40 cm of organic material overlying silty flood plain deposits	acidic calcareous									Nairn Falls Naylor					
Fifteen to 40 cm of organic material overlying sandy flood plain deposits	acidic									Nesuch					
Fifteen to 40 cm of organic material overlying sandy, silty flood plain deposits	acidic									Newberry					
Silty flood plain deposits	acidic					Tenquille		Rutherford Sankey			Quamell	Valicau Vickberg			
	calcareous							Regand Sinnes			Questt	Van Beem			
Twenty to 50 cm of sandy fluvial veneer overlying gravelly, sandy flood plain deposits	acidic calcareous		Walden Wheeler					Ronayne Rivers							
Sandy, silty flood plain deposits	acidic							Renville Sister				Viccars			
Silty, sandy flood plain deposits	acidic		Wildfong					Sangster							
Twenty to 50 cm of sandy fluvial veneer overlying silty flood plain deposits	acidic		Wittal					Shantz				Verlinden			
Twenty to 50 cm of silty fluvial veneer overlying sandy flood plain deposits	acidic calcareous		Wallace Winters					Scullard Summerskill							
Gravelly, sandy morainal blanket and veneer deposits	acidic calcareous				Yantzie		Yvonne								
Sixty to 160 cm of poorly decomposed organic material overlying mineral material	acidic													Zurbrugg	
Sixty to 160 cm of poorly decomposed organic material with layers of mineral material interbedded	acidic calcareous												Zurcher Zaruba		
Forty to 160 cm of moderately decomposed organic material with layers of mineral material interbedded	acidic														Zoltay

*Terms used are those defined in the "Terrain Classification System", R.A.B., 1976.

Clausen series (CC)

Clausen series occur mainly on landslides and mudflow fans derived from unconsolidated, acidic surficial geologic materials in the Green and Birkenhead river valleys. The soil textures are angular cobbly, gravelly sandy loam or angular cobbly, gravelly loamy sand. Clausen series occurs on gentle to very steep slopes. They are well drained, very to exceedingly stony and moderately pervious. The Clausen soils are generally acid and are classified as Orthic Dystric Brunisol. A few isolated pockets in the Gates River area occur which are calcareous to the surface. These have been included in the Clausen series as Clausen:calcareous variant (CA:cv), due to the extremely limited acreage of this variant and its close morphological similarity to the modal Clausen soil. The Clausen soils are characterized by thin (<4 cm) LFH horizons underlain by thin (<5 cm) black mineral surface horizons. These overlie dark yellowish brown mineral horizons which grade to gray at about 25 cm depth. Roots are found to the depth of the control section. Clausen series usually supports a Douglas-fir forest which commonly has an understory of red alder, common paper birch, willow, wild rose, common Saskatoon , Oregon boxwood, and some grasses.

Collister series (CE)

Collister series have formed in shallow (<1 m) colluvial veneer deposits derived from intrusive bedrock throughout the study area. These soils range from gravelly sand to gravelly sandy loam in texture. They are well to rapidly drained, moderately to rapidly pervious, very to exceedingly stony, and occur on a range of slopes from gentle to steep. Collister series soils are generally acid although small inclusions of calcareous soils may occur in areas of locally calcareous bedrock. These soils are mostly Orthic Dystric Brunisols, but Orthic Eutric Brunisols may occur as inclusions within mapping units and are calcareous within 50 cm of the surface. The Collister soils generally have an LFH horizon of 10 cm thickness or greater overlying a thin (<2 cm) light gray surface mineral horizon. This in turn overlies a yellowish brown mineral horizon that grades to gray at about 35 cm depth or may reach bedrock within 50 cm. Roots are encountered to the depth of the profile. Collister series is commonly associated with Douglas-fir forest and the associated species, trembling aspen, lodgepole pine, kinnickinnik, western twinberry and some grasses.

Conroy series (CF)

Conroy series have formed in blankets (>1 m) of colluvial deposits which are derived from, overlie and conform, generally, to the shape of the underlying acidic bedrock. These soils are well drained, moderately pervious, very to exceedingly stony, and angular gravelly sandy loam to angular gravelly fine sandy loam. The soils occur on slopes ranging from gentle to steep throughout the study area. Conroy series soils are acid and classified as Orthic Dystric Brunisol. They commonly have about 10 cm of LFH horizon overlying dark yellowish brown mineral soil that grades to gray at approximately 35 cm depth. Roots occur throughout the soil profile. The Conroy series is associated with Douglas-fir forest including the associated vegetation of trembling aspen, lodgepole pine, western twinberry, kinnickinnik, and some grasses.

Cottingham series (CH)

The Cottingham series have formed in the colluvial deposits of avalanche tracks and fans derived from acidic unconsolidated material in the upper Lillooet River valley generally at the foot of steep slopes, on north and west aspects. These soils are angular gravelly sand and angular gravelly loamy sand with minor inclusions of angular gravelly sandy loam and angular gravelly fine sandy loam. They are acid, well drained, moderately to rapidly pervious, moderately to very stony, and occur on moderate to steep slopes. Cottingham series soils are classified as Orthic Dystric Brunisol. However, on the active portions of the avalanche tracks, inclusions of Orthic or Cumulic Regosol occur. Soils of the Cottingham series have little (<5 cm) or no LFH horizon development but have a yellowish brown mineral horizon which grades to gray at about 35 cm depth. Roots are encountered throughout the soil profile. The vegetation associated with this series is commonly red alder, bog glandular birch, willow, and mosses. A variant of the series is mapped which is very bouldery and is called Cottingham:bouldery variant (CH:bv).

B. Birkenhead River, Blackwater Creek, Gates River area

Chumley series (CB)

Soils of the Chumley series are classified as Orthic Regosols and occur on actively forming colluvial fan and apron deposits derived from the local calcareous metasedimentary bedrock. They are angular very gravelly sandy loam or angular very gravelly loamy sand. The soils are rapidly drained, rapidly pervious, moderately stony, slightly to moderately calcareous in the soil parent material and occur on very strong to very steep slopes. Chumley soils exhibit little or no horizon development. Little or no vegetation is present with the exception of some mosses and lichens found on the surface of stones.

Cloutier series (CD)

Cloutier series soils occur commonly in actively forming colluvial rock fall deposits derived from acidic intrusive bedrock, primarily in the Birkenhead River valley, but also occasionally in the upper Lillooet River valley. The soils are composed of very large angular blocks of rock, with a matrix of very gravelly sand or very gravelly loamy sand. They are rapidly drained, rapidly pervious, extremely stony and occur on gentle or very strong to steep slopes. The soils of the Cloutier series are acid throughout and are classified as Orthic Regosol. There is little or no horizon development and the only vegetation associated are mosses and lichens found on the rock surfaces.

Cosulich series (CG)

Cosulich series soils have formed in relatively shallow, usually <2 m thick, colluvial deposits which overlie and are derived from calcareous metasedimentary bedrock. The soils are very to excessively stony, angular gravelly sand or angular gravelly loamy sand with minor inclusions of angular gravelly sandy loam. They are slightly to moderately calcareous in the soil parent material, well drained, and moderately to rapidly pervious. The soils of the Cosulich series are classified as Orthic Eutric Brunisol generally having an LFH horizon >5 cm thick overlying reddish brown mineral soil which grades to gray at about 40 cm depth. Tree roots occur throughout the solum of the soil. Vegetation commonly associated with the Cosulich series includes Rocky Mountain Douglas-fir, western white pine, white spruce, common paper birch, red alder, willow, western thimble berry, Oregon boxwood, pipsissewa, and some grasses.

Cowell series (CI)

Cowell series soils have developed in the colluvial deposits of avalanche tracks and fans derived from metasedimentary bedrock in the Birkenhead River, Blackwater Creek, and Gates River valleys. The soils are moderately stony, angular gravelly sand, angular gravelly loamy sand and occasionally, angular gravelly sandy loam. The Cowell series occurs on strong to steep slopes. They are slightly to moderately calcareous in the soil parent material, well drained, and moderately pervious. They are classified as Orthic Eutric Brunisol although the active portions of the avalanche tracks may also contain inclusions of Orthic or Cumulic Regosols. Cowell soil profiles have LFH horizons of 6 cm or more in thickness which are underlain by reddish brown mineral soil grading to gray at about 25 cm depth. Roots occur throughout the solum of the soil. Red alder, bog glandular birch, willow and mosses are the vegetation commonly associated with the Cowell series.

Combow series (CW)

Soils of the Combow series have formed and are forming in active colluvial deposits derived from calcareous metavolcanic and metasedimentary bedrock in the Birkenhead River and Birkenhead Lake valleys. The Combow series soils are composed of large, angular rock blocks which have an angular gravelly sand, angular gravelly loamy sand and occasionally, angular gravelly sandy loam textured matrix. They are slightly to moderately calcareous throughout the soil profile, well to rapidly drained, rapidly pervious, extremely stony, and occur on very strong to steep slopes. Combow series soils are classified as Orthic Regosol, showing little or no soil profile development. They have sparse vegetative cover predominantly in the form of mosses and lichens on the rock surfaces.

5.1.2 Soils formed in Fluvial Materials

A. Lillooet River area

Farmer series (FA)

Farmer series soils have formed in the fluvial fan deposits of Miller and Wolverine creeks and other small tributaries to the Lillooet River. The soils, where the streams have not been channelized, are prone to periodic flooding. Soils of the Farmer series are moderately stony, gravelly sand or gravelly loamy sand with occasional lenses of sandy loam or fine sandy loam occurring in the soil profile. They are well drained, moderately pervious, acid Orthic Regosol which occur on very gentle to gentle slopes (for slope definition see Glossary of Terms). Tree roots are encountered throughout the profile. Where Farmer soils are vegetated they support western red cedar, western hemlock, coast Douglas-fir and some red alder, common paper birch and Rocky Mountain maple.

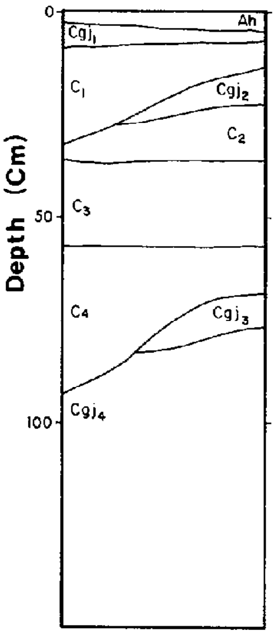
Frontier series (FR)

Frontier soils have formed in bouldery, gravelly fluvial fan deposits of large streams, such as North and Rutherford creeks, which are tributary to the Lillooet and Green Rivers. They are characteristically bouldery and extremely stony, very gravelly sand, very gravelly loamy sand or less commonly, very gravelly sandy loam. The soils are acid throughout, well drained, moderately to rapidly pervious, Orthic Regosols occurring on very gentle to moderate slopes. Portions of these soils are subject to periodic flooding, particularly those areas immediately adjacent to the present stream channels. Occasionally soils occur which are similar to Frontier but have thick (>25 cm) lenses of sand between 50 and 100 cm depth. These variants have been mapped as Frontier:coarse at depth (FR:cd). Tree roots are encountered throughout the soil profile. The vegetation associated with Frontier soils is predominantly black cottonwood with western red cedar, coast Douglas-fir, lodgepole pine, willow, horsetails and ferns.

Gates Lake series (GA)*

Gates Lake series soils occur on sandy fluvial deposits within the present-day channel of the Lillooet River as well as in some areas which have been severed from the normal river channel by diking and channelization. Soils of this series which are situated outside of the dikes are prone to periodic flooding and fluctuating ground water tables which are determined by seasonal river levels. The Gates Lake series is nonstony, sandy loam or fine sandy loam, usually grading to sand at depth. A thin (<5 cm) layer of loam or silt loam is commonly present on the surface. It is acid, well to moderately well drained, moderately pervious, and occurs on level to very gentle slopes. Soils of the Gates Lake series exhibit little or no soil profile development and are classified as Orthic Regosol. Variants occur which have gravelly sand or gravelly loamy sand occurring between 50 and 100 cm depth and are mapped as Gates Lake:gravelly at depth (GA:gd). Thin, discontinuous lenses of silt loam may be encountered in some profiles. There is sparse vegetative cover associated with Gates Lake soils, especially where they occur outside of the dikes. Within the dikes they are commonly vegetated by black cottonwood, western red cedar, red alder, willows, and horsetails. A few tree roots are encountered throughout the depth of the soil profile.

A diagram and brief description of a representative Gates Lake series soil profile, which was sampled, is presented in Figure 16.



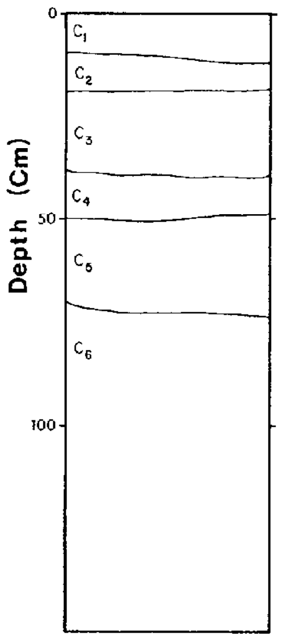
Ah	Very dark grayish brown loam; 2 to 4 cm thick; pH 4.8 (0.01M $CaCl_2$)
Cgj_1	Dark grayish brown fine sandy loam with prominent dark yellowish brown mottles; 2 to 6 cm thick; pH 4.8 (0.01M $CaCl_2$)
C_1	Grayish brown sandy loam; 7 to 24 cm thick; pH 4.7 (0.01M $CaCl_2$)
Cgj_2	Dark grayish brown fine sandy loam with prominent dark yellowish brown mottles; 0 to 9 cm thick; pH 4.7 (0.01M $CaCl_2$)
C_2	Grayish brown and dark gray loamy sand; 4 to 14 cm thick; pH 4.7 (0.01M $CaCl_2$)
C_3	Grayish brown loamy sand; 11 to 36 cm thick; pH 4.5 (0.01M $CaCl_2$)
C_4	Grayish brown loamy sand; 11 to 36 cm thick; pH 4.5 (0.01M $CaCl_2$)
Cgj_3	Grayish brown loamy sand with prominent yellowish red mottles; 0 to 8 cm thick; pH 4.6 (0.01M $CaCl_2$)
Cgj_4	Grayish brown sand with prominent yellowish brown mottles; pH 4.8 (0.01M $CaCl_2$)

Figure 16: Soil profile and abridged description of the Gates Lake series

<u>Gilmore series</u> (GI)

Gilmore series soils are generally developed on gravelly fluvial deposits within the present day or recently abandoned channels of the Lillooet River and some of its larger tributaries such as Meager Creek. Soils of the Gilmore series are prone to periodic flooding and fluctuating ground water tables as determined by river levels and are subject to active river channelling as the river migrates back and forth across its flood plain. The Gilmore series soils are moderately stony, gravelly sand or gravelly sandy loam, often with lenses of loamy sand or sandy loam encountered within the soil profile. They are acid, well to moderately well drained, moderately to rapidly pervious, occur on level to very gentle slopes and are classified as Orthic Regosol. Some tree roots occur throughout the soil profile. In a few areas these soils have sand lenses (>25 cm thick) occurring at varying depths below 50 cm or contain substantial amounts of boulders within the soil profile. These have been mapped as Gilmore:coarse at depth (GI:cd) or Gilmore: bouldery (GI:bv) variants respectively. Gilmore soils are generally sparsely vegetated having occasional shrubby coast Douglas-fir, lodgepole pine, black cottonwood, willow and some horsetails.

A diagram and brief description of a representative Gilmore series soil profile, which was sampled, is presented in Figure 17.



C_1 Olive gray and light gray gravelly sand; 9 to 11 cm thick; pH 4.7 (0.01M $CaCl_2$)

C_2 Olive gray and light gray coarse sand; 7 to 9 cm thick; pH 5.0 (0.01M $CaCl_2$)

C_3 Olive gray and light gray gravelly sand; 20 to 22 cm thick; pH 5.1 (0.01M $CaCl_2$)

C_4 Olive gray and light gray coarse sand; 9 to 12 cm thick; pH 5.2 (0.01M $CaCl_2$)

C_5 Olive gray and light gray gravelly sand; 20 to 24 cm thick; pH 5.1 (0.01M $CaCl_2$)

C_6 Dark olive gray and light gray gravelly sand; pH 5.1 (0.01M $CaCl_2$)

Figure 17: Soil profile and abridged description of the Gilmore series

Grundy series (GR)

Grundy series soils have formed on bouldery, gravelly, fluvial terraces in the Green River valley, and in the Lillooet River valley near its junction with Meager Creek. The Grundy series soils are exceedingly stony, bouldery gravelly sand or bouldery gravelly loamy sand with occasional inclusions of bouldery gravelly sandy loam. The soils are well to rapidly drained, rapidly to moderately pervious, and acid throughout. They occur on nearly level to very gentle slopes with strong to steep slopes along the terrace escarpments. Soils of the Grundy series are classified as Orthic Dystric Brunisol. They commonly have a thin (<5 cm) LFH horizon which overlies reddish brown horizon that grades to gray at about 30 cm depth. Tree roots occur throughout the depth of the soil profile. Vegetation associated with the Grundy series is predominantly lodgepole pine with minor coast Douglas-fir, kinnickinnik, and some grasses.

Nairn Falls series (NA)

Nairn Falls soils occupy limited area and have formed on the silty fluvial deposits of the Lillooet River flood plain which are capped by shallow organic material. The Nairn Falls series is composed of 15 to 40 cm (if moderately decomposed) or up to 60 cm (if poorly decomposed) of organic material overlying nonstony silt loam or silty clay loam, occasionally with bands of loam or silt as a result of periodic flooding. These soils are acid throughout, poorly to very poorly drained due to seasonally high ground water tables, and moderately to slowly pervious. They occur on level to nearly level slopes and in slightly depressional areas. The Nairn Falls series is classified as a Rego Gleysol:peaty phase. In a few cultivated areas some Rego Humic Gleysols are included where the organic matter has decomposed or underlying mineral material has been incorporated to the point where the surface horizon no longer is organic. Roots are encountered to about 35 cm depth. Where the Nairn Falls series has not been cultivated the native vegetation is composed primarily of willow, sedge, and some grasses.

A diagram and brief description of a sampled Nairn Falls series soil profile is presented in Figure 18.

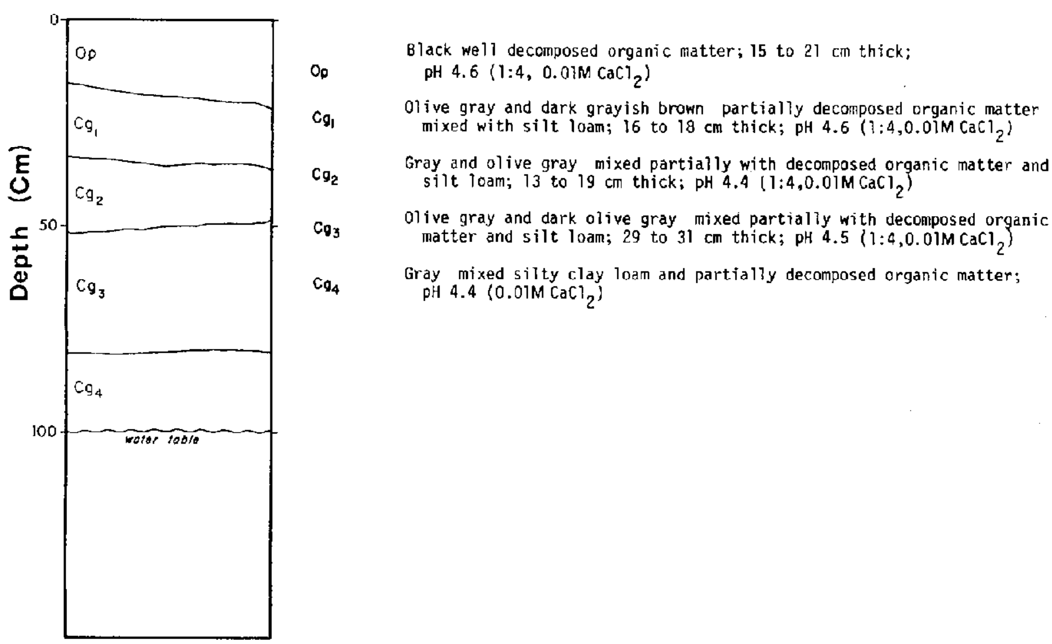
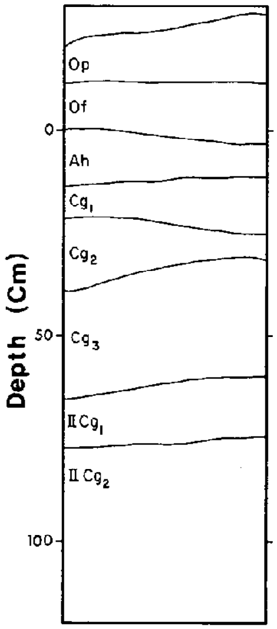


Figure 18: Soil profile and abridged description of the Nairn Falls series

<u>Nesuch series</u> (NE)

Nesuch series soils have developed in shallow organic materials overlying sandy fluvial deposits on the Lillooet River flood plain. Soils of the Nesuch series are composed of a surface organic layer, 15 to 40 cm in thickness (if moderately decomposed) or 15 to 60 cm in thickness (if poorly decomposed) which overlies nonstony sandy loam commonly grading to loamy sand or sand below 50 cm depth. These soils are moderately to rapidly pervious, poorly to very poorly drained due to seasonally high ground water tables, and acid throughout. They occur on level to nearly level slopes in slightly depressional areas. Roots are encountered to about 85 cm depth. They are classified as Rego Humic Gleysol:peaty phase. Nesuch series occur in association with Zurbrugg series and/or Ranson series in some areas. In areas where the Nesuch series has not been cultivated it is commonly vegetated with Douglas' spirea, willow, shrubby black cottonwood and sedge.

Figure 19, is a diagram and brief description of a typical sampled Nesuch series soil profile.



Op	Dark grayish brown plowed partially decomposed organic material; 10 to 17 cm thick; pH 4.3 (1:2,0.01M $CaCl_2$)
Of	Dark reddish brown well preserved organic material; 11 to 15 cm thick; pH 3.9 (1:5,0.01M $CaCl_2$)
Ah	Dark reddish brown loam; 8 to 14 cm thick; pH 4.0 (1:5,0.01M $CaCl_2$)
Cg_1	Grayish brown sandy loam with distinct light olive brown mottles; 6 to 14 cm thick; pH 4.3 (0.01M $CaCl_2$)
Cg_2	Grayish brown sandy loam with distinct brown mottles; 6 to 18 cm thick; pH 4.5 (0.01M $CaCl_2$)
Cg_3	Dark gray fine sandy loam with prominent dark yellowish brown mottles; 27 to 29 cm thick; pH 4.4 (0.01M $CaCl_2$)
$IICg_1$	Grayish brown loamy sand with distinct yellowish brown mottles; 12 to 15 cm thick; pH 4.2 (0.01M $CaCl_2$)
$IICg_2$	Grayish brown sand with distinct yellowish brown mottles; pH 4.3 (0.01M $CaCl_2$)

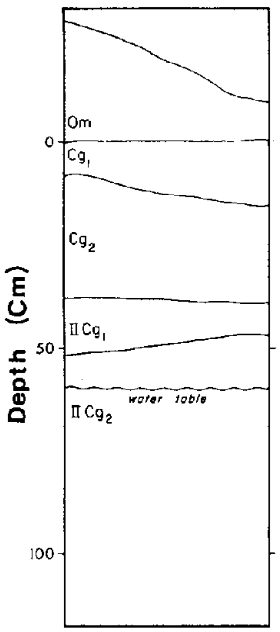
Figure 19: Soil profile and abridged description of the Nesuch series

Newberry series (NW)*

Newberry series soils have formed in shallow organic deposits overlying stratified silty and sandy fluvial deposits on the Lillooet River flood plain. The Newberry series is composed of surface organic materials of 15 to 40 cm in thickness (if moderately decomposed) or 15 to 60 cm thickness (if poorly decomposed) which overlie alternating layers of nonstony sandy loam and silty clay loam. The alternating layers are at least 5 cm thick and continuous across the soil profile.

The soils are acid throughout, moderately to slowly pervious, poorly to very poorly drained due to seasonally high ground water tables, and occur on level to nearly level slopes. Roots are encountered to about 35 cm depth. Newberry soils are classified as Rego Gleysol:peaty phase. They grade into Zurcher series (Terric Fibrisol) or Rutherford series (Rego Gleysol) in some areas. Native vegetation associated with Newberry series includes primarily hardhack with willow, shrub black cottonwood and sedge.

A diagram and brief description of a representative Newberry series soil profile, which was sampled, is presented in Figure 20.



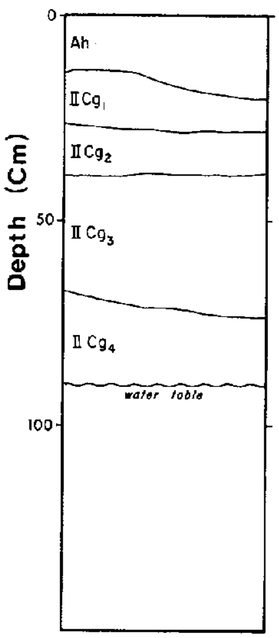
Om	Very dark brown moderately decomposed organic material; 10 to 30 cm thick; pH 4.2 (1:10,0.01M $CaCl_2$)
Cg_1	Olive and black sandy loam; 8 to 16 cm thick; pH 4.5 (0.01M $CaCl_2$)
Cg_2	Olive gray sandy loam with distinct reddish brown mottles; 23 to 30 cm thick; pH 4.7 (0.01M $CaCl_2$)
$IICg_1$	Dark grayish brown silt loam; 8 to 14 cm thick; pH 4.6 (0.01M $CaCl_2$)
$IICg_2$	Grayish brown silt loam; pH 4.6 (0.01M $CaCl_2$)

Figure 20: Soil profile and abridged description of the Newberry series

Quamell series (QM)

Quamell series soils have formed on silty flood plain deposits of the Lillooet River, mainly near Pemberton. The Quamell series soils are nonstony silt loam or silty clay loam throughout the control section. They are slowly pervious, poorly to very poorly drained due to seasonally high ground water tables, acid throughout, and occur on level slopes in depressional landscape positions. Roots commonly are encountered to about 65 cm depth. Surface ponding of water occurs on the Quamell series following heavy rainfall or snowmelt. The Quamell soils are classified as Rego Humic Gleysol and are limited in extent. Vegetation associated with these soils is primarily sedge, reed, rush, and willow.

A diagram and brief description of a typical Quamell series soil profile, which was sampled, is presented in Figure 21.



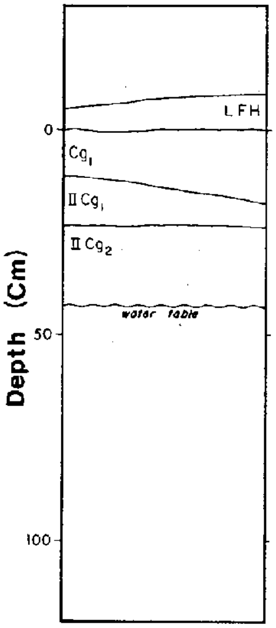
Ah	Very dark brown loam; 13 to 20 cm thick; pH 4.5 (0.01M $CaCl_2$)
IICg1	Grayish brown silt loam with prominent, dark yellowish brown mottles; 8 to 13 cm thick; pH 4.5 (0.01M $CaCl_2$)
IICg2	Dark grayish brown silt loam with prominent, reddish brown mottles; 11 to 13 cm thick; pH 4.5 (0.01M $CaCl_2$)
IICg3	Pale olive silty clay loam with prominent, yellowish red mottles; 29 to 35 cm thick; pH 4.6 (0.01M $CaCl_2$)
IICg4	Olive silt loam

Figure 21: Soil profile and abridged description of the Quamell series

Ronayne series (RA)

Ronayne series soils have formed in stream channels which are within the presently active flood plain and are periodically inundated. They also occur in stream channels truncated by diking and channelization, but which are seasonally inundated by underground seepage from the Lillooet River. These soils have formed in veneers (<1 m) of sandy fluvial deposits overlying gravelly fluvial deposits. Ronayne series soils consist of 20 to 50 cm of nonstony sand or loamy sand with occasional thin surface layers of silt or silt loam, that overlie moderately stony, gravelly and very gravelly sand or gravelly and very gravelly sandy loam. The soils are acid throughout, rapidly pervious, and very poorly drained as the result of high ground water levels which are dependent on the levels of water in the Lillooet River. Roots occur to about 25 cm depth. Ronayne series occurs in channels which are level to nearly level on the bed, but have moderate to strong slopes on the sides. The Ronayne series soils are classified as Rego Gleysol. They are sparsely vegetated, commonly by willow, shrub black cottonwood, and sedge.

Figure 22 is a brief description and diagram of a representative Ronayne series soil profile, which was sampled.



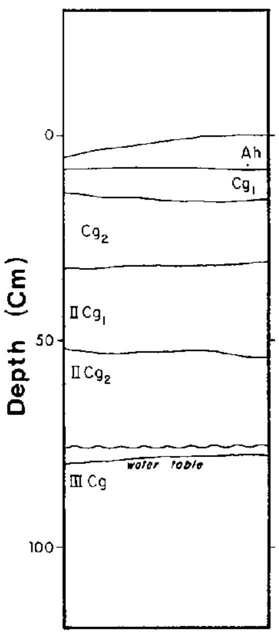
LFH	Black raw to well decomposed deciduous organic matter; 5 to 9 cm thick; pH 4.9 (1:10,0.01M $CaCl_2$)
Cg_1	Olive gray silt loam with prominent, dark yellowish brown mottles; 11 to 18 cm thick; pH 4.3 (0.01M $CaCl_2$)
$IICg_1$	Gray coarse sand, with prominent, yellowish brown mottles; 6 to 13 cm thick; pH 4.3 (1:10,0.01M $CaCl_2$)
$IICg_2$	Greenish gray very gravelly, loamy sand; pH 4.3 (0.01M $CaCl_2$)

Figure 22: Soil profile and abridged description of the Ronayne series

Renville series (RE)

Renville series soils have formed in veneers (<1 m) of silty fluvial deposits overlying sandy fluvial deposits on the Lillooet River flood plain. They are composed of 20 to 50 cm of nonstony silt loam or silty clay loam overlying nonstony sand to sandy loam which in turn may again be underlain at depth by nonstony silt loam or silty clay loam strata. These acid soils are slowly to moderately pervious (surface ponding occurs occasionally following heavy rainfall or during snowmelt), very poorly drained due primarily to seasonally high ground water levels and occur on level to nearly level slopes in depressional landscape positions. Soils of the Renville series are classified as Rego Gleysol and are often found associated with the poorly drained Scullard series. Common native vegetation in uncultivated areas includes willow, Douglas' spirea and sedge.

A diagram and brief soil profile description of a sampled Renville series soil is presented in Figure 23.



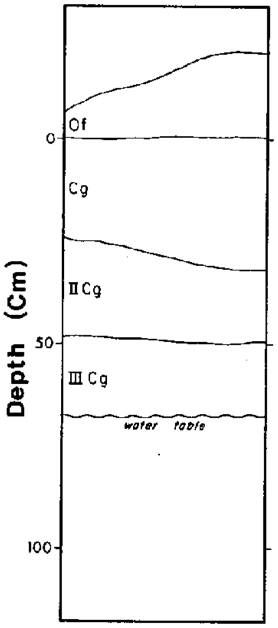
Ah	Silt loam; 3 to 9 cm thick; pH 4.5 (1:10,0.01M $CaCl_2$)
Cg_1	Olive gray silty clay loam with prominent, dark yellowish brown mottles; 6 to 8 cm thick; pH 4.3 (1:4,0.01M $CaCl_2$)
Cg_2	Grayish brown and very dark grayish brown silty clay loam with prominent, yellowish brown mottles; 15 to 18 cm thick; pH 4.4(0.01M $CaCl_2$)
$IICg_1$	Dark gray fine sandy loam with prominent, reddish brown mottles; 20 to 23 cm thick; pH 4.5 (0.01M $CaCl_2$)
$IICg_2$	Dark gray sandy loam; 24 to 28 cm thick; pH 4.3 (0.01M $CaCl_2$)
IIICg	Dark gray silt loam; pH 4.4 (0.01M $CaCl_2$)

Figure 23: Soil profile and abridged description of the Renville series

Ranson series (RN)

Ranson series soils have developed on sandy flood plain deposits of the Lillooet River. These soils are composed of nonstony loamy sand or sandy loam frequently with a capping of shallow (<20 cm) organic material and are periodically inundated by standing water. Ranson series soils are acid throughout, moderately to rapidly pervious, very poorly drained due to a seasonally high ground water table, and occur on level slopes in depressional areas. They are classified as Rego Gleysol and are often found in close association with the poorly drained Scobie series which is similar in morphology. Ranson series soils are associated with black cottonwood, red alder, willow, rose, common cattail, American skunk cabbage, fern, sedge and grass vegetation.

Figure 24 presents a diagram and brief soil profile description of a sampled Ranson series soil.



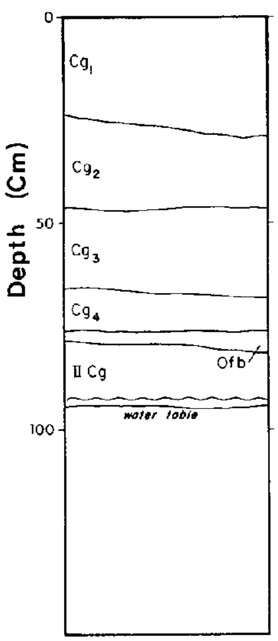
Of	Poorly decomposed organic material; 7 to 21 cm thick; pH 4.7 (1:5,0.01M $CaCl_2$)
Cg	Olive gray loamy sand with prominent, yellowish red, mottles; 25 to 33 cm thick; pH 5.1 (0.01M $CaCl_2$)
IICg	Olive gray fine sandy loam with prominent, dark reddish brown mottles; 17 to 23 cm thick; pH 4.8 (0.01M $CaCl_2$)
IIICg	Dark gray sandy loam with distinct, olive brown mottles; pH 4.8 (0.01M $CaCl_2$)

Figure 24: Soil profile and abridged description of the Ranson series

Rutherford series (RU)*

Rutherford series soils have formed in silty flood plain deposits of the Lillooet River. Soils of the Rutherford series are composed of nonstony silt loam or silty clay loam. They are acid throughout, very poorly drained due to high ground water levels and slowly pervious, resulting in ponding on the surface following heavy rainfall or during snowmelt. They occur on level to nearly level slopes in depressional landscape positions. Roots are encountered to about 65 cm depth. Rutherford soils are classified as Rego Gleysol. Sankey soils which occur in poorly drained sites slightly upslope from Rutherford soils are often mapped in complexes with Rutherford soils. A soil variant occurs which is loamy sand or sandy loam between 50 and 100 cm depth and is mapped as Rutherford:coarse at depth (RU:cd). Most of the Rutherford soils are cultivated, but native vegetation commonly associated with this series is composed of willow, red alder, and sedge.

A diagram and brief description of a representative Rutherford series soil profile, which was sampled, is presented in Figure 25.



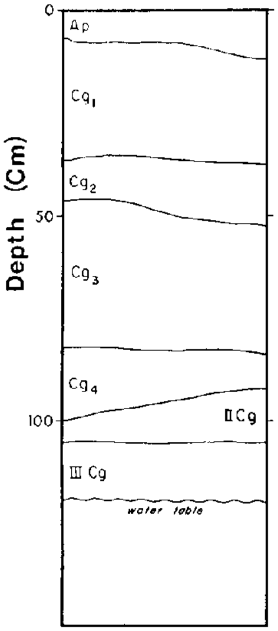
Cg_1	Grayish brown silt loam mixed with thin layers and pockets of organic matter, with prominent, brown to dark brown mottles; 23 to 28 cm thick; pH 4.4(1:4, 0.01M $CaCl_2$)
Cg_2	Light olive gray silty clay loam with prominent, dark yellowish brown mottles; 18 to 23 cm thick; pH 4.4 (0.01M $CaCl_2$)
Cg_3	Olive gray silty clay loam with prominent, dark yellowish brown mottles; 20 to 23 cm thick; pH 4.6(0.01M $CaCl_2$)
Cg_4	Grayish brown silty clay loam mixed with thin layers and pockets of organic matter; 8 to 10 cm thick; pH 4.4 (1:4,0.01M $CaCl_2$)
Ofb	Dark grayish brown poorly decomposed organic material; 2 to 5 cm thick; pH 4.3 (1:10,0.01M $CaCl_2$)
IICg	Dark gray fine sandy loam; 13 to 16 cm thick; pH 4.2 (0.01M $CaCl_2$)

Figure 25: Soil profile and abridged description of the Rutherford series

Sankey series (SA)*

Sankey soils have formed on silty fluvial deposits within the Lillooet River flood plain and are among the most commonly occurring soils in the Lillooet River valley. Texturally they consist of nonstony silty clay loam or silt loam. Thin bands of sandy loam and/or organic material or organic enriched layers occur in some profiles. These layers are generally less than 5 cm thick and discontinuous and are a result of periodic past flooding. Sankey soils are acid throughout, slowly pervious with resultant surface ponding occurring following heavy rainfall or during snowmelt, and are poorly drained due to seasonally high ground water levels. They occur on level to nearly level slopes. The depth of rooting is about 85 cm. They are classified as Rego Gleysol although minor inclusions of Orthic Gleysol are present in some map units. Two soil variants of limited area also occur. Sankey:coarse at depth (SA:cd) has loamy sand or sandy loam between 50 and 100 cm depth while Sankey:anthropogenic (SA:an) consists of areas significantly altered by man's activities. The Sankey series is similar to the Rutherford series but is somewhat better drained (poorly vs very poorly). They are often mapped together as a soil complex. Sankey soils are commonly cultivated. Uncleared areas have a vegetative cover consisting of black cottonwood, western red cedar, red alder, hazelnut and some grasses.

Figure 26 is a representative diagram and brief description of a Sankey series soil profile, which was sampled.



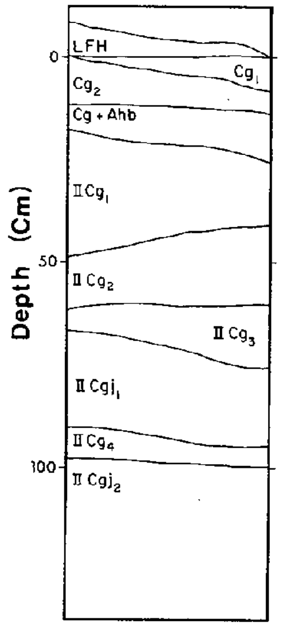
Ap	Brown to dark brown silty clay loam; 6 to 11 cm thick; pH 4.6 (0.01M $CaCl_2$)
Cg_1	Grayish brown silty clay loam, with distinct, olive brown mottles; 26 to 30 cm thick; pH 4.9 (0.01M $CaCl_2$)
Cg_2	Gray silty clay loam with prominent, dark yellowish brown mottles; 10 to 15 cm thick; pH 4.6 (0.01M $CaCl_2$)
Cg_3	Gray silty clay loam with prominent, olive mottles; 31 to 36 cm thick; pH 4.3 (0.01M $CaCl_2$)
Cg_4	Gray mixed silty clay loam and thin organic layers with prominent, olive brown mottles; 9 to 18 cm thick; pH 4.3 (1:4,0.01M $CaCl_2$)
IICg	Dark gray sandy loam; 5 to 13 cm thick; pH 4.3 (0.01M $CaCl_2$)
IIICg	Olive gray and olive mixed thin organic layers and silty clay loam; pH 4.4 (1:4,0.01M $CaCl_2$)

Figure 26: Soil profile and abridged description of the Sankey series

Scobie series (SC)*

Soils of the Scobie series have formed in sandy flood plain deposits of the Lillooet River. These soils are composed of nonstony fine sandy loam or sandy loam, often having a thin surface layer of silt loam. They are acid throughout, moderately to rapidly pervious, poorly drained due to seasonally high ground water levels, and occur on level to nearly level slopes. The rooting depth is about 100 cm. Soils of the Scobie series are classified as Rego Gleysol and often occur in association with the very poorly drained Ranson soils. Soil variants occur which are either silt loam to silty clay loam textured between 50 and 100 cm depth, or are gravelly loamy sand or gravelly sandy loam between 50 and 100 cm depth. These variants are mapped as SC:md (Scobie: medium at depth) and SC:gd (Scobie:gravelley at depth), respectively. Where not cultivated, the Scobie series supports black cottonwood, western red cedar, common paper birch and willow.

A diagram and brief description of a sampled Scobie series soil profile is presented in Figure 27.



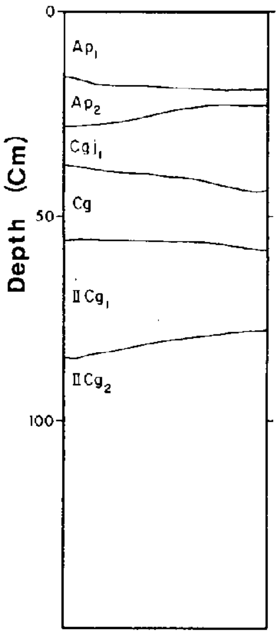
LFH	Undecomposed to well decomposed leaf litter; 0 to 8 cm thick; pH 5.5 (0.01M $CaCl_2$)
Cg_1	Light olive gray silt loam with prominent, dark yellowish brown mottles; 0 to 8 cm thick; pH 5.2 (0.01M $CaCl_2$)
Cg_2	Olive gray fine sandy loam with prominent, dark yellowish brown mottles; 6 to 12 cm thick; pH 5.2 (0.01M $CaCl_2$)
Cg+Ahb	Grayish brown and very dark brown silt loam with prominent, dark yellowish brown mottles; 6 to 11 cm thick; pH 5.0 (0.01M $CaCl_2$)
II Cg_1	Grayish brown sandy loam with distinct, dark yellowish brown mottles; 16 to 31 cm thick; pH 4.9 (0.01M $CaCl_2$)
II Cg_2	Gray fine sandy loam with prominent, dark yellowish brown mottles; 13 to 20 cm thick; pH 4.7 (0.01M $CaCl_2$)
II Cg_3	Grayish brown fine sandy loam, with faint, olive brown mottles; 5 to 15 cm thick; pH 4.7 (0.01M $CaCl_2$)
II Cgj_1	Gray loamy sand with prominent, olive brown mottles; 19 to 23 cm thick; pH 4.7 (0.01M $CaCl_2$)
II Cg_4	Grayish brown fine sandy loam with prominent, brown to dark brown mottles; 5 to 8 cm thick; pH 4.7 (0.01M $CaCl_2$)
II Cgj_2	Grayish brown loamy sand with prominent, dark yellowish brown mottles; pH 4.6 (0.01M $CaCl_2$)

Figure 27: Soil profile and abridged description of the Scobie series

Shantz series (SH)

Shantz series soils have formed in veneers (< 1 m) of sandy fluvial deposits overlying silty fluvial deposits on the flood plain of the Lillooet River. These soils are nonstony composed of 20 to 50 cm of fine sandy loam or sandy loam overlying silt loam or silty clay loam. They are acid throughout, slowly to moderately pervious, resulting in occasional surface ponding following heavy rainfall or snowmelt, and poorly drained due to seasonally high groundwater levels. They occur on level to nearly level slopes. Tree roots are found to the depth of the soil profile. Soils of the Shantz series are classified as Rego Gleysol and occur extensively throughout the Lillooet River valley. The Shantz series commonly supports black cottonwood, western red cedar, common paper birch, red alder, willow and some grasses.

A diagram and brief description of a sampled Shantz series soil profile is presented in Figure 28.



Ap_1 Dark brown loam with prominent, dark reddish brown mottles; 16 to 19 cm thick; pH 5.2 (0.01M $CaCl_2$)

Ap_2 Very dark grayish brown and gray fine sandy loam with prominent, dark reddish brown mottles; 4 to 12 cm thick; pH 4.4 (0.01M $CaCl_2$)

Cgj_1 Brown fine sandy loam with distinct, brown to dark brown mottles; 10 to 21 cm thick; pH 5.1 (0.01M $CaCl_2$)

Cg Grayish brown fine sandy loam with prominent, dark yellowish brown mottles; 14 to 18 cm thick; pH 5.2 (0.01M $CaCl_2$)

$IICg_1$ Olive gray silt loam with prominent, brown to dark brown mottles; 20 to 29 cm thick; pH 5.3 (0.01M $CaCl_2$)

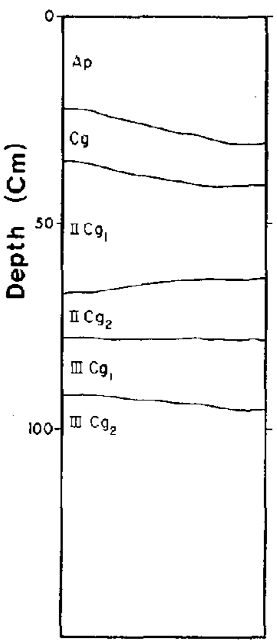
$IICg_2$ Gray silt loam with prominent, brown to dark brown mottles; pH 5.2 (0.01M $CaCl_2$)

Figure 28: Soil profile and abridged description of the Shantz series

Sister series (SI)*

Sister series soils have developed in stratified sandy and silty fluvial deposits on the Lillooet River flood plain. Sister series soils are composed of alternating layers of nonstony loam to silty clay loam and nonstony sand to sandy loam, with 20 to 35 cm of loam to silty clay loam at the surface. The alternating layers are at least 5 cm thick and continuous. These soils are acid throughout, moderately to slowly pervious, poorly drained due to seasonally high ground water tables, and occur on level to nearly level slopes. The maximum depth of rooting is about 65 cm. Soils of the Sister series are classified as Rego Gleysol. They occur extensively in the Lillooet River valley, particularly where tributary streams join the main valley. Native vegetation associated with the Sister series commonly includes black cottonwood, western red cedar, common paper birch, red alder, willow and some grasses.

Figure 29 is a diagram and brief description of a representative Sister series soil profile, which was sampled.



Ap — Brown to dark brown silt loam with prominent, dark reddish brown mottles; 22 to 30 cm thick; pH 4.7 (0.01M $CaCl_2$)

Cg — Olive gray silt loam with prominent, dark reddish brown mottles; 10 to 12 cm thick; pH 4.8 (0.01M $CaCl_2$)

IICg1 — Dark grayish brown loamy sand with prominent, olive brown mottles; 23 to 33 cm thick; pH 4.9 (0.01M $CaCl_2$)

IICg2 — Dark grayish brown loamy sand, with prominent, dark yellowish brown mottles; 11 to 15 cm thick; pH 4.7 (0.01M $CaCl_2$)

IIICg1 — Gray silty clay loam with prominent, dark yellowish brown mottles; 14 to 17 cm thick; pH 4.7 (0.01M $CaCl_2$)

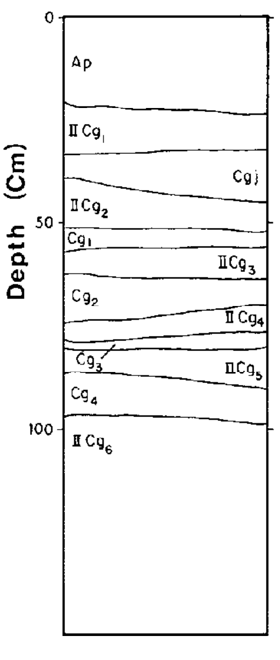
IIICg2 — Gray and very dark brown silt loam mixed with thin layers of Ahb; pH 4.3 (0.01M $CaCl_2$)

Figure 29: Soil profile and abridged description of the Sister series

Sangster series (SN)*

Soils of the Sangster series have formed from interbedded silty and sandy flood plain deposits of the Lillooet River. Sangster series soils are nonstony and composed of alternating layers of fine sandy loam or sandy loam and loam to silty clay loam, with 20 to 35 cm of fine sandy loam or sandy loam at the surface. The layers are at least 5 cm thick and continuous. These acid soils are moderately to slowly pervious, poorly drained due to seasonally high ground water tables, and occur on level to nearly level slopes. Roots occur to about 100 cm depth. Soils of the Sangster series are classified as Rego Gleysol. They are similar to the Sister series, but with sandy rather than silty textures occurring at the surface. Where not cultivated the vegetation includes black cottonwood, western red cedar, common paper birch, red alder, willow and some grasses.

A diagram and brief description of a sampled Sangster series soil profile is presented in Figure 30.



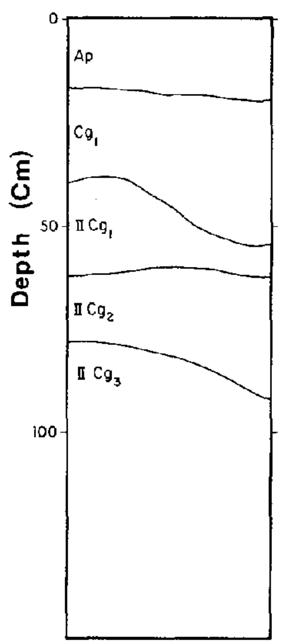
Ap	Dark brown fine sandy loam; 20 to 23 cm thick; pH 5.0 (0.01M $CaCl_2$)
IICg1	Olive gray and very dark brown silt loam with prominent, dark yellowish brown mottles; 9 to 13 cm thick pH 5.4 (0.01M $CaCl_2$)
Cgj	Grayish brown fine sandy loam with distinct, dark yellowish brown mottles; 6 to 13 cm thick; pH 5.5 (0.01M $CaCl_2$)
IICg2	Dark grayish brown silty clay loam with distinct, dark yellowish brown mottles; 7 to 12 cm thick; pH 5.5 (0.01M $CaCl_2$)
Cg1	Grayish brown fine sandy loam with distinct, yellowish brown mottles; 4 to 6 cm thick; pH 5.6 (0.01M $CaCl_2$)
IICg3	Olive gray silt loam with distinct, yellowish brown mottles; 5 to 8 cm thick; pH 5.4 (0.01M $CaCl_2$)
Cg2	Grayish brown fine sandy loam with distinct yellowish brown mottles; 6 to 12 cm thick; pH 5.6 (0.01M $CaCl_2$)
IICg4	Olive gray silt loam with prominent, dark yellowish brown mottles; 4 to 6 cm thick; pH 5.6 (0.01M $CaCl_2$)
Cg3	Grayish brown sandy loam with prominent, dark yellowish brown mottles; 2 to 4 cm thick; pH 5.6 (0.01M $CaCl_2$)
IICg5	Olive gray silt loam with prominent, dark yellowish brown mottles; 6 to 10 cm thick; pH 5.6 (0.01M $CaCl_2$)
Cg4	Olive gray fine sandy loam with prominent, dark yellowish brown mottles; 9 to 11 cm thick; pH 5.5 (0.01M $CaCl_2$)
IICg6	Olive silt loam with prominent, dark yellowish brown mottles; pH 5.6 (0.01M $CaCl_2$)

Figure 30: Soil profile and abridged description of the Sangster series

Scullard series (SU)*

Scullard series soils have formed in veneers (<1 m) of silty fluvial deposits overlying sandy fluvial deposits on the Lillooet River flood plain. The Scullard series soils are nonstony and composed of 20 to 50 cm of silt loam or silty clay loam overlying fine sandy loam or sandy loam. They are acid throughout, slowly to moderately pervious (often resulting in surface ponding following heavy rainfall and/or snowmelt), poorly drained due to seasonally high ground water tables, and occur on level to nearly level slopes. The depth of rooting is about 115 cm. Scullard soils are classified as Rego Gleysol. A soil variant occurs in limited areas where the underlying strata are gravelly rather than sandy. It is mapped as Scullard:gravelly at depth (SU:gd). The Scullard series commonly is vegetated by black cottonwood, western red cedar, common paper birch, red alder, willow, and grasses.

A diagram and brief description of a representative Scullard series soil profile, which was sampled, is presented in Figure 31.



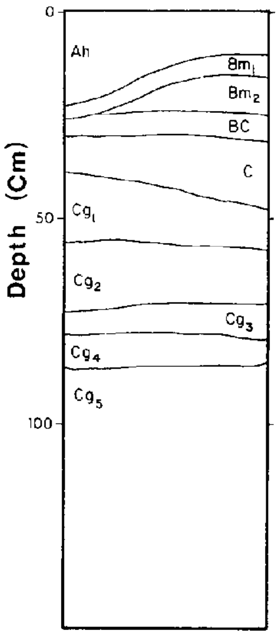
Ap	Dark grayish brown silty clay loam; 16 to 19 cm thick; pH 4.8 (0.01M $CaCl_2$)
Cg_1	Grayish brown silty clay loam with prominent, light olive brown mottles; 23 to 36 cm thick; pH 4.8 (0.01M $CaCl_2$)
$IICg_1$	Dark grayish brown loam with prominent, yellowish red mottles; 7 to 23 cm thick; pH 4.6 (0.01M $CaCl_2$)
$IICg_2$	Dark grayish brown fine sandy loam with prominent, yellowish red mottles; 16 to 30 cm thick; pH 4.6 (0.01M $CaCl_2$)
$IICg_3$	Dark grayish brown fine sandy loam with prominent, dark yellowish brown mottles; pH 4.5 (0.01M $CaCl_2$)

Figure 31: Soil profile and abridged description of the Scullard series

Tenquille series (TN)

Tenquille series soils have formed on silty flood plain deposits of the Lillooet River. Soils of the Tenquille series are nonstony silt loam or silty clay loam. They are acid throughout but greater than pH 5.5 in the surface 25 cm, moderately to slowly pervious, imperfectly drained due to fluctuating ground water tables, and occur on level to nearly level topography. Tree roots are encountered to at least 100 cm depth. These soils are classified as Gleyed Melanic Brunisol and occur only in a very small area near the village of Pemberton. Typical natural vegetation is black cottonwood, western red cedar, willow, and some grasses.

Figure 32 is a brief description and diagram of a typical Tenquille series soil profile.



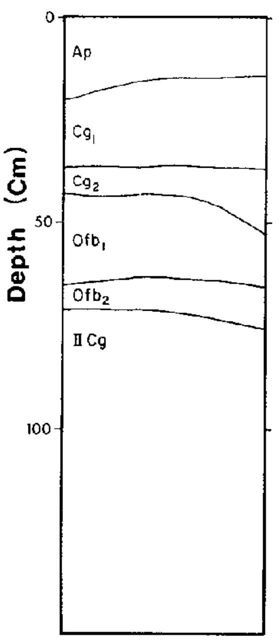
Ah	Very dark grayish brown silt loam; 10 to 22 cm thick; pH 6.2 (0.01M $CaCl_2$)
Bm_1	Brown to dark brown silt loam; 4 to 6 cm thick; pH 5.8 (0.01M $CaCl_2$)
Bm_2	Dark grayish brown silt loam; 0 to 9 cm thick; pH 5.3 (0.01M $CaCl_2$)
BC	Grayish brown silt loam; 4 to 6 cm thick; pH 5.4 (0.01M $CaCl_2$)
C	Olive gray silt loam; 13 to 17 cm thick; pH 5.4 (0.01M $CaCl_2$)
Cg_1	Grayish brown silt loam with prominent, dark yellowish brown mottles; 10 to 17 cm thick; pH 5.2 (0.01M $CaCl_2$)
Cg_2	Olive silt loam with prominent, yellowish brown mottles; 13 to 17 cm thick; pH 5.1 (0.01M $CaCl_2$)
Cg_3	Olive gray silt loam with prominent, dark yellowish brown mottles; 6 to 9 cm thick; pH 5.0 (0.01M $CaCl_2$)
Cg_4	Dark olive gray silt loam with prominent, dark yellowish brown mottles; 6 to 8 cm thick; pH 4.9 (0.01M $CaCl_2$)
Cg_5	Olive silt loam with distinct, brown to dark brown mottles; pH 4.8 (0.01M $CaCl_2$)

Figure 32: Soil profile and abridged description of the Tenquille series

Valleau series (VA)*

Valleau soils have formed from interbedded silty fluvial deposits and organic deposits on the flood plain of the Lillooet River. Valleau series soils are nonstony silty loam or silty clay loam with organic or organic enriched layers interbedded. The alternating layers, are at least 5 cm thick and continuous and there is usually 20 to 35 cm of silt loam or silty clay loam at the soil surface. These acid soils are slowly pervious often resulting in surface ponding following heavy rainfall or snowmelt, poorly drained due to seasonally high water tables and slow permeability, and occur on level to nearly level slopes. Roots are encountered to at least 100 cm depth and often logs and other woody debris are found in the subsoil. Valleau series soils are classified as Rego Gleysol:cumulic phase. Vegetation commonly associated with this series is predominantly willow, shrub black cottonwood, sedge and some grasses.

In Figure 33 a brief description and diagram of a representative Valleau series soil profile, which was sampled, is presented.



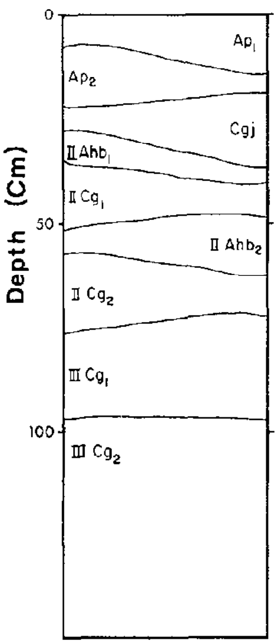
Ap	Grayish brown loam with prominent, dark yellowish brown mottles; 13 to 19 cm thick; pH 4.8 (0.01M $CaCl_2$)
Cg_1	Light olive gray silty clay loam with prominent, reddish brown mottles; 17 to 23 cm thick; pH 4.8 (0.01M $CaCl_2$)
Cg_2	Very dark grayish brown and grayish brown silt loam mixed with pockets and lenses of organic matter with prominent, dark reddish brown mottles; 7 to 17 cm thick; pH 4.5 (1:4,0.01M $CaCl_2$)
Ofb_1	Dark brown undecomposed organic material; 13 to 22 cm thick; pH 4.3(1:10,0.01M $CaCl_2$)
Ofb_2	Very dark brown poorly decomposed organic material; 6 to 10 cm thick; pH 4.0 (1:10,0.01M $CaCl_2$)
II Cg	Dark gray and greenish gray silty clay loam mixed with pockets and lenses of organic matter; pH 4.6 (1:4,0.01M $CaCl_2$)

Figure 33: Soil profile and abridged description of the Valleau series

Viccars series (VC)

Viccars series soils have formed from sandy and silty fluvial deposits interbedded with organic accumulations on the Lillooet River flood plain. The Viccars series soils consist of alternating strata, at least 5 cm thick and continuous of nonstony loam to silty clay loam, nonstony loamy sand, sandy loam or fine sandy loam and organic or organic enriched layers. The surface 20 to 35 cm is usually loam to silty clay loam. Roots are found to a depth of about 40 cm and wood debris is often found throughout the soil profile. Viccars series soils are acid throughout the soil profile, moderately to slowly pervious, poorly drained due to seasonally high ground water levels, and occur on level to nearly level slopes in slightly depressional landscape positions. These soils are classified as Rego Gleysol:cumulic phase. Viccars:coarse at surface variant (VC:cs) occurs in a few minor areas where the surface textures are sandy rather than silty. Viccars soils commonly support willow, black cottonwood shrub, sedge and some grass vegetation.

Figure 34 is a brief description and diagram of a representative Viccars series soil profile, which has been sampled.



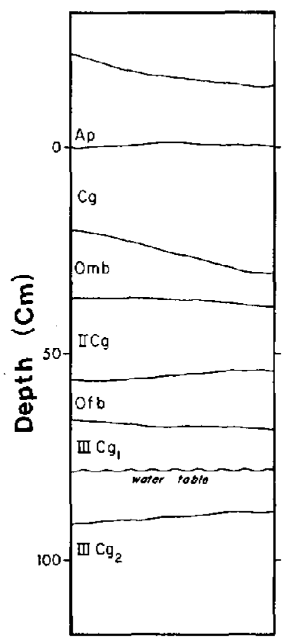
Ap_1	Dark yellowish brown loam with prominent, dark reddish brown mottles; 7 to 14 cm thick; pH 4.3 (1:4,0.01M $CaCl_2$)
Ap_2	Dark brown and grayish brown loam, with prominent, yellowish red mottles; 5 to 15 cm thick; pH 4.3 (0.01M $CaCl_2$)
Cgj	Dark yellowish brown loamy sand, with prominent, yellowish red mottles;5 to 18 cm thick; pH 4.3 (0.01M $CaCl_2$)
$IIAhb_1$	Dark grayish brown and very dark brown silty clay loam, with prominent, dark reddish brown mottles; 3 to 8 cm thick; pH 4.0(0.01M $CaCl_2$)
$IICg_1$	Olive gray silty clay loam with prominent, dark yellowish brown mottles; 8 to 16 cm thick; pH 4.5 (0.01M $CaCl_2$)
$IIAhb_2$	Dark grayish brown and dark brown silt loam, with prominent, yellowish red mottles; 5 to 14 cm thick; pH 4.4 (0.01M $CaCl_2$)
$IICg_2$	Dark gray and very dark grayish brown silt loam mixed with thin layers of Ahb, with prominent, dark reddish brown mottles; 10 to 20 cm thick; pH 4.5 (0.01M $CaCl_2$)
$III Cg_1$	Dark gray sandy loam with prominent, dark reddish brown mottles; 21 to 26 cm thick; pH 4.3 (0.01M $CaCl_2$)
$III Cg_2$	Gray fine sandy loam with prominent, dark yellowish brown mottles; pH 4.4 (0.01M $CaCl_2$)

Figure 34: Soil profile and abridged description of the Viccars series

Verlinden series (VE)

Verlinden series soils have formed on the Lillooet River flood plain in sandy fluvial veneers (< 1 m) overlying silty fluvial deposits and are interbedded with organic or organic enriched layers. The soils are nonstony and composed of 20 to 50 cm of loamy sand or sandy loam overlying silt loam or silty clay loam in which layers of organic or organic enriched materials are interbedded. The organic layers are at least 5 cm thick and continuous. The Verlinden series soils are acid throughout, moderately to slowly pervious, poorly drained due to seasonally high ground water tables, and occur on level to nearly level slopes. Roots are found to about 45 cm and woody debris occurs frequently throughout the soil profile. This series is classified as a Rego Humic Gleysol:cumulic phase. The native vegetation associated with this series includes willow, red alder, shrubby black cottonwood, sedge, and some grasses.

A diagram and brief description of a representative Verlinden series soil profile, which was sampled, is presented in Figure 35.



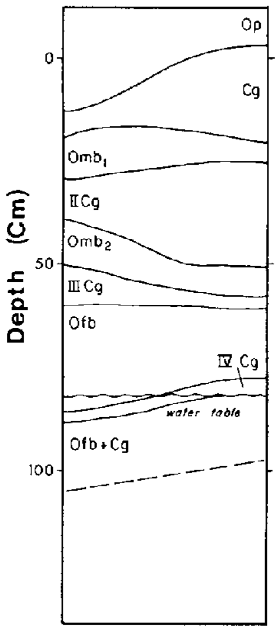
Ap	Very dark brown sandy loam; 15 to 22 cm thick; pH 4.7 (1:10,0.01M $CaCl_2$)
Cg	Grayish brown sandy loam with prominent, dark yellowish brown mottles; 19 to 30 cm thick; pH 4.5 (0.01M $CaCl_2$)
Omb	Black moderately decomposed organic material; 8 to 17 cm thick; pH 4.4 (1:10,0.01M $CaCl_2$)
IICg	Grayish brown silty clay with prominent, dark yellowish brown mottles; 16 to 20 cm thick; pH 4.4 (0.01M $CaCl_2$)
Ofb	Poorly decomposed organic material; 9 to 14 cm thick; pH 4.3 (1.4, 0.01M $CaCl_2$)
IIICg1	Very dark gray silt loam; 20 to 25 cm thick; pH 4.6 (0.01M $CaCl_2$)
IIICg2	Dark olive gray silt loam; pH 4.6 (0.01M $CaCl_2$)

Figure 35: Soil profile and abridged description of the Verlinden series

Vickberg series (VI)

Soils of the Vickberg series have formed in silty fluvial deposits interbedded with organic accumulations on the flood plain of the Lillooet River. The soils are composed of nonstony silt loam or silty clay loam interbedded with organic or organic enriched strata. The surface 20 to 35 cm are usually silt loam or silty clay loam sometimes having a thin organic capping. The interbedded organic layers are at least 5 cm thick and continuous. Vickberg series soils are acid throughout, slowly pervious resulting in surface ponding following heavy rainfall and/or snowmelt, very poorly drained due to high ground water tables and slow permeability, and occur on level to nearly level slopes in depressional areas. These soils are classified as Rego Gleysol:cumulic phase. The Vickberg series is similar to Valleau series but is very poorly drained and is usually located adjacent to local, small water bodies. The natural vegetation commonly associated with the Vickberg series includes willow, common cattail and sedge.

Figure 36 is a brief description and diagram of a typical Vickberg series soils profile, which was sampled.



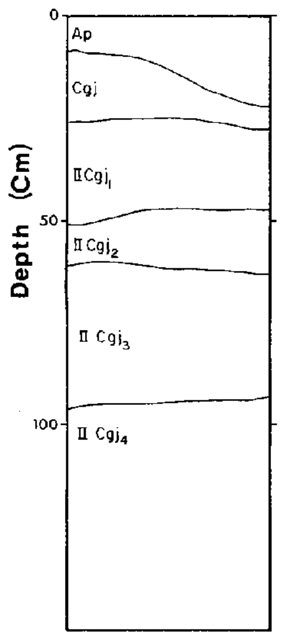
Op	Cultivated, semidecomposed organic material; 11 to 27 cm thick; pH 4.3 (1:10,0.01M $CaCl_2$)
Cg	Light olive gray silty clay loam; 6 to 23 cm thick; pH 4.2 (1:10,0.01M $CaCl_2$)
Omb_1	Moderately decomposed organic material; 5 to 11 cm thick; pH 4.2 (1:10,0.01M $CaCl_2$)
IICg	Very dark grayish brown and grayish brown fine sandy loam with prominent, brown to dark brown mottles; 10 to 27 cm thick; pH 4.5 (0.01M $CaCl_2$)
Omb_2	Moderately decomposed organic material; 7 to 11 cm thick; pH 4.4(1:10,0.01M $CaCl_2$)
IIICg	Grayish brown silt loam; 3 to 10 cm thick; pH 4.6 (1:10,0.01M $CaCl_2$)
Ofb	Poorly decomposed organic material; 17 to 26 cm thick; pH 4.5 (1:10,0.01M $CaCl_2$)
IVCg	Grayish brown silt loam; 2 to 4 cm thick; pH 4.5 (1:10,0.01M $CaCl_2$)

Figure 36: Soil profile and abridged description of the Vickberg series

Walden series (WD)

Walden series soils have formed in veneers (< 1 m) of sandy fluvial deposits overlying gravelly fluvial deposits on the Lillooet River flood plain. Soils of the Walden series soils are composed of 20 to 50 cm of nonstony loam or fine sandy loam overlying moderately stony gravelly to very gravelly sand or gravelly loamy sand. They are acid, rapidly to moderately pervious, and imperfectly drained due to fluctuating ground water tables which may be at the surface during freshet in some years. These soils occur on nearly level to very gentle slopes. The Walden series soils are classified as Gleyed Regosol. Black cottonwood, western red cedar and some coast Douglas-fir are vegetative species commonly associated with the Walden series. Tree roots are encountered to a depth of at least 65 cm in the profile.

Following in Figure 37 is a diagram and brief discussion of a representative soil profile of the Walden series.



Ap	Brown to dark brown loam; 8 to 22 cm thick; pH 4.9 (0.01M $CaCl_2$)
Cgj	Light grayish brown fine sandy loam with prominent, dark yellowish brown mottles; 5 to 17 cm thick; pH 5.0 (0.01M $CaCl_2$)
IICgj1	Grayish brown gravelly sand with prominent, brownish yellow mottles; 20 to 25 cm thick; pH 5.1 (0.01M $CaCl_2$)
IICgj2	Light grayish brown very gravelly sand with prominent, dark yellowish brown mottles; 10 to 16 cm thick; pH 5.1 (0.01M $CaCl_2$)
IICgj3	Yellowish brown gravelly sand with prominent, dark yellowish brown mottles; 30 to 35 cm thick; pH 5.0 (0.01M $CaCl_2$)
IICgj4	Olive gray gravelly loamy sand with prominent, dark yellowish brown mottles; pH 5.0 (0.01M $CaCl_2$)

Figure 37: Soil profile and abridged description of the Walden series

Whitehead series (WH)

Whitehead series soils have formed in gravelly fluvial deposits on the Lillooet River flood plain. Soils of the Whitehead series are moderately stony gravelly to very gravelly sand or gravelly loamy sand. They are acid, rapidly pervious, imperfectly drained due to fluctuating ground water levels, and occur on level to nearly level slopes. Soils of the Whitehead series are classified as Gleyed Regosol. The very poorly drained Ronayne soils are sometimes minor inclusions in areas of Whitehead soils and are found in depressions and/or channels. Natural vegetation associated with the Whitehead series often includes black cottonwood, western white pine, western red cedar, willow and various moisture tolerant shrubs. Roots occur to a depth of 70 cm in the profile.

Figure 38 is a diagram and brief description of a typical Whitehead series soil profile which was sampled.

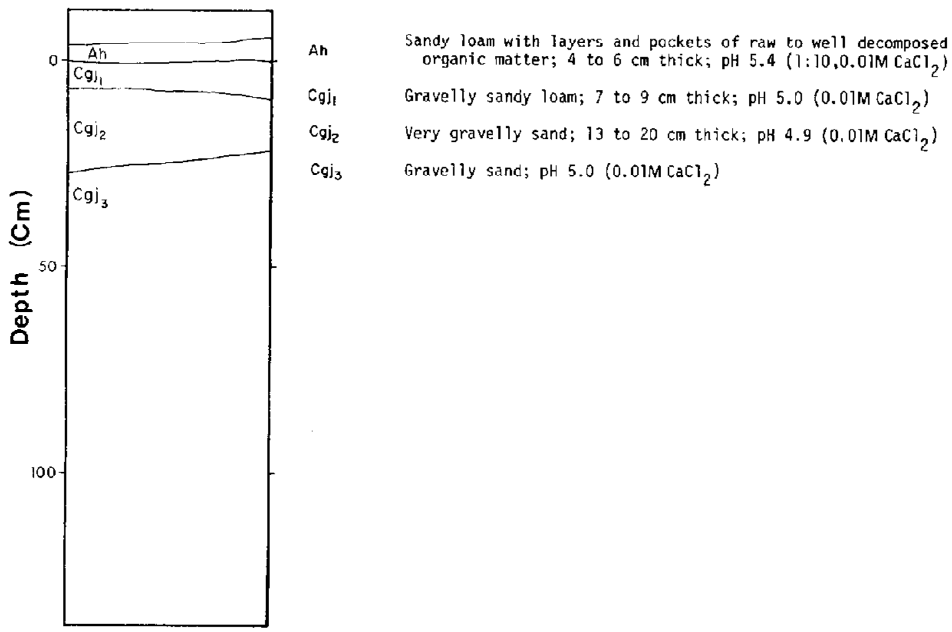
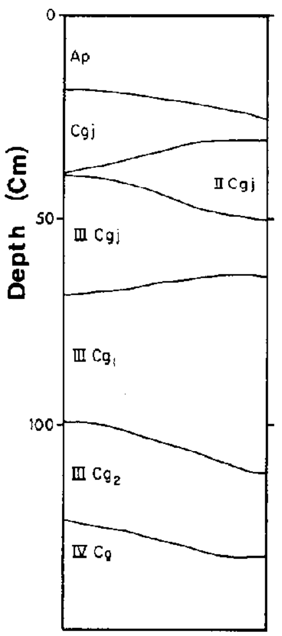


Figure 38: Soil profile and abridged description of the Whitehead series

Wildfong series (WI)*

Soils of the Wildfong series have formed in interbedded silty and sandy fluvial flood plain deposits. They are nonstony and composed of alternating layers of silt loam or silty clay loam and sand to sandy loam. The surface 20 to 35 cm is usually sand to sandy loam. The alternating layers are at least 5 cm thick and continuous. Wildfong soils are acid, moderately pervious, imperfectly drained due to fluctuating ground water levels, and occur on level to very gentle topography. They are classified as Gleyed Regosol. Soil variants occupying minor areas are Wildfong:medium at surface (WI:ms) which has silt loam or silty clay loam at the surface and Wildfong:cumulic variant (WI:cv) which has buried, thin organic or organic enriched horizons. The Wildfong series is similar to the Sangster series except that it is imperfectly rather than poorly drained. Tree roots are encountered to a depth of at least 115 cm in the soil profile. Some of the vegetative species which occur in association with the Wildfong series are black cottonwood, western red cedar, red alder, Rocky Mountain maple, devil's club, common red osier dogwood and thimbleberry.

A diagram and brief description of a representative Wildfong series soil profile, which was sampled, is given in Figure 39.



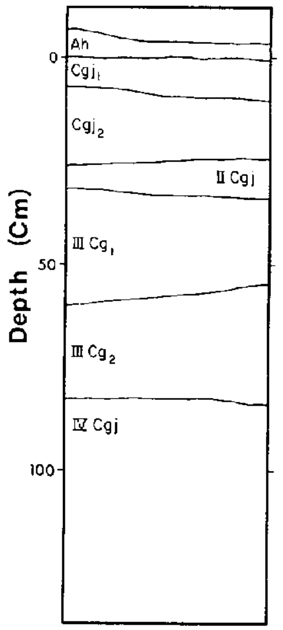
Ap	Dark grayish brown fine sandy loam; 13 to 20 cm thick; pH 5.9 (0.01M $CaCl_2$)
Cgj	Olive gray sandy loam, with prominent, dark yellowish brown mottles; 0 to 11 cm thick; pH 5.7 (0.01M $CaCl_2$)
IICgj	Olive silty clay loam with prominent, dark yellowish brown mottles; 5 to 12 cm thick; pH 5.2 (0.01M $CaCl_2$)
IIICgj1	Olive brown fine sandy loam with distinct, dark yellowish brown mottles; 7 to 12 cm thick; pH 5.0 (0.01M $CaCl_2$)
IIICgj2	Olive brown silt loam with distinct, dark yellowish brown mottles; 18 to 23 cm thick; pH 4.8 (0.01M $CaCl_2$)
IIICgj3	Grayish brown silt loam with distinct, yellowish brown mottles; 8 to 11 cm thick; pH 5.0 (0.01M $CaCl_2$)
IVCgj	Dark olive gray fine sandy loam with distinct, dark yellowish brown mottles; pH 5.0 (0.01M $CaCl_2$)

Figure 39: Soil profile and abridged description of the Wildfong series

Wallace series (WL)

Wallace series soils have formed in silty fluvial veneers (<1 m) overlying sandy fluvial deposits on the Lillooet River flood plain. The soils are nonstony and consist of 20 to 50 cm of silt loam or silty clay loam overlying loamy sand or sandy loam. The Wallace soils are acid, slowly to moderately pervious, imperfectly drained due to fluctuating ground water levels, and occur on level to very gentle slopes. They are classified as Gleyed Regosol. The soil variant Wallace: gravelly at depth (WL:gd) occurs in minor areas where gravelly material occurs between 50 and 100 cm depth. Vegetation is commonly western red cedar, black cottonwood, red alder, willow, western thimbleberry and false solomon's seal. Rooting depth generally extends to the depth of the soil profile.

Figure 40 is a brief description and diagram of a typical Wallace series soil profile, which was sampled.



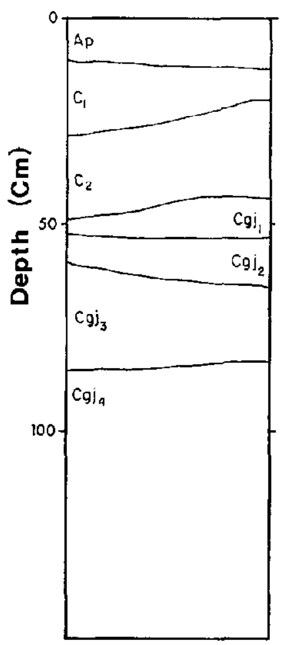
Ah	Silt loam mixed with some layers and pockets of raw to well decomposed leaf litter; 3 to 7 cm thick; pH 5.7 (1:10,0.01M $CaCl_2$)
Cgj_1	Grayish brown and dark grayish brown silt loam, with faint, olive brown mottles; 7 to 10 cm thick; pH 5.4 (0.01M $CaCl_2$)
Cgj_2	Olive gray and very dark grayish brown silty clay loam, with distinct, yellowish brown mottles; 14 to 19 cm thick; pH 5.1 (0.01M $CaCl_2$)
IICgj	Grayish brown loamy sand with faint, brown mottles; 6 to 10 cm thick; pH 5.1 (0.01M $CaCl_2$)
$IIICg_1$	Olive silt loam with prominent, yellowish brown mottles; 20 to 28 cm thick; pH 4.9 (0.01M $CaCl_2$)
$IIICg_2$	Grayish brown fine sandy loam, with prominent, dark yellowish brown mottles; 23 to 30 cm thick; pH 4.9 (0.01M $CaCl_2$)
IVCgj	Grayish brown sandy loam with faint, light olive brown mottles; pH 4.9 (0.01M $CaCl_2$)

Figure 40: Soil profile and abridged description of the Wallace series

Wolverine series (WO)*

Wolverine series soils have formed in sandy fluvial deposits on the Lillooet River flood plain, usually on the levees adjacent to the Lillooet River. They are composed of nonstony loamy sand or sandy loam with occasional bands of fine sandy loam. These soils are acid, moderately to rapidly pervious, imperfectly drained due to fluctuating ground water levels, and occur on level to very gentle slopes. They are classified as Gleyed Regosol. Minor areas of soil variants occur which have silt loam or silty clay loam between 50 and 100 cm depth; gravelly or very gravelly sand or gravelly sandy loam between 50 and 100 cm; or are moderately well drained and trending toward Brunisolic soil development. These variants are mapped as Wolverine:medium at depth (WO:md), Wolverine:gravelly at depth (WO:gd) and Wolverine:drainage (WO:dv) variants, respectively. Some of the vegetation associated with the Wolverine series includes western red cedar, coast Douglas-fir, black cottonwood, Sitka spruce, red alder, willow, some grasses and some mosses. Tree roots occur to a depth of at least 60 cm in the soil profile.

Figure 41 is a diagram and brief description of a sampled Wolverine series soil profile.



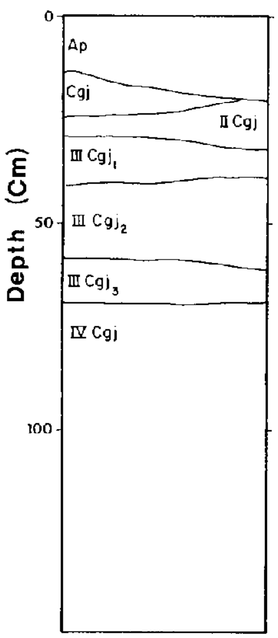
Ap	Dark grayish brown fine sandy loam, with prominent, dark yellowish brown mottles; 10 to 12 cm thick; pH 5.1 (0.01M $CaCl_2$)
C_1	Grayish brown sandy loam; 8 to 19 cm thick; pH 5.2 (0.01M $CaCl_2$)
C_2	Grayish brown loamy sand; 20 to 24 cm thick; pH 5.1 (0.01M $CaCl_2$)
Cgj_1	Dark grayish brown fine sandy loam with prominent, brown to dark brown mottles; 4 to 8 cm thick; pH 5.2 (0.01M $CaCl_2$)
Cgj_2	Grayish brown sandy loam with prominent, dark yellowish brown mottles; 6 to 12 cm thick; pH 5.1 (0.01M $CaCl_2$)
Cgj_3	Grayish brown loamy sand, with distinct, light olive brown mottles; 18 to 26 cm thick; pH 5.1 (0.01M $CaCl_2$)
Cgj_4	Olive gray sandy loam with prominent, light olive brown mottles; pH 5.2 (0.01M $CaCl_2$)

Figure 41: Soil profile and abridged description of the Wolverine series

Wittal series (WT)

Wittal series soils are limited in areal extent and have formed in veneers (< 1 m) of sandy fluvial deposits overlying silty fluvial deposits within the flood plain of the Lillooet River. These soils are composed of 20 to 50 cm of nonstony sandy loam or fine sandy loam overlying nonstony silt loam or silty clay loam and occasionally, sandy loam reoccurs at depth. The Wittal series is acid, moderately pervious, imperfectly drained due to fluctuating ground water levels, and occurs on level to very gentle slopes. They are classified as Gleyed Regosol. Vegetation commonly associated with the Wittal series includes western red cedar, black cottonwood, Rocky Mountain maple, salmonberry, thimbleberry, willow, grasses and herbs. Tree roots are encountered throughout the depth of the soil profile.

A diagram and brief description of a sampled Wittal series soil profile is given in Figure 42.



Ap	Dark grayish brown and light grayish brown fine sandy loam; 18 to 25 cm thick; pH 4.7 (0.01M $CaCl_2$)
Cgj	Grayish brown, dark grayish brown and light grayish brown silt loam; with prominent, yellowish brown mottles; 5 to 21 cm thick; pH 4.9 (0.01M $CaCl_2$)
II Cgj	Grayish brown, and light brownish gray loamy fine sand, with yellowish brown mottles; 0 to 20 cm thick; pH 5.0 (0.01M $CaCl_2$)
III Cgj	Grayish brown, dark grayish brown, and light brownish gray silt loam with prominent, yellowish brown mottles; 13 to 30 cm thick; pH 5.0 (0.01M $CaCl_2$)
III Cg_1	Grayish brown and light brownish gray silt loam with prominent, yellowish brown and dark yellowish brown mottles; 30 to 48 cm thick; pH 5.0 (0.01M $CaCl_2$)
III Cg_2	Olive gray and light brownish gray silt loam with distinct, dark yellowish brown and light yellowish brown mottles; 21 to 25 cm thick: pH 5.1 (0.01M $CaCl_2$)
IV Cg	Gravelly coarse sand

Figure 42: Soil profile and abridged description of the Wittal series

B. Birkenhead River, Blackwater Creek, Gates River area

Fougberg series (FB)

Fougberg series soils have formed in the fluvial fan deposits of tributaries to Birkenhead River, Blackwater Creek and Gates River. The soil parent materials are derived from calcareous bedrock or unconsolidated materials. Soils of the Fougberg series are exceedingly stony, cobbly, very gravelly sand to very gravelly sandy loam. They are slightly to moderately calcareous in the parent material, rapidly to moderately pervious, well drained, and occur on very gentle to gentle slopes. Tree roots are encountered throughout the depth of the soil profile. Fougberg series soils are classified as Orthic Eutric Brunisol. They often have a thin, leached, surface horizon (<5 cm thick) followed by a strong brown layer 15 to 30 cm thick which grades to yellowish brown parent material at 55 to 60 cm depth. Vegetation commonly associated with this series is predominantly Rocky Mountain Douglas-fir with lodgepole pine, western red cedar, common paper birch, some black cottonwood, roses, herbs and grasses.

Franks series (FC)

Franks series soils have formed in the veneers (< 1 m thick) of sandy fluvial deposits overlying bouldery and/or gravelly fluvial fan deposits in the Birkenhead River, Blackwater Creek and Gates River valleys. The soils are composed of 20 to 50 cm of nonstony sand to sandy loam overlying exceedingly to excessively stony, bouldery and/or gravelly sand to gravelly sandy loam. They are well drained, and slightly to moderately calcareous in the parent material. They are moderately to rapidly pervious, and occur on very gentle to gentle slopes. Tree roots are encountered to the depth of the soil profile. Soils of the Franks series are classified as Orthic Eutric Brunisol and have a thin (<5 cm thick) leached horizon overlying 10 to 15 cm of brown sandy loam which grades to yellowish brown parent material at 55 to 60 cm depth. Often buried organic or organic enriched layers, usually <5 cm thick, are encountered indicating periodic flooding. Vegetation associated with this series includes Rocky Mountain Douglas-fir, western hemlock, western red cedar, common paper birch, red alder, herbs, and grasses.

Flichel series (FL)

Soils of the Flichel series have formed on bouldery, gravelly fluvial fan deposits in the Birkenhead River, Blackwater Creek, and Gates River valleys. They are exceedingly to excessively stony, bouldery, very gravelly sand to very gravelly sandy loam. They are slightly to moderately calcareous in the soil parent material, rapidly to moderately pervious, well to rapidly drained, and occur on very gentle to moderate slopes. Generally, tree roots are encountered throughout the soil profile. Flichel series soils are classified as Orthic Eutric Brunisol. Included in Flichel series map units are some Orthic Regosol soils associated with the active portions of the fluvial fans. Flichel soils commonly have a thin (<5 cm), leached surface horizon overlying a brown horizon 10-15 cm thick which grades to the yellowish brown parent material at 55 to 60 cm depth. The vegetation generally associated with Flichel soils includes Rocky Mountain Douglas-fir, western red cedar, common paper birch, red alder, some black cottonwood, herbs and grasses.

Fotsch series (FO)

Fotsch series soils have formed in beach deposits adjacent to Birkenhead Lake, One Mile Lake and other small lakes. These soils are composed of 20 to 50 cm of nonstony to moderately stony sand to sandy loam overlying exceedingly to excessively stony bouldery and/or gravelly sand to gravelly sandy loam. They are neutral to moderately calcareous in the soil parent material, moderately to rapidly pervious, well drained, and occur on very gentle to moderate slopes. Few tree roots are encountered to the depth of the soil profile. The Fotsch series soils are classified as Orthic Eutric Brunisol. In areas where the beaches are actively forming some Orthic Regosol profiles are included. In local areas where some of the bedrock is acid, Orthic Dystric Brunisols may also be present. Fotsch soils have a thin (<5 cm thick), discontinuous, leached surface layer overlying a yellowish brown horizon 15 to 30 cm thick which grades to the brown soil parent material at 45 to 50 cm depth. Where these soils are vegetated they support Rocky Mountain Douglas-fir, common paper birch, red alder, roses, herbs and some grasses.

Giguere series (GG)

Giguere series soils occur primarily on the gravelly fluvial flood plain deposits of the Birkenhead and Gates rivers. They are moderately to exceedingly stony gravelly sand to gravelly sandy loam, slightly to moderately calcareous throughout, rapidly pervious, well to moderately well drained, and occur on level to very gentle slopes. The Giguere series soils are prone to periodic flooding due to being located immediately adjacent to the river. They are classified as Orthic Regosol and are similar in morphology to Gilmore series soils, but differ in that the Gilmore soils are acid. Very few roots are encountered in the soil profile. Giguere soils are usually non-vegetated but where vegetation has established, it commonly consists of shrubby black cottonwood, red alder, and willows.

Guthrie series (GU)

Guthrie series soils have formed on bouldery and gravelly terraced fluvial deposits within the Birkenhead River, Blackwater Creek, and Gates River valleys. They are exceedingly to excessively stony and bouldery, gravelly sand to gravelly sandy loam, slightly to moderately calcareous in the parent material, moderately to rapidly pervious and well to rapidly drained. They occur on level to very gentle slopes with moderate to steep slopes on the terrace edges. They are classified as Orthic Eutric Brunisol. Tree roots occur throughout the soil profile. Guthrie soils are similar in morphology to the Grundy series soils but differ chemically, being calcareous rather than acid. The Guthrie soils generally have a thin (<5 cm thick) litter layer overlying a yellowish brown horizon 25 to 30 cm thick which grades to the brown parent material at 45 to 50 cm depth. The vegetation associated with Guthrie soils is predominantly Rocky Mountain Douglas-fir with lodgepole pine, kinnickinnik, soopolallie, mosses and grasses.

Naylor series (NB)

Soils of the Naylor series have developed in shallow organic deposits overlying silty fluvial deposits on the Birkenhead River and Blackwater Creek flood plains. These soils are similar in morphology to the Nairn Falls series soils, however, they are calcareous rather than acid. Naylor soils consist of an organic layer, 15 to 40 cm thick if moderately decomposed,or 15 to 60 cm thick if poorly decomposed, overlying nonstony silt loam or silty clay loam. They are slightly to moderately calcareous in the mineral material, slowly pervious, poorly to very poorly drained due to seasonally high ground water tables, and occur on level to nearly level slopes in depressional landscape positions. Naylor series soils are classified as Rego Gleysol:peaty phase. The water table often is within 40 cm of the soil surface and may be at the surface during high runoff periods. The majority of tree roots are found in the surface organic material. Vegetation associated with Naylor soils includes willows, American skunk cabbage, horsetail, some western red cedar and some Sitka spruce.

Questt series (QU)

Questt series soils have developed in silty fluvial deposits on the flood plains of Birkenhead River, Blackwater Creek, and Gates River. The soils are nonstony silt loam or silty clay loam, slightly to moderately calcareous in the parent material, slowly pervious and very poorly drained due to seasonally high ground water tables and slow permeability. They occur on level to nearly level slopes in depressional areas. Soils of the Questt series are classified as Rego Humic

Gleysol. They may be inundated periodically by ponded waters. Questt soils have a dark brown or black surface horizon 25 to 30 cm thick underlain by the brown soil parent material at 25 to 50 cm depth. These soils are similar in morphology to the Quamell series but are calcareous. The water table is often within 85 cm of the surface and can occur at the surface during high runoff periods. Roots are encountered to about 55 cm depth. Vegetation found on these soils includes western red cedar, sedges and common horsetail.

Rivers series (RB)

Rivers series soils have formed in veneers (<1 m) of sandy fluvial deposits overlying gravelly fluvial deposits, primarily in the active stream channels of the Birkenhead River, Blackwater Creek, and Gates River. These areas are periodically inundated by river flood waters. The Rivers series soils are composed of 20 to 50 cm of nonstony loamy sand or sandy loam over moderately to exceedingly stony, gravelly to very gravelly sand to gravelly sandy loam. They are rapidly to moderately pervious, and very poorly drained as a result of seasonally high ground water tables and periodic inundation. Rivers soils are slightly to moderately calcareous. These soils occur on level to nearly level slopes on the channel bed and are bounded by moderate to steep slopes on the banks. Rivers series soils are similar to Ronayne soils in the Lillooet River area, but are calcareous. The Rivers soils are classified as Rego Gleysol and have a shallow (<5 cm thick) organic litter layer overlying a 10 to 15 cm thick, highly mottled, blue-gray horizon which grades to the parent material at 25 to 30 cm depth. The water table is usually at or within 25 cm of the surface. Some tree roots occur in the surface 15 cm. Some black cottonwood and willows are associated with this series.

Regand series (RG)

Regand series soils have formed on silty fluvial flood plain deposits of Blackwater Creek. Soils of the Regand series consist of nonstony silt loam or silty clay loam and are slightly to moderately calcareous, slowly to moderately pervious, very poorly drained due to high ground water levels, and occur on level to nearly level slopes in depressional areas. Ponding occurs during high runoff periods. The Regand series, classified as Rego Gleysol, is similar in morphology to the Rutherford series, but is calcareous. Regand soils have a dark brown surface horizon 5 to 10 cm thick or greater where the surface has been plowed which grades to mottled blue-gray parent material at 5 to 10 cm depth. The water table generally occurs between the surface and 35 cm depth. Roots occur in the surface 15 to 20 cm. Vegetation associated with the Regand series includes red alder, willow, common red osier dogwood, horsetails and some sedges.

Rivett series (RI)

Soils of the Rivett series have formed from the sandy fluvial deposits of the Birkenhead River, Blackwater Creek, and Gates River. They are nonstony loamy sand or sandy loam, slightly to moderately calcareous throughout, moderately to rapidly pervious, very poorly drained due to high ground water levels, and occur in level to nearly level areas. Rivett series soils are classified as Rego Gleysol and are similar in morphology to the Ranson series, but are calcareous. The Rivett soils have a dark brown surface horizon 5 to 10 cm thick which grades into a mottled, olive gray parent material which may contain occasional, thin bands of buried organic or organic enriched layers at depth. The water table generally occurs between 25 and 50 cm depth but is at the surface during some parts of the year. Black cottonwood, willows, American skunk cabbage, horsetails and sheep sorrel are some of the vegetative species associated with the Rivett series.

Sinnes series (SE)

Sinnes series soils have formed in silty fluvial deposits occuring on the flood plain of Blackwater Creek. These soils are nonstony silt loam or silty clay loam. They are moderately to strongly calcareous throughout, slowly pervious, poorly drained due to seasonally high ground water tables and slow permeability, and occur on level to nearly level slopes. Ponding and flooding occurs during high runoff periods. Soils of this series, classified as Rego Gleysol, are similar in morphology to Sankey soils, but are calcareous. Sinnes soils have a dark brown surface horizon 5 to 10 cm thick over a grayish brown, strongly mottled horizon 5 to 10 cm thick which grades to an olive gray parent material at about 30 cm depth. Occasional, thin (<5 cm thick) bands of buried organic or organic enriched layers occur throughout the profile. Tree roots are encountered in the surface 50 cm. Vegetation commonly associated with the Sinnes series includes willows, some black cottonwood, and horsetails.

Summerskill series (SM)

Summerskill series soils have developed from veneers (< 1 m) of silty fluvial deposits overlying sandy fluvial deposits on the Blackwater Creek, Birkenhead River, and Gates River flood plains. They are nonstony and consist of 20 to 50 cm of silt loam or silty clay loam overlying loamy sand or sandy loam. Summerskill soils are slightly to moderately calcareous throughout, moderately pervious, poorly drained due to seasonally high ground water levels, and occur on level to nearly level slopes in depressional areas. They are classified as Rego Gleysol. In minor areas strongly calcareous soil variants are mapped as Summerskill:calcareous variant (SM:cv). A minor area of very poorly drained Summerskill soil is mapped as Summerskill series:drainage variant (SM:dv). Summerskill series soils are similar in morphology to Scullard soils, but are calcareous. The Summerskill soils have a dark brown surface horizon 5 to 10 cm thick which grades to mottled, olive gray parent material. Rooting occurs throughout the soil profile. Associated vegetation includes black cottonwood, white spruce, horsetail and wild roses.

Van Beem series (VB)

Van Beem series soils have formed in silty fluvial deposits, interbedded with organic accumulations on the flood plains of the Birkenhead River, Blackwater Creek and Gates River. They are composed of nonstony silt loam or silty clay loam layers which are interbedded with organic or organic enriched layers. There is usually 20 to 35 cm of silt loam or silty clay loam at the surface. The individual layers are at least 5 cm thick and continuous. Van Beem series soils are slightly to moderately calcareous throughout, slowly pervious, poorly to very poorly drained due to seasonally high ground water tables and slow permeability, and occur on level to nearly level slopes in depressional areas. Ponding and flooding occurs in these soils during high runoff periods. They are classified as Rego Gleysol:cumulic phase and are similar in morphology to Valleau series soils, but are calcareous. The Van Beem soils have a dark brown surface horizon 5 to 10 cm thick (15 to 25 cm thick where cultivated) overlying olive gray parent material interbedded with organic or organic enriched layers 5 to 15 cm thick. Tree roots occur occasionally throughout the soil profile. Some of the vegetation associated with these soils includes willows, devil's club, grand fir, western hemlock, western red cedar, and some Rocky Mountain Douglas-fir.

Wheeler series (WE)

Wheeler series soils have formed in veneers (< 1 m) of sandy fluvial deposits overlying gravelly fluvial deposits on the flood plains of the Birkenhead River, Blackwater Creek, and Gates River. These soils are composed of 20 to 50 cm of nonstony loamy sand or sandy loam overlying moderately to exceedingly stony, gravelly to very gravelly loamy sand or gravelly sandy loam. Wheeler series soils are slightly to moderately calcareous throughout, rapidly pervious, imperfectly drained due to fluctuating ground water tables and periodic flooding, and occur on level to nearly level slopes on the river flood plain. They are classified as Gleyed Regosol. Wheeler soils are similar in morphology to Walden series soils, but are calcareous. The Wheeler soils have a thin, (<5 cm thick) dark brown surface horizon grading to a faintly mottled, yellowish brown gravelly parent material. Tree roots are encountered throughout the soil profile. Associated vegetation includes willows, lodgepole pine, and some black cottonwood.

Wuschke series (WG)

Wuschke series soils have formed on gravelly fluvial deposits on the flood plains of the Birkenhead River, Blackwater Creek, and Gates River. They are composed of moderately to exceedingly stony, gravelly to very gravelly loamy sand or gravelly sandy loam. They are slightly to moderately calcareous throughout, rapidly permeable, imperfectly drained due to fluctuating ground water levels, and occur on level to very gently slopes. These soils are classified as Gleyed Regosol and are similar in morphology to the Whitehead series except that the Whitehead series is acid. Wuschke soils have no profile development and are faintly mottled and gray throughout. Vegetation commonly associated with the Wuschke soils are Rocky Mountain Douglas-fir, Rocky Mountain maple, common paper birch and willows.

Winters series (WN)

Winters series soils have formed in veneers (< 1 m) of silty fluvial deposits overlying sandy fluvial deposits on the flood plains of the Birkenhead River, Blackwater Creek and Gates River. These soils consist of 20 to 50 of nonstony silt loam or silty clay loam overlying nonstony loamy sand or sandy loam. They are slightly to moderately calcareous throughout, slowly to moderately pervious, imperfectly drained due to fluctuating ground water levels, and occur on level to very gentle slopes. Soils of the Winters series are classified as Gleyed Regosol and are similar in morphology to Wallace series soils. Wallace soils, however, are acid. Winters soils have a thin (5 to 10 cm thick) organic litter layer overlying a thin (5 to 10 cm thick) dark brown surface mineral layer which grades into faintly mottled, gray parent material. Tree roots occur throughout the soil profile. Some of the vegetation associated includes Rocky Mountain Douglas-fir, trembling aspen, common paper birch and red alder.

5.1.3 Soils formed in Morainal Materials

A. Lillooet River area

Yantzie series (YA)

Yantzie series soils have formed in gravelly morainal deposits in the Green River and One Mile Creek regions of the study area. These soils are composed of moderately to exceedingly stony, gravelly loamy sand or gravelly sandy loam. They are acid, moderately pervious, well drained, and occur on very gentle to steep slopes. They are classified as Eluviated Dystric Brunisol. Yantzie soils have an organic litter layer 5 to 10 cm thick at the surface underlain by a leached horizon 10 to 15 cm thick over a reddish brown horizon 15 to 20 cm thick which grades into the brown parent material at 35 to 40 cm depth. Vegetation associated with the Yantzie series includes coast Douglas-fir, western hemlock, western red cedar and lodgepole pine.

B. Birkenhead River, Blackwater Creek, Gates River area

Yvonne series (YV)

Yvonne series soils have formed in gravelly morainal deposits within the Birkenhead River, Blackwater Creek, and Gates River valleys. Soils of the Yvonne series are moderately to exceedingly stony, gravelly to very gravelly loamy sand or gravelly sandy loam. These soils are slightly to moderately calcareous in the parent material, moderately pervious, well drained, and occur on very gentle to steep slopes. They are classified as Orthic Eutric Brunisol. Minor areas of soil variants occur which are mapped as Yvonne:shallow variant (YV:sv) where depth to bedrock is less than 1 m and Yvonne:calcareous variant (YV:cv) where the parent material is strongly calcareous. Vegetation associated with the Yvonne series includes lodgepole pine, Rocky Mountain Douglas-fir, willow and roses.

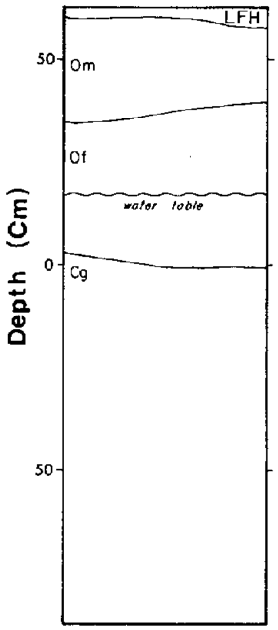
5.1.4 Soils formed in Organic Materials

A. Lillooet River area

Zurbrugg series (ZA)

Zurbrugg series soils have developed from poorly decomposed organic deposits derived from sedges, rushes and reeds occurring on the Lillooet River flood plain. They consist of 60 to 160 cm of fibric (poorly decomposed) organic material overlying mineral material, commonly silt or silt loam. They are acid, nonstony, moderately to rapidly pervious, poorly to very poorly drained due to high ground water levels caused by seepage from adjacent slopes and from the Lillooet River during freshet, and occur on level to nearly level slopes. Soils of the Zurbrugg Series are classified as Terric Mesic Fibrisol. The native vegetation consists of rushes, sedges, and reeds, with some willow and bog birch.

A brief description and diagram of a representative Zurbrugg series soil profile, which was sampled, is presented in Figure 43.



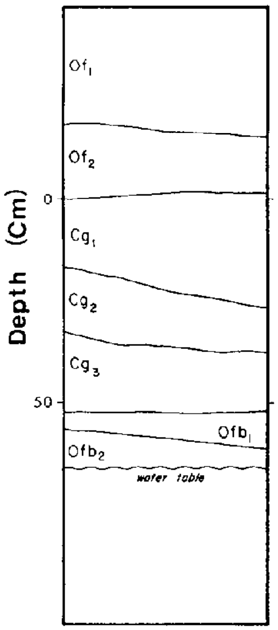
LFH	Raw to partially decomposed leaf litter; 3 to 5 cm thick
Om	Dark reddish brown partially decomposed organic material; 19 to 26 cm thick; pH 4.9 (1:10,0.01M $CaCl_2$)
Of	Dark yellowish brown poorly decomposed organic material; 31 to 39 cm thick; pH 4.8 (1:10,0.01M $CaCl_2$)
Cg	Dark grayish brown silt; pH 4.8 (0.01M $CaCl_2$)

Figure 43: Soil profile and abridged description of the Zurbrugg series

Zurcher series (ZE)*

Zurcher series soils have developed from undecomposed organic materials derived from sedges, rushes and reeds occurring in wet, depressional areas on the Lillooet River flood plain. Soils of the Zurcher series consist of 60 to 160 cm of fibric (poorly decomposed) organic material with layers of mineral (commonly silt or silt loam) material interbedded. The mineral layers, either together or as a single layer, total 5 to 30 cm in thickness and are continuous. These soils are acid, nonstony, rapidly pervious, poorly to very poorly drained due to high ground water levels, and occur on level to nearly level slopes. Zurcher soils are classified as Terric Fibrisol but map units may include Cumulo Fibrisols where the depth of organic material is greater than 160 cm.

A diagram and brief description of a sampled Zurcher series soil profile is given in Figure 44.



Of_1 Very dark brown poorly decomposed organic material; 30 to 33 cm thick; pH 4.0 (1:10, 0.01M $CaCl_2$)

Of_2 Very dark brown poorly decomposed organic material; 14 to 18 cm thick; pH 3.8 (1:10, 0.01M $CaCl_2$)

Cg_1 Very dark grayish brown silt loam containing appreciable organic matter with prominent, dark yellowish brown mottles; 17 to 28 cm thick; pH 4.0 (0.01M $CaCl_2$)

Cg_2 Very dark green silt loam containing appreciable organic matter; 11 to 16 cm thick; pH 4.1 (1:4, 0.01M $CaCl_2$)

Cg_3 Olive gray silty clay loam; 15 to 20 cm thick; pH 4.4 (0.01M $CaCl_2$)

Ofb_1 Very dark grayish brown poorly decomposed organic material containing some silt loam, 4 to 9 cm thick; pH 4.4 (1:4, 0.01M $CaCl_2$)

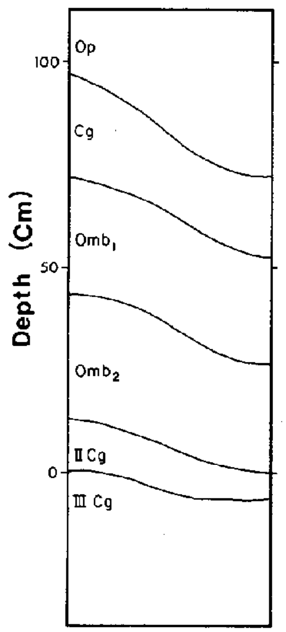
Ofb_2 Very dark grayish brown poorly decomposed organic material

Figure 44: Soil profile and abridged description of the Zurcher series

Zoltay series (ZO)

Zoltay series soils have formed from moderately decomposed organic materials derived from sedges, rushes, and reeds occurring in wet depressional areas on the flood plain of the Lillooet River. These soils are composed of 40 to 160 cm of mesic (moderately decomposed) organic material interbedded with layers of silty mineral material. The mineral layers, either together or as a single layer, total 5 to 30 cm in thickness. The Zoltay soils are acid, nonstony, rapidly to moderately pervious, poorly to very poorly drained due to high ground water levels caused by seepage from adjacent areas, and occur on level to nearly level slopes. Zoltay series soils are classified as Terric Mesisol: cumulo phase. The main vegetation is sedges, rushes, and reeds, with some shrubs.

Figure 45 is a brief description and diagram of a Zoltay series soils profile, which was sampled.



Op	Dark reddish brown partially decomposed organic material with mineral material incorporated; 24 to 48 cm thick; pH 4.3 (0.01M $CaCl_2$)
Cg	Grayish brown loamy sand with faint, light olive brown mottles; 20 to 24 cm thick; pH 4.5 (0.01M $CaCl_2$)
Omb_1	Black moderately decomposed organic material; 27 to 29 cm thick; pH 3.9 (1:5,0.01M $CaCl_2$)
Omb_2	Dark reddish brown moderately decomposed organic material; 30 to 33 cm thick; pH 3.6 (1:5,0.01M $CaCl_2$)
II Cg	Dark brown silt loam mixed with layers and pockets of moderately decomposed organic material; 6 to 10 cm thick; pH 3.6 (1:5,0.01M $CaCl_2$)
III Cg	Dark grayish brown loamy sand with prominent, yellowish red mottles; pH 4.0 (0.01M $CaCl_2$)

Figure 45: Soil profile and abridged description of the Zoltay series

B. Birkenhead River, Blackwater Creek, Gates River area

Zaruba series (ZR)

Soils of the Zaruba series have formed in undecomposed organic materials found in wet, depressional areas of the flood plains of the Birkenhead River, Blackwater Creek, and Gates River. Zaruba series soils are composed of 60 to 160 cm of fibric (poorly decomposed) organic material which is interbedded with variable textured mineral layers. The mineral layer(s) which are continuous, are individually at least 5 cm thick and, in total, less than 30 cm thick. These soils are slightly to moderately calcareous, nonstony, moderately to rapidly pervious, poorly to very poorly drained due to high ground water levels, and occur on level to nearly level slopes. They are classified as Terric Fibrisol:cumulo phase. The water table fluctuates from the surface to a depth of 30 cm. Roots occur throughout the profile. Vegetation associated with the Zaruba series includes bog glandular birch, red alder, sedges and some mosses.

5.1.5 Miscellaneous Land Types

Anthropogenic (A)

Anthropogenic land types are areas of land which have been altered by man's activities. The soils have been so modified that there no longer exists recognizable soil profile characteristics. Areas mapped as "Anthropogenic" in the study area are characteristically landfill areas, sawmill sites, urbanized areas, and gravel pits. Soils mapped as anthropogenic variants of established series have been disturbed by man's activities, but some recognizable soil profile characteristics still remain.

Rock land (RO)

Rock land areas are characterized by exposed bedrock outcrops or areas where the soil mantle is less than 10 cm thick. Often these land areas have steep slopes.

5.2 Discussion of Relative Positions of Soil Series to each other in the Landscape

The relationships between the soils of the study area are complex. In order to simplify and illustrate some of the soils interrelationships oblique landscape sketches and cross-sectional diagrams have been developed. Descriptions of the relationships of the soil series to each other on the landscape are described verbally and illustrated diagramatically in the sections following. Figure 46 indicates the portions of the valley covered by the oblique sketches and identifies the location of the cross-sectional diagrams.

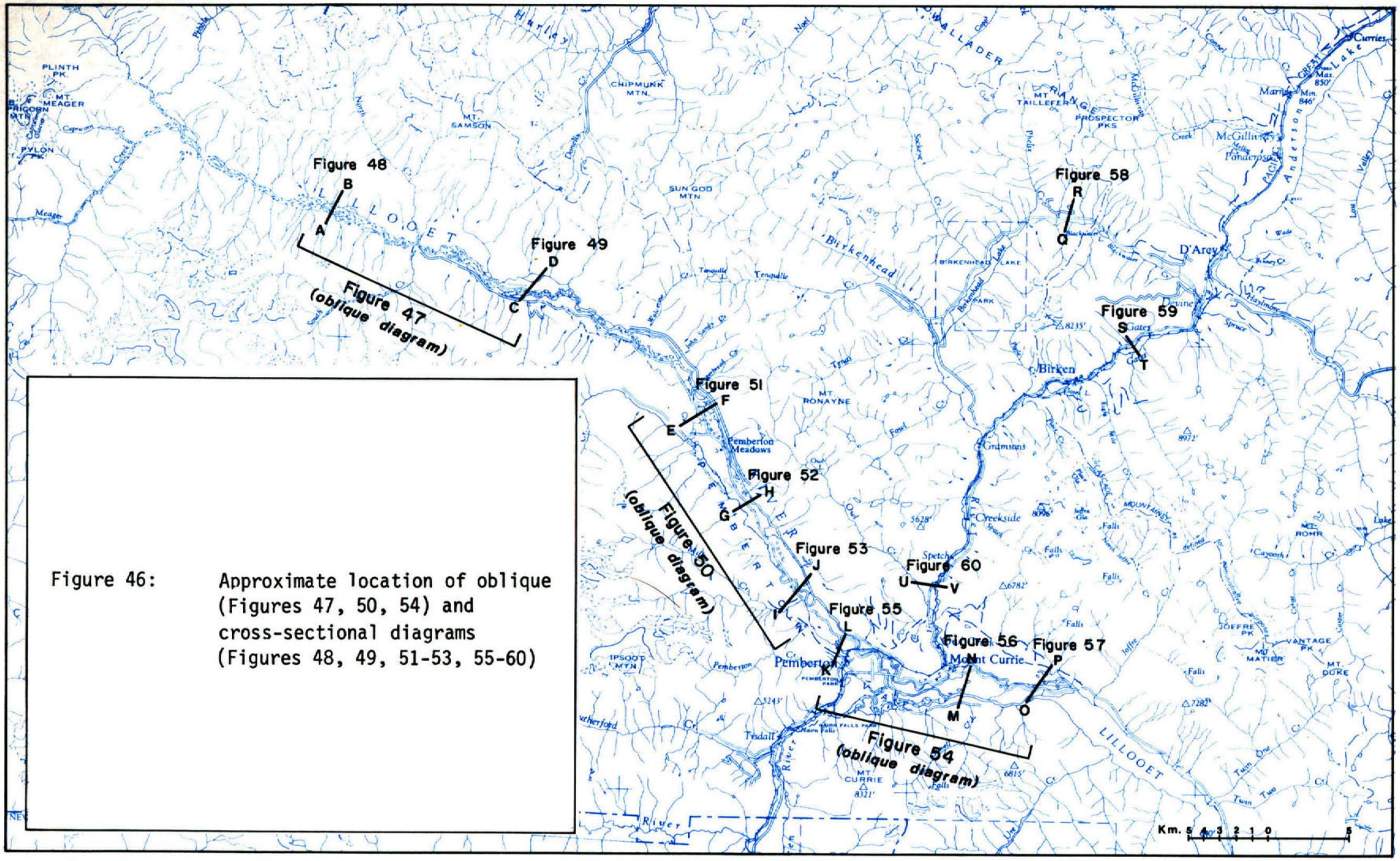


Figure 46: Approximate location of oblique (Figures 47, 50, 54) and cross-sectional diagrams (Figures 48, 49, 51-53, 55-60)

In all of the cross-sectional diagrams the lower boundaries of the various soil textures are approximate and estimated from field observations. These diagrams are drawn approximately to scale with approximately 100 times vertical exaggeration. Each cross-sectional diagram is located in a specific area of the study area, but is also meant to give a general indication of the patterns within the area in which it is located.

Based on the general landscape patterns of soil parent materials and soils, the study area can be subdivided into six general sections as follows: Meager Creek to Wolverine Creek, Wolverine Creek to Miller Creek, Miller Creek to Lillooet Lake, the Birkenhead River – Gates River – and Blackwater Creek valleys, Green River, and uplands.

5.2.1 Meager Creek to Wolverine Creek Section

Figure 47 illustrates that portion of the Lillooet River valley upstream from the Kenworthy farm to Meager Creek and shows the braided nature of the Lillooet River upstream from Wolverine Creek.

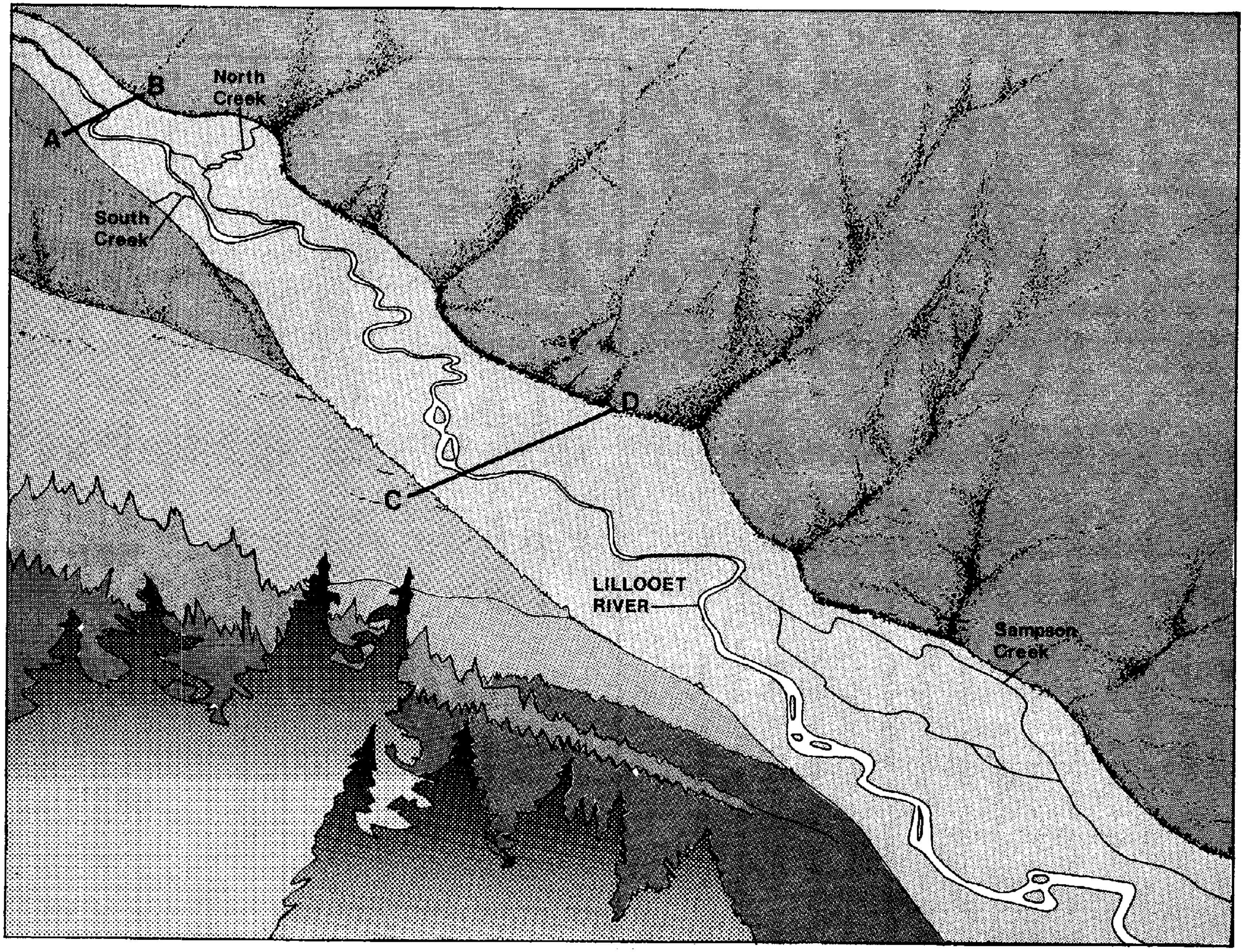


Figure 47: Oblique diagram of the Meager Creek to Wolverine Creek section of the Lillooet River valley. Approximate locations of cross-sectional diagrams AB, and CD are indicated.

Cross-sectional diagram AB (Fig. 48) illustrates the nature of soils which occur on the braided flood plain deposits of the Lillooet River. Plate 1 gives a picture of the area being described by Figure 48. The relatively high velocity of the river is indicated by deposits of gravel which remain on the flood plain as flood waters recede. On the slightly raised terraces of the flood plain, the gravels are covered by veneers (< 1 m thick) of sandy material (Walden series soils) or by blankets (> 1 m thick) of sandy deposits (Wolverine series soils). However, adjacent to the presently active channel of the river these sands are absent. In the channels, which appear to be periodically flooded as indicated by lack of vegetation and pockets of standing water, shallow to deep veneers of sandy materials are again found. The deeper deposits appear to be located on the inside bends of the channels and become thinner toward the outside or eroding side. On Walden series and Wolverine series soils both deciduous and coniferous forest are established, although most of the large, mature cedar has been removed by logging. The Ronayne series soils are found in the channels of the flood plain which are inundated during freshet, and the water table remains near the surface throughout the year. Parts of these channels may be flooded all year long.

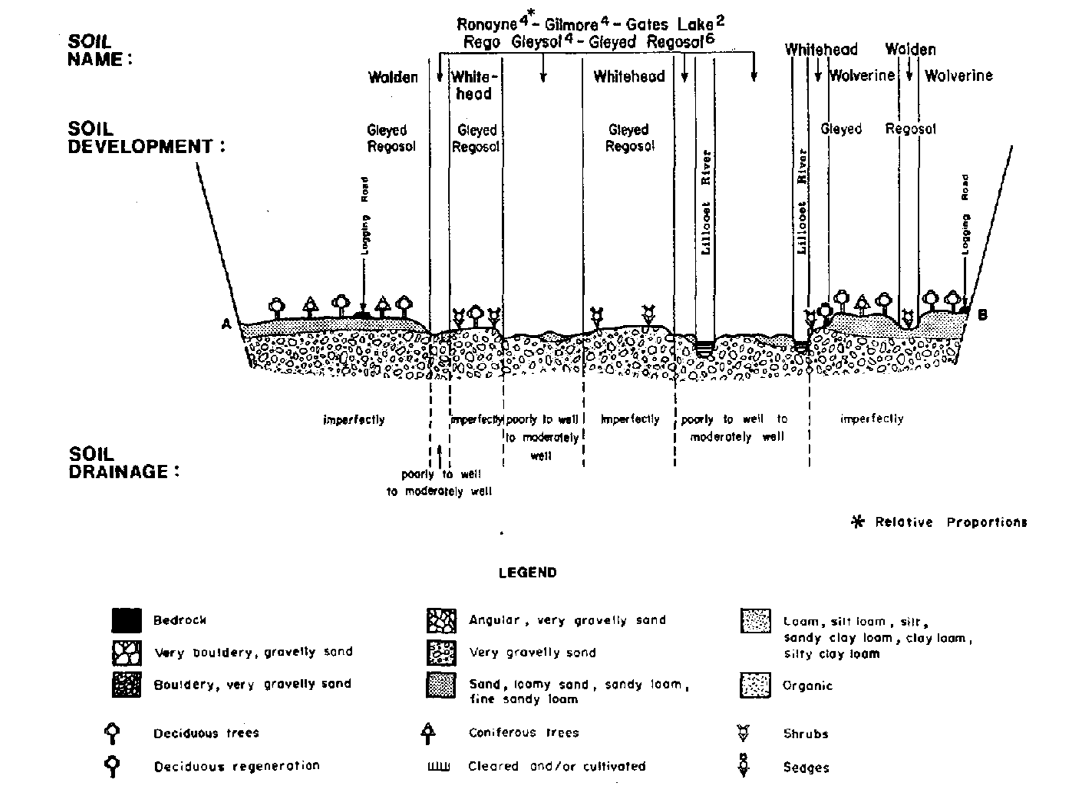


Figure 48: Cross-sectional diagram AB, located northwest of North and South Creeks

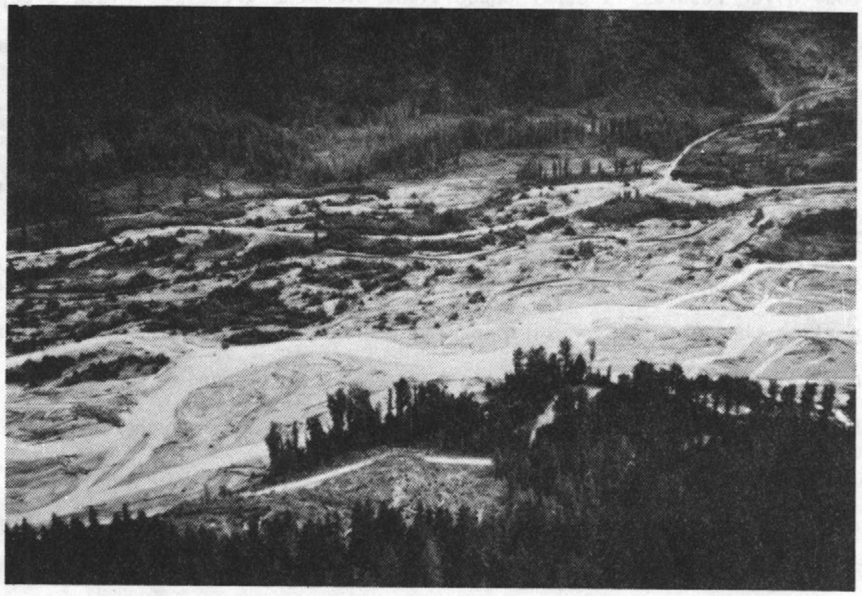


Plate 1: Pictoral description of Figure 48, cross-sectional diagram AB

Cross-sectional diagram CD (Fig. 49) illustrates the area where reduction in flow velocity of the Lillooet River results in sandy depositions over the gravels. Plate 2 depicts the general area being described by Figure 49. The sandy, poorly drained Scobie series soils which occur adjacent to the river are related to Ranson series soils which are also sandy but very poorly drained. Soils of the Ranson series generally occur in stream channels which are occupied by slower moving waters during freshet and include slightly ponded areas where the soils may contain thin lenses of silt. Whitehead series soils are gravelly throughout and generally occur on landscape positions (at slightly higher elevations) which are not as frequently flooded. Ronayne series soils are found in river channels free of water during much of the year but which are generally inundated during freshet. The Sister series soils occur where water is ponded for part of the year but are also periodically inundated by high velocity water. This results in the characteristic alternating layers of sandy and silty deposits associated with the Sister series. Wolverine series soils are found adjacent to the gravelly Whitehead soils, in what appears to be an infilled portion of the inside of the original river channel.

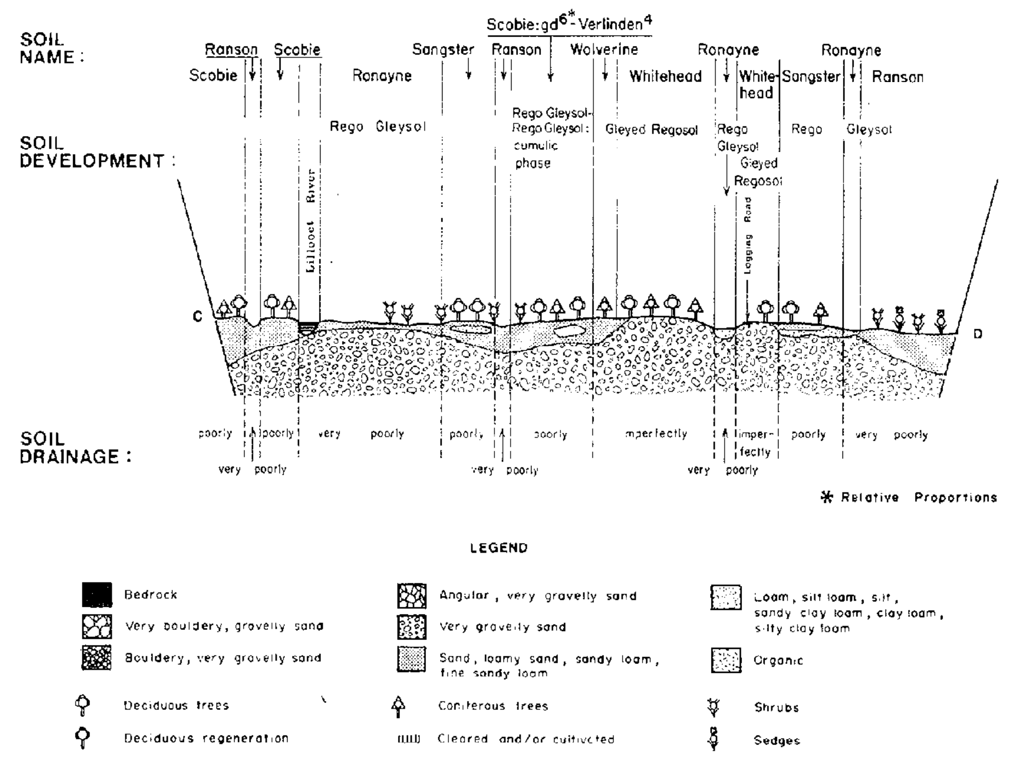


Figure 49: Cross-sectional diagram CD, located northwest of Railroad Creek

Plate 2: . Pictoral description of Figure 49, cross-sectional diagram CD

5.2.2 Wolverine Creek to Miller Creek Section

The oblique landscape diagram in Figure 50 illustrates that portion of the valley from approximately the confluence of Ryan Creek and the Lillooet River downstream to Miller Creek. Within this area three cross-sectional diagrams have been drawn to illustrate the relationship of the soils to each other on the landscape.

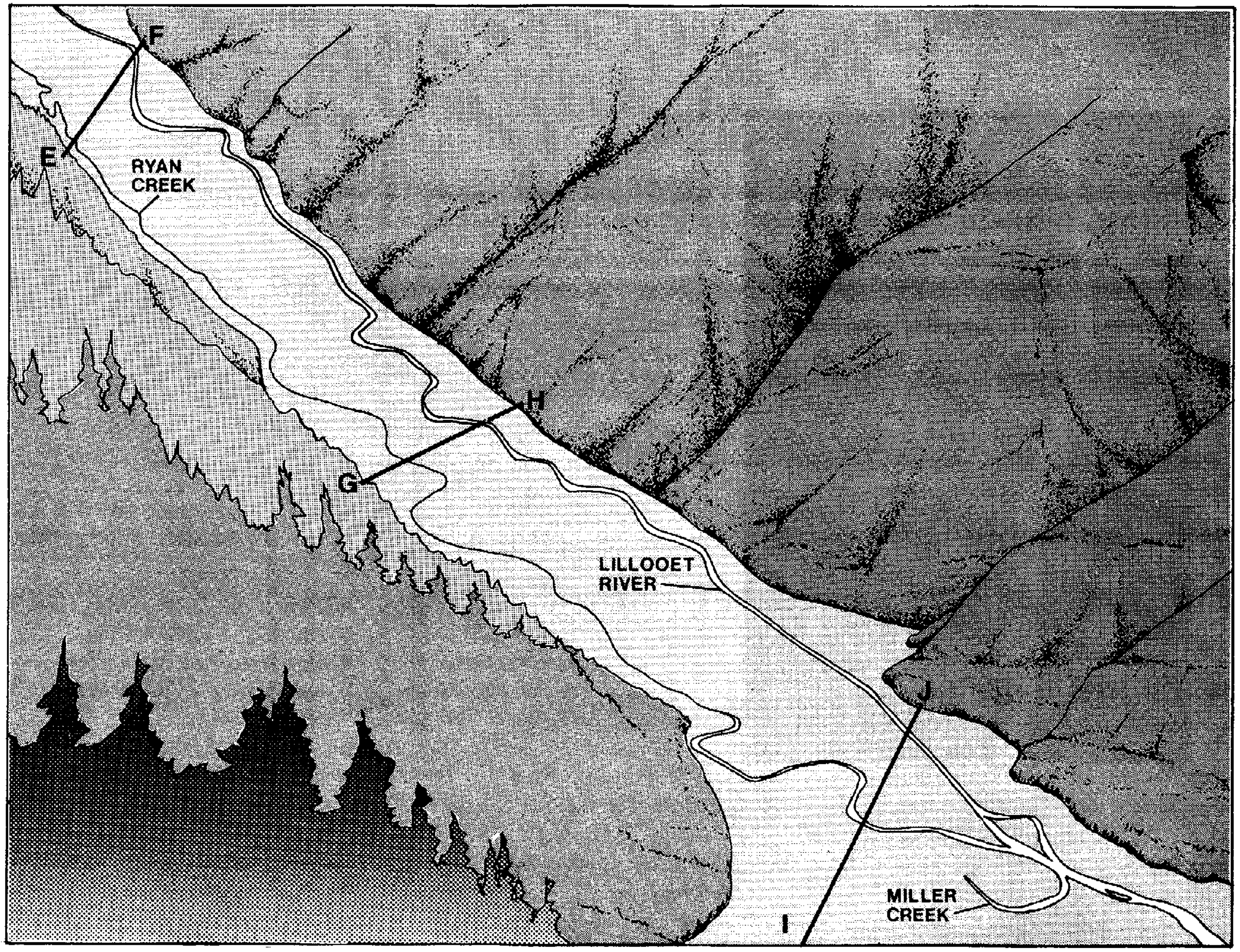


Figure 50: Oblique diagram of the Wolverine to Miller Creek area. Approximate location of cross-sectional diagrams EF, GH, and IJ are indicated

Cross-sectional diagram EF (Fig. 51) illustrates an area in which the distribution of soil parent materials has been influenced primarily by the Lillooet River. Plate 3 gives an illustration of the geographical area being described by Figure 51. There are no major tributary streams entering the Lillooet valley at this point. Scobie series soils are located in the middle of a meander scroll of the Lillooet River abandoned as a result of channelization of the river. Wolverine series and Wolverine series:gravelly at depth occur in the abandoned meander scar. On the east side of the valley the Scobie series soils are bounded by Gates Lake and Ronayne soils. The Ronayne series soils, located in channels, are periodically inundated, particularly during freshet and have water near the surface throughout most of the year. Sankey series and Rutherford series

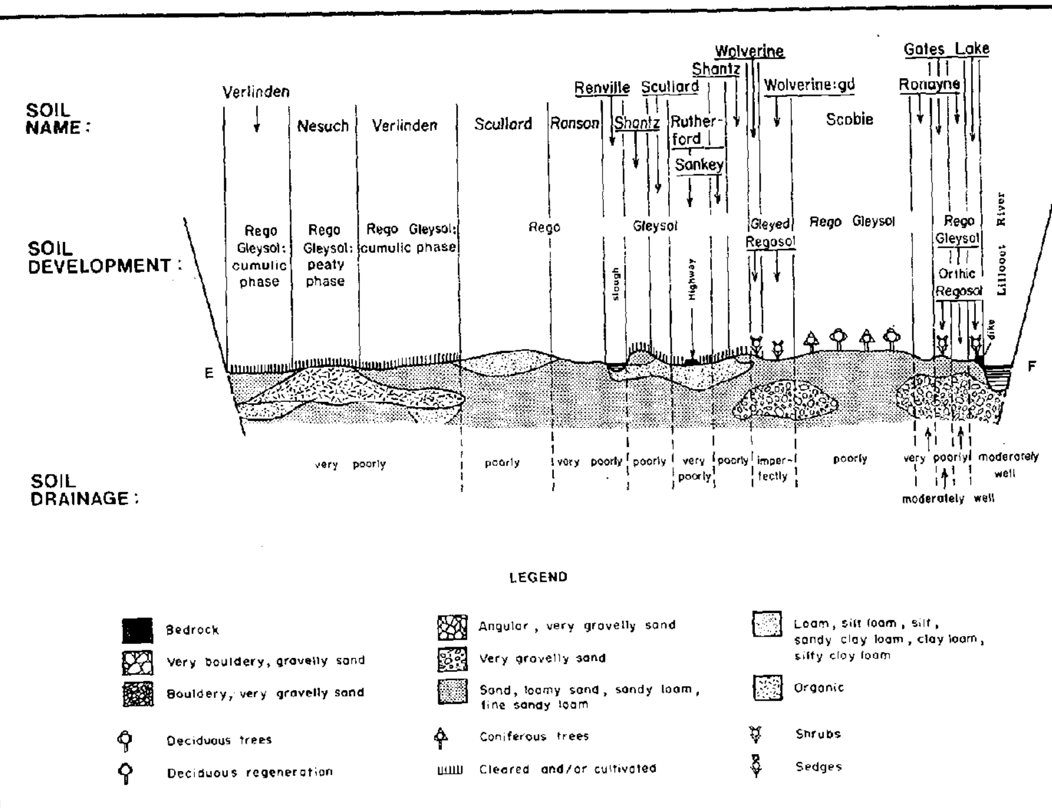


Figure 51: Cross-sectional diagram EF, located northwest of Ryan Creek and southeast of Wolverine Creek extending across the Lillooet River valley

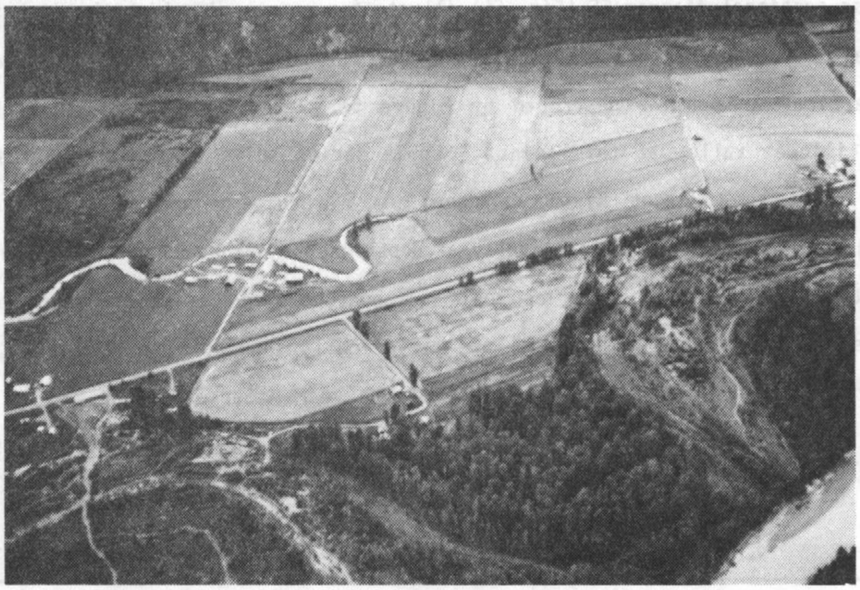


Plate 3: Pictoral description of Figure 51, cross-sectional diagram EF

soils generally occur in depressional areas. Near the west side of the valley a greater frequency of buried organic layers occurs to form the Verlinden series soils. These are situated adjacent to the Nesuch series soils. Shantz series soils are transitional between Sankey series and Scobie series, being composed of sandy loam or fine sandy loam overlying loam to silty clay loam. Scullard series soils are also transitional between Sankey series and Scobie series, but are composed of silt loam or silty clay loam overlying sandy loam to fine sandy loam.

Cross-sectional diagram GH (Fig. 52) illustrates the greater complexity of soils which have formed as the result of the influence of two large streams. The west side of Ryan Creek shows a relatively simple progression from the imperfectly drained Wolverine series, through poorly drained Scobie series and very poorly drained Ranson series, to the very poorly drained Nesuch soils. All of these soils have developed in sandy fluvial soil parent materials deposited primarily by Ryan Creek. The soil differences are defined on the basis of soil drainage which is the result of differences in elevation and topographic micro-relief.

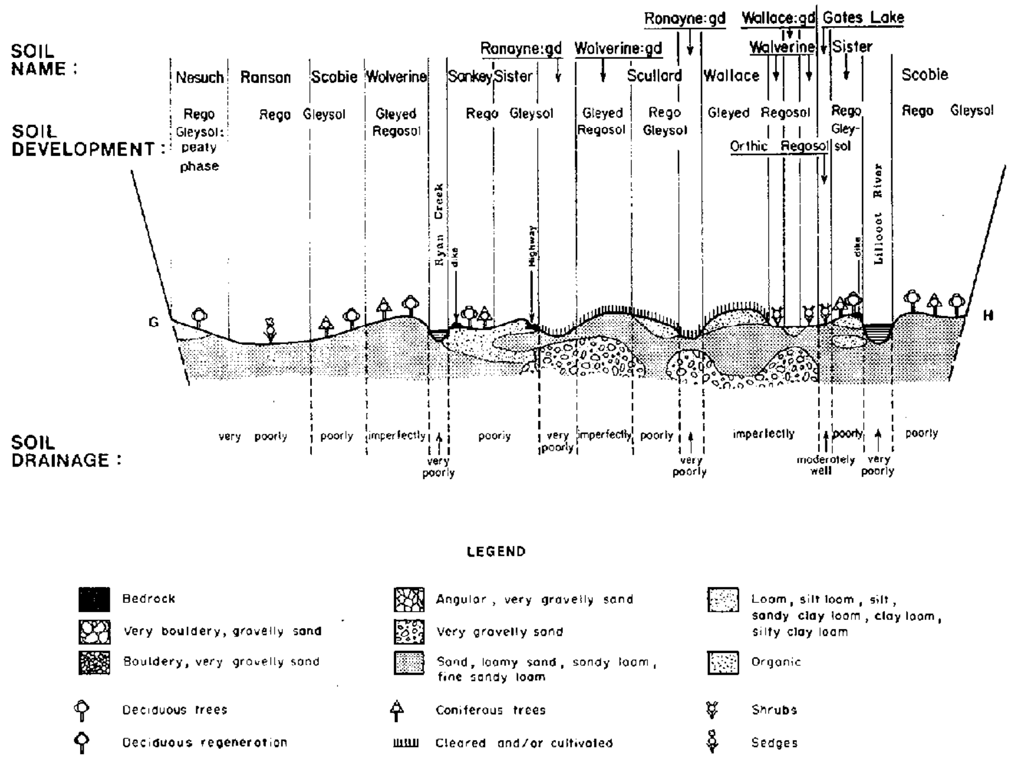


Figure 52: Cross-sectional diagram GH, located between Miller and Ryan Creek junction and extending across the Lillooet River valley

That part of the cross-section between Ryan Creek and the Lillooet River illustrates some of the complexity which has resulted from the meeting and mixing of deposits of Lillooet River and Ryan Creek on the flood plain. Ronayne soils are found in abandoned stream channels, while Wolverine series and Wallace series are located on the levees adjacent to both present and abandoned stream channels. Sankey soils occur in a depression into which the meander of Ryan Creek was gradually expanding until it was diked. Sister series soils are found in slightly depressional areas adjacent to the streams where their development was influenced by frequent flooding. Ronayne series:gravelly at depth; Wallace series:gravelly at depth; and Wolverine series occur in the channel occupied by the Lillooet River prior to channelization. Scullard series and Wallace series are found adjacent to old stream channels and were probably formed as backwater channel deposits where quiet waters deposited silts over the sands.

Cross-sectional diagram IJ (Fig. 53) illustrates the sequence of soils occurring from the apex of the Miller Creek fan northward across Ryan Creek to the north side of the Lillooet River. Plate 4 depicts the general geographical area described by Figure 53. The soils in this cross-section progress from the Farmer series on the Miller Creek fan through the Wolverine and Scobie series to the Sister, Sankey and Shantz series on the flood plain. Sankey series soils have formed in depressional areas which are subject to flooding and intermittent ponding. The Sister series occurs up slope from Sankey soils and have resulted from periodic flooding by quickly moving waters depositing sands followed by inundation by ponded waters in which silts were deposited. These soils are often flanked by the Shantz soil series which was deposited in a fashion similar to the Sister series although greater depths of sands were laid down.

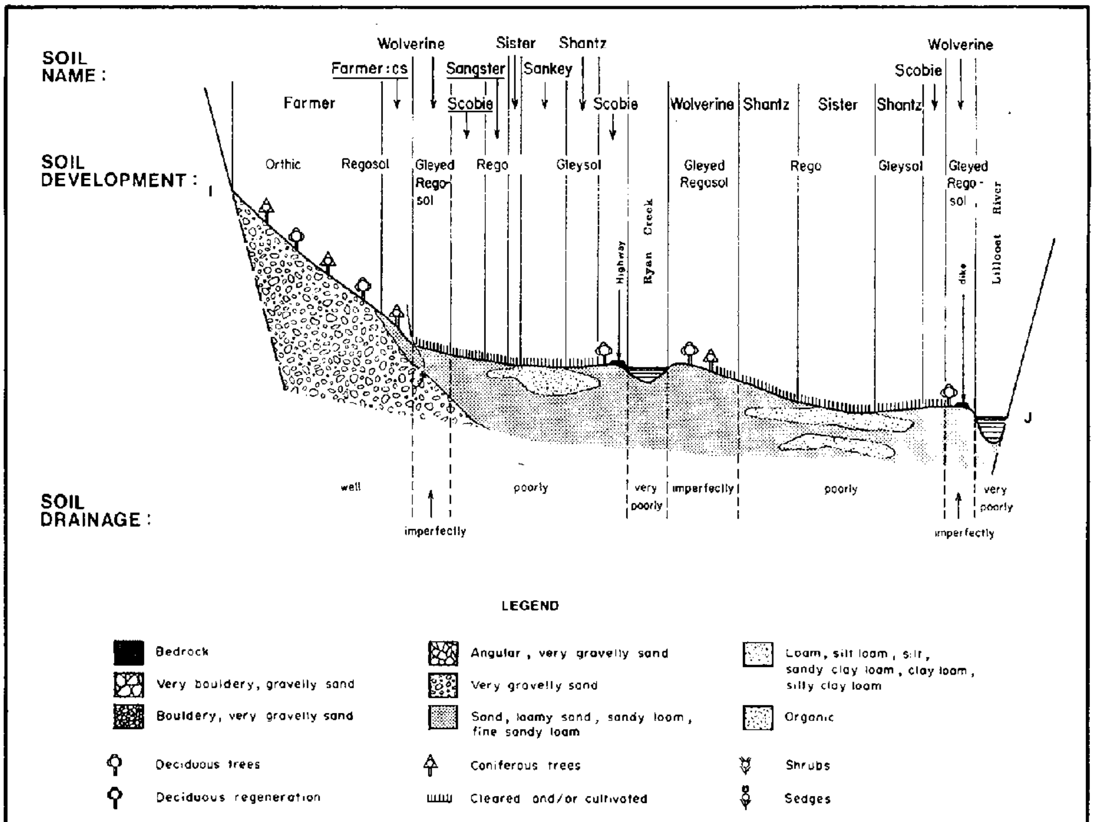
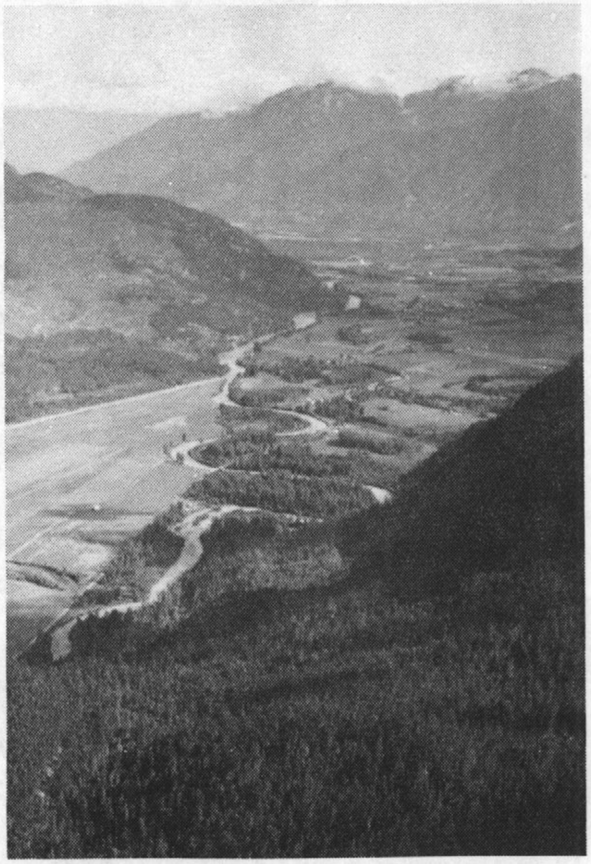


Figure 53: Cross-sectional diagram IJ, located across the Lillooet River from the Miller Creek junction

Plate 4:

Pictoral description of Figure 53, cross-sectional diagram IJ (photo by J.M. Ryder)



5.2.3 Miller Creek to Lillooet Lake Section

The oblique landscape diagram in Figure 54 illustrates the portion of the valley upstream from Lillooet Lake towards Pemberton. This area has been influenced by the confluence of the Green, Birkenhead, and Lillooet rivers and One-Mile Creek.

The soils of this portion of the study area are considered to have developed under relatively similar conditions of climate, vegetation, parent materials, relief and time. However, minor variations particularly in soil parent materials and relief, combined with some differences in water regime, have caused the differences among identified soil series. The textures of soil parent materials range from sandy loam to silt loam and some silty clay loam. There are also localized areas of gravel in abandoned river channels and on fans where tributaries join the main valley. Shallow to deep organic deposits occur in depressional areas along the valley sides.

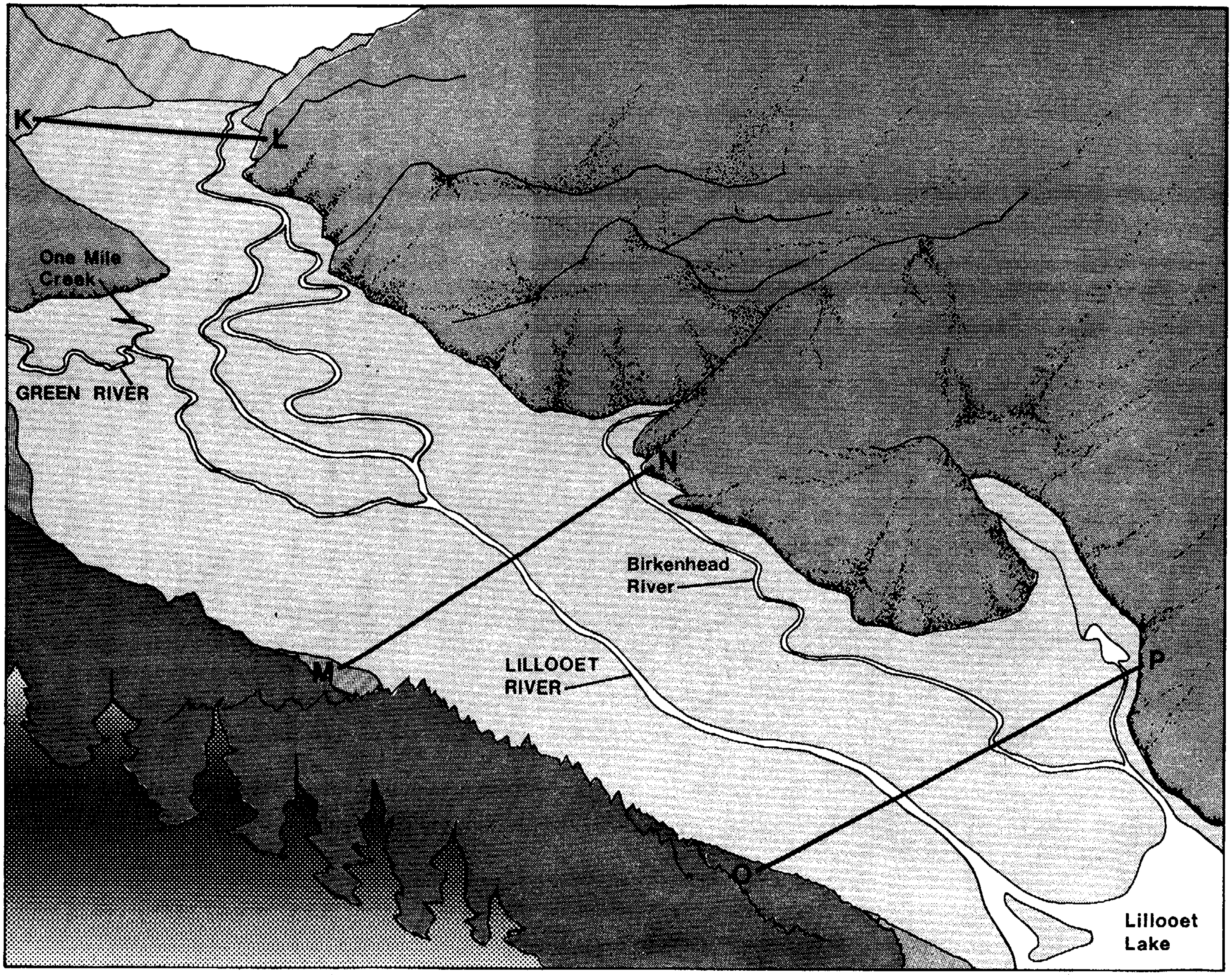


Figure 54: Oblique diagram of the Miller Creek to Lillooet Lake area showing the approximate locations of cross-sectional diagrams KL, MN, and OP

Cross-sectional diagram KL, in Figure 55, illustrates the gradation of soils across the valley floor just northwest of Pemberton. It illustrates a rather simplified progression of soils extending from the topographically higher Lillooet River to the depressional areas on the opposite side of the valley. Plate 5 depicts the general geographical area described by Figure 55 and is looking west up the valley. The Gates Lake series occurs on the active flood plain of the Lillooet River. The Wolverine soil series occurs on the levees adjacent to the Lillooet River and its old channel. Shantz soils occur in minor meander scars left by the river at a previous time. The Wolverine series grades into the Scobie series. Gates Lake, Wolverine, and Scobie series soils have developed in sandy materials deposited by quickly moving water which maintained its load of silt and clay to be deposited later in the quieter water of the depressional areas. This is illustrated by the gradation from Rutherford to Quamell soils. Rutherford soils have formed at what appears to be the upper extent of a ponding zone and sands can be expected at some depth below the silts.

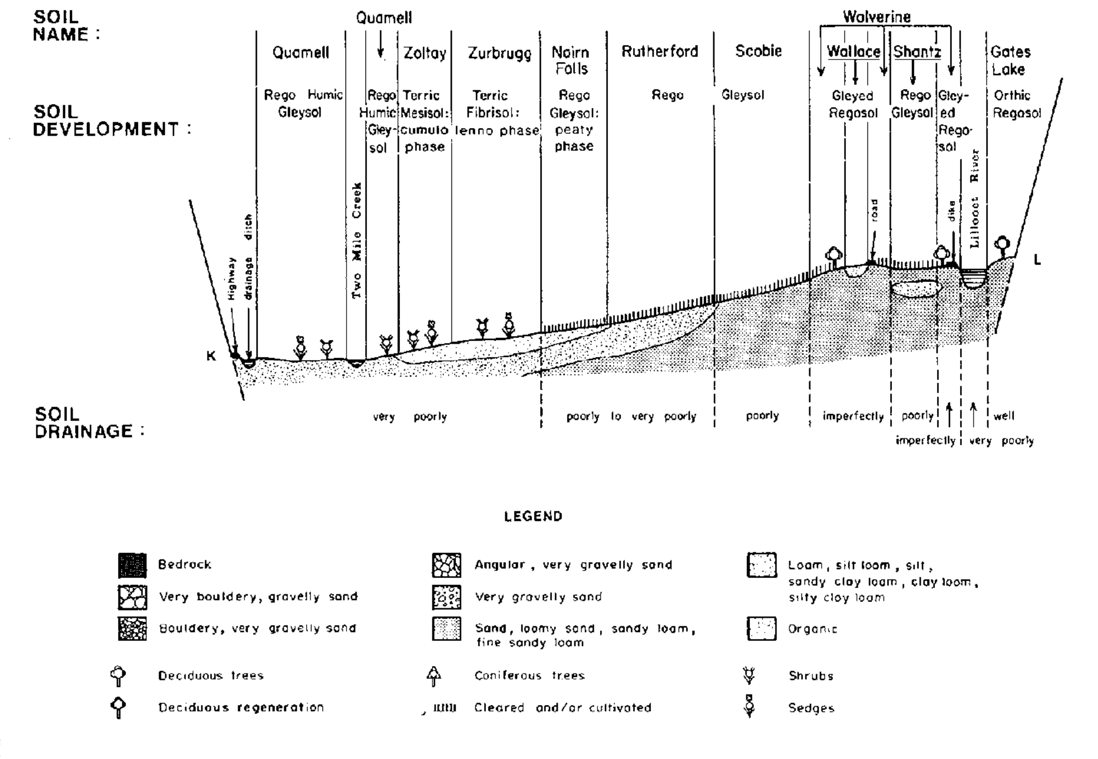


Figure 55: Cross-sectional diagram KL, located northwest of Pemberton and extending across the Lillooet River valley

Plate 5: Pictoral description of Figure 55, cross-sectional diagram KL (photo by J. M. Ryder)

Rutherford soils grade into the Nairn Falls series which has a shallow capping of organic material overlying the silts. The organic accumulation has resulted because of the proximity to a ponding area. Nairn Falls series then grades into Zurbrugg and Zurcher series which are primarily shallow organic soils, although Zurcher series, with its lenses of mineral material, indicates periodic flooding. The Quamell soil series represents what once was a localized pond which has since been drained.

Cross-sectional diagram MN (Fig. 56) illustrates the influence on the soils of the depositional and erosional effects of the Lillooet and Birkenhead rivers. Plate 6 depicts the general geographical location of Figure 56. Wolverine soils occur between the Lillooet River and the valley side on the south side of the valley. On the north side, the Sister soils grade into Scullard soils which generally occur in abandoned backwater channels. Also associated are the Scobie soils occurring at slightly higher elevations than the Scullard soils. Scobie soils grade into Sankey series:coarse at depth soils. Traversing across a Sankey:coarse at depth soil area are Shantz and Sangster soils developed on the deposits of a small stream channel that wanders across the flood plain. Sankey:coarse at depth soils then grade into the Rutherford series. Near the Birkenhead River organic surfaces typical of the Nairn Falls soils have developed. The Scobie series reoccurs adjacent to the Birkenhead River.

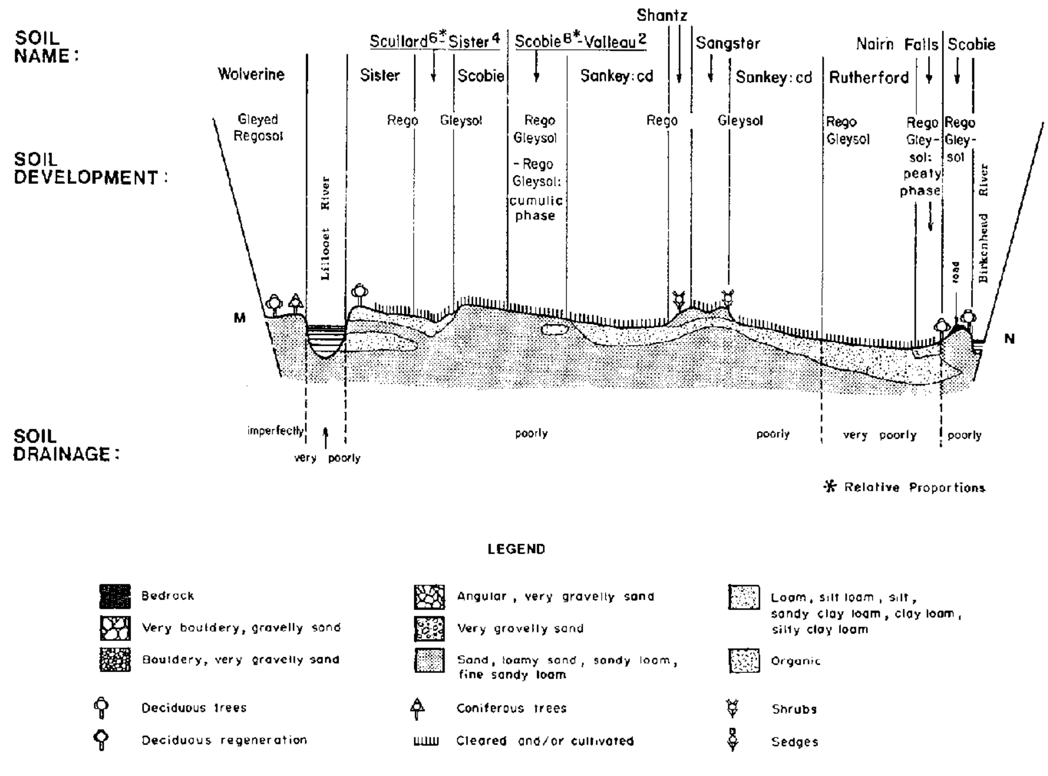


Figure 56: Cross-sectional diagram MN, located southeast of Mount Currie village and extending across the Lillooet River valley

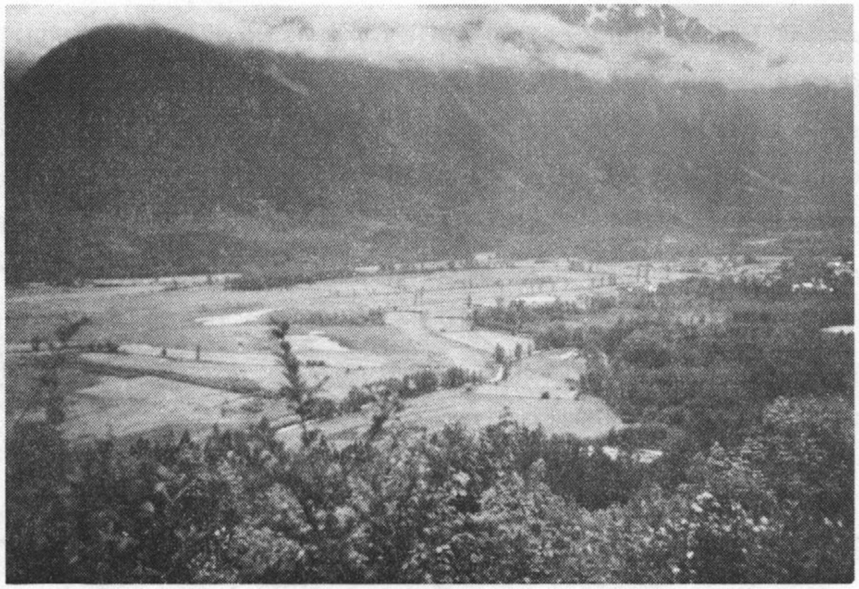


Plate 6: Pictoral description of Figure 56, cross-sectional diagram MN

Cross-sectional diagram OP (Fig. 57) indicates that both the Lillooet and Birkenhead rivers appear to be degrading their channels and forming terraces in the pre-existing flood plain deposits. Plate 7 depicts the general geographical area described by Figure 57. Soils at this point have been formed primarily from loam to silty clay loam fluvial materials overlying sandy materials. The soils grade from deep (>1 m) silty deposits as in the Sankey series through Sankey series:cd soils to Scullard series, which have silty veneers less than 50 cm thick. This gradation is interrupted in places where previous channels of the river, now abandoned except perhaps during freshet, have eroded through the surface layers exposing the sandy Gates Lake series. In other channels, gravelly deposits typieal of the Wolverine series:gravelly at depth or Walden series are encountered between 50 and 100 cm depth. Adjacent to the Birkenhead River the Ronayne soils occur on a slight terrace above the river and appear to be periodically inundated, particularly during freshet. North of the Birkenhead River, Renville soils occur in a small channel which is periodically inundated, especially during heavy runoff from the valley sides following rainfall or snowmelt. The adjacent Sangster soils have formed as a result of periodic overbank flooding.

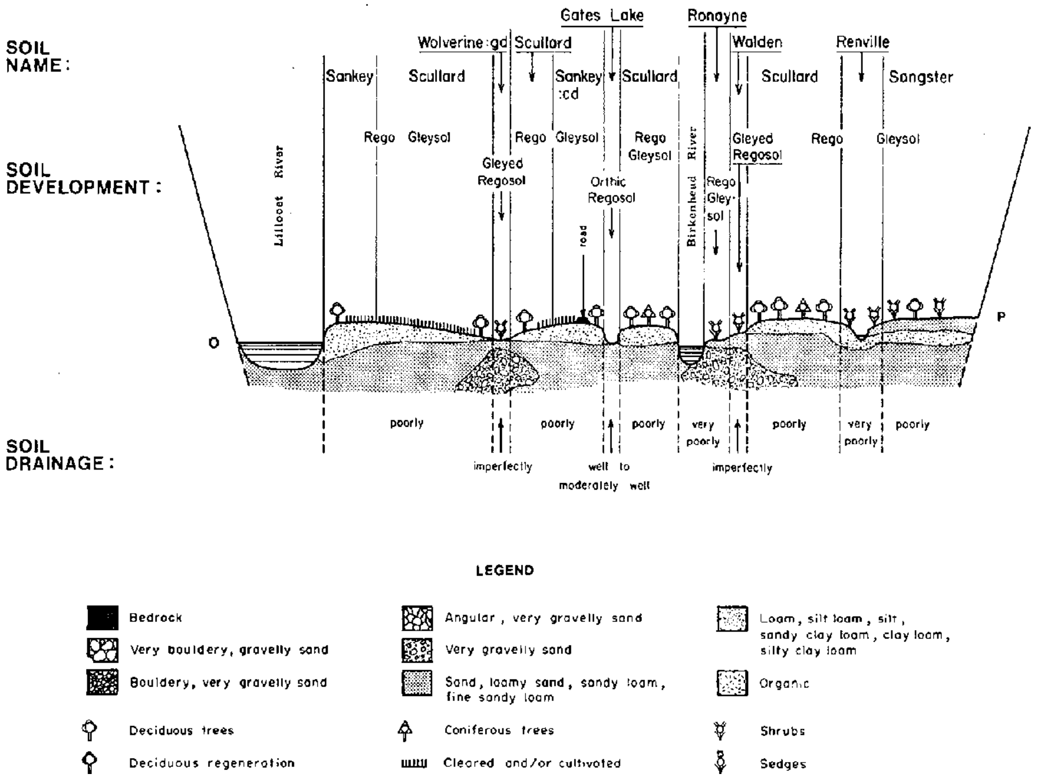


Figure 57: Cross-sectional diagram OP, located west of Lillooet Lake and extending across the Lillooet River valley

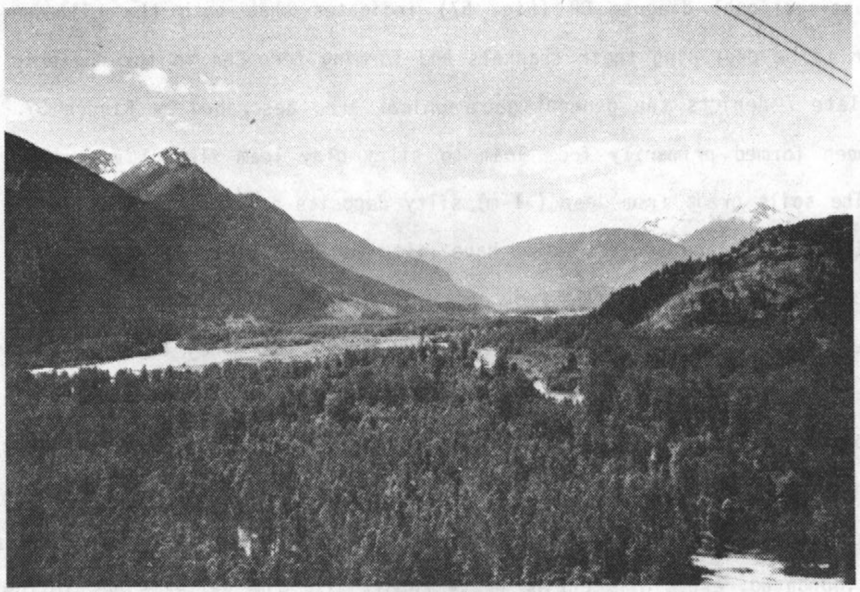


Plate 7: Pictoral description of Figure 57, cross-sectional diagram OP

5.2.4 Blackwater Creek Valley - Gates River Valley - Birkenhead River Valley Section

This section discusses the relationships of the soils in the Blackwater Creek, Gates River and Birkenhead River valleys. Each of these valleys is distinctive with respect to the soils which have developed, the soil parent materials from which they have formed, and their topographic expression.

Cross-sectional diagram QR (Fig. 58) illustrates a fairly typical sequence of soils extending across the Blackwater Creek valley. Plate 8 illustrates the geographical area described by Figure 58. The Yvonne soils have formed on morainal deposits on the south wall of the valley. Near to and at the bottom of the slopes Flichel soils (developed on both active and inactive fluvial fans) are frequently found. The valley bottom soils are Rivers series, and are situated in and adjacent to the Blackwater Creek flood plain. The Cowell soils have developed in the avalanche tracks and fans on the north side of the valley.

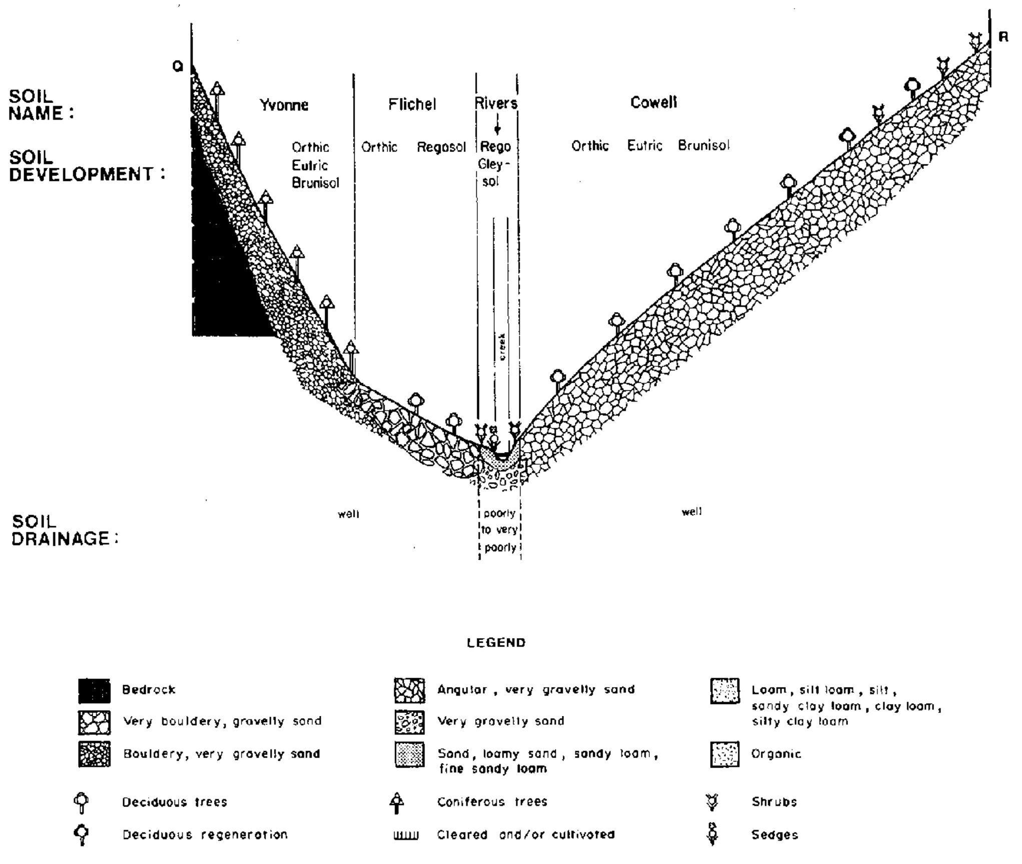


Figure 58: Cross-sectional diagram QR, located between Blackwater Lake and Phelix Creek extending across the Blackwater Creek valley

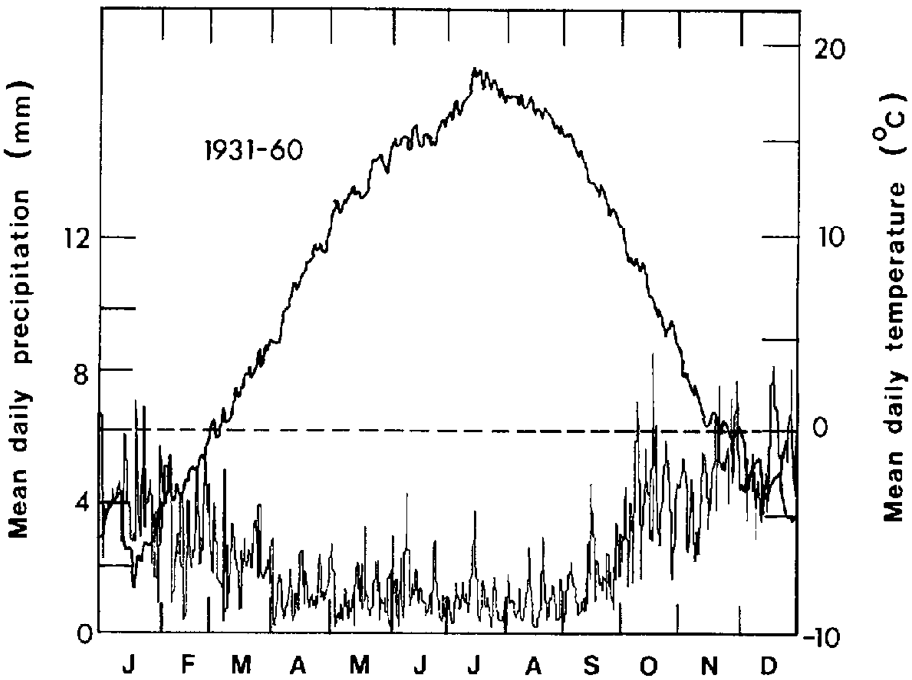


Figure 5: Mean daily temperature and precipitation, Pemberton Meadows (after Gilbert, R., 1972)

4.2 Physiography and Drainage

The Pemberton Valley lies within the Pacific Ranges of the Coast Mountains region as defined by Holland (1964). The valley itself is drained by the Lillooet River which flows southward into Lillooet Lake and thence to Harrison Lake and the Fraser River. The Lillooet River is fed by its tributaries; Meager, Pebble, North, South, Wolverine, John Sandy, Gingerbread, Ryan, Miller, and One Mile creeks and the Green River. The Birkenhead River with its tributaries, Poole, Spetch, and Owl creeks, also drains southward into Lillooet Lake. Gates River, and its tributaries including Eight Mile, Spruce, Blackwater and Haylmore creeks, drains northward into Anderson Lake. The drainage basins of the major streams within the study area are presented in Figure 6.

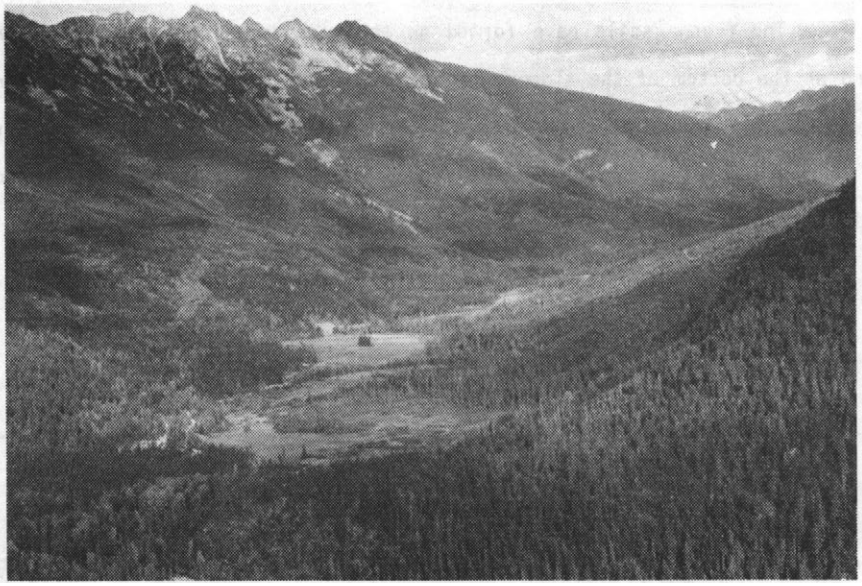


Plate 8: Pictoral description of Figure 58, cross-sectional diagram QR (photo by J. M. Ryder)

Cross-sectional diagram ST (Fig. 59) illustrates the typical soils in the Gates River valley. Plate 9 illustrates the general geographical area described by Figure 59. The Gates River valley, which is generally wider than the Blackwater Creek valley, also has a greater diversity of soils. Soils parent materials range from morainal deposits to rock outcrops along the valley walls to the fluvial deposits of the valley floor. Yvonne soils are found on the morainal deposits of the valley slopes. Talus accumulations below bedrock outcrops are primarily Chumley series. On the valley bottom the soils grade from Van Beem series through the Questt series to the Rivett series and Summerskill series:drainage variant. Rivett soils are situated in and adjacent to the Gates River stream channel.

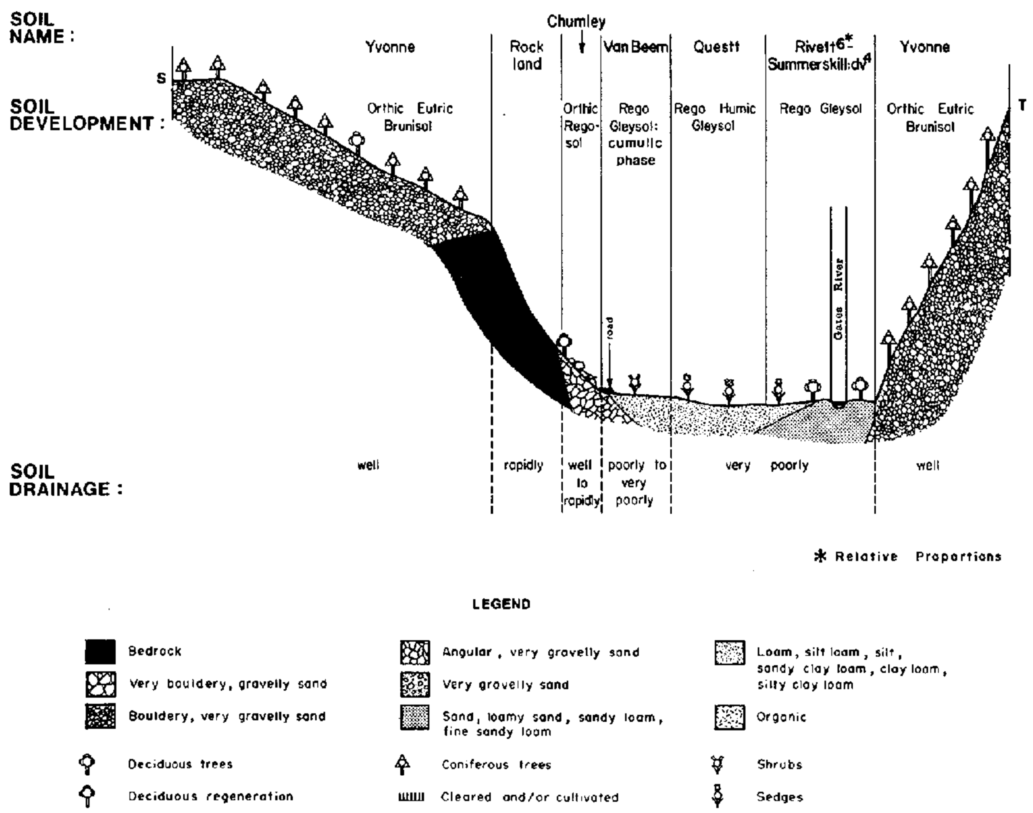


Figure 59: Cross-sectional diagram ST, located between Eight Mile Creek and Spruce Creek extending across the Gates River valley

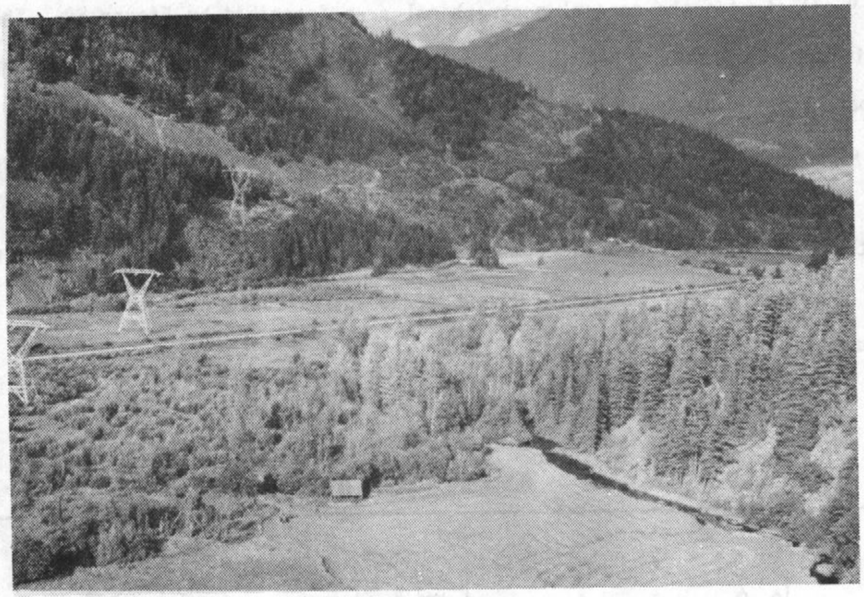


Plate 9: Pictoral description of Figure 59, cross-sectional diagram ST (photo by J. M. Ryder)

Cross-sectional diagram UV (Fig. 60) illustrates the soils in the lower part (downstream of the canyon) of the Birkenhead River valley. Plate 10 depicts the general geographical area described by Figure 60. Soil parent materials range from morainal deposits and bedrock outcrops on the valley sides to the fluvial fan deposits of Owl Creek and the fluvial deposits of the Birkenhead River. Yvonne soils are developed on the morainal deposits on both sides of the valley. Flichel series soils occur on the Owl Creek fan. Giguere series soils are found on small terraces slightly above the level of the Birkenhead River and are occasionally inundated.

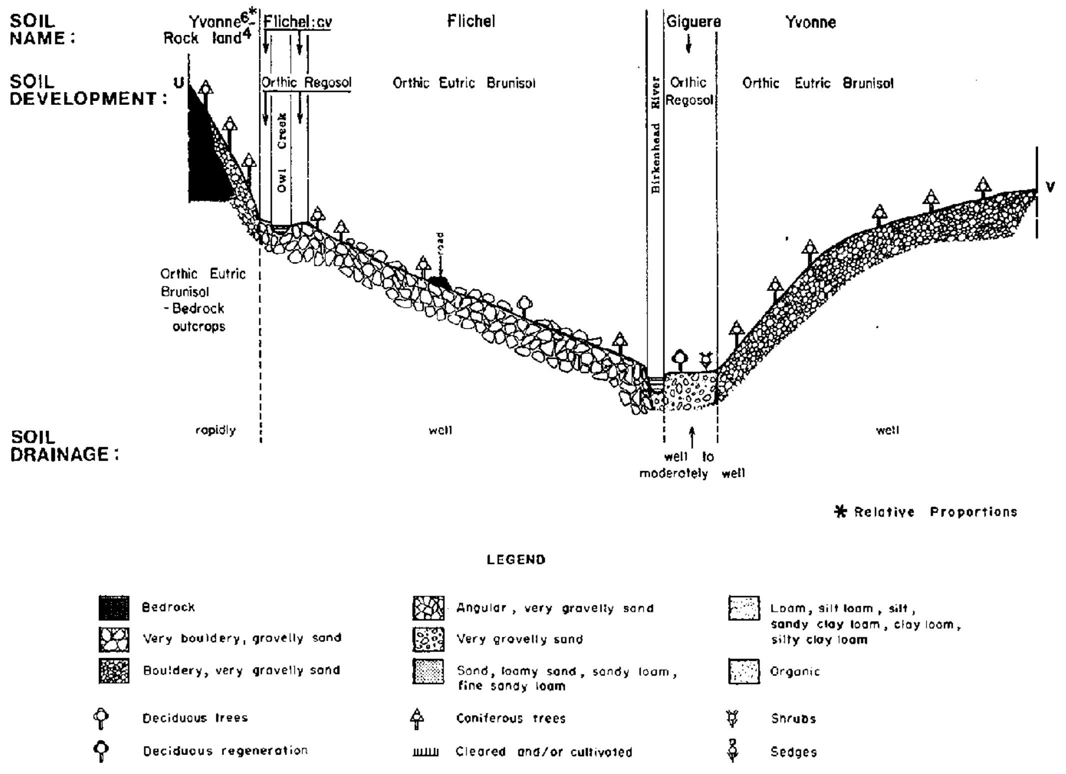


Figure 60: Cross-sectional diagram UV, located at Owl Creek and extending across the Birkenhead River valley

Plate 10: Pictoral description of Figure 60, cross-sectional diagram UV

5.2.5 Green River Section

In the Green River section of the study area the soils have formed primarily on landslide and fluvial fan deposits. Frontier soils have developed on the bouldery, gravelly fluvial fan deposits of Rutherford Creek and the Green River. Also in this area are the Clausen soils formed on colluvial landslide deposits. Grundy soils occur on the upper fluvial terraces of the Green River and Gilmore soils are found along the flood plain. Bedrock outcrops occur at Nairn Falls.

Cross-sectional diagrams are not presented for this and the following areas because of the relatively simple relationships of the soils here and the small amount of area involved.

5.2.6 Uplands Section

Mapped uplands in the main Lillooet River valley include those adjacent to Pemberton as well as those near Mt. Currie.

A. near Pemberton

On the uplands adjacent to Pemberton are found Cloutier series, Collister series, Conroy series, Fotsch series and Frontier series and Rock land. Cloutier series soils are found on actively forming colluvial talus slopes. Collister soils occur on shallow, neutral to moderately calcareous colluvial materials over bedrock. Conroy soils occur on deeper colluvial deposits which are generally non-calcareous. Fotsch series soils occur along the edges of One Mile Lake where wave action has modified the original deposits into beaches. Frontier series soils occur on the bouldery, gravelly, coarse textured fluvial deposits of One Mile Creek.

B. near Mt. Currie village

The soils which occur on the uplands near Mt. Currie village are Collister series, Conroy series, Cosulich series, Flichel series, Yvonne series and Yvonne series:shallow variant, and Rock land. Collister series and Cosulich series occur primarily in colluvial deposits greater than 1 m deep overlying bedrock while Conroy series have developed in shallower colluvium. Yvonne soils have formed on morainal deposits which are sometimes veneers overlying bedrock (YV:sv). Rock land areas are primarily bedrock outcrops which may have a shallow (< 10 cm) mantle of soil occuring in some places.

chapter 6

INTERPRETATIONS FOR SELECTED LAND USES

6 INTERPRETATIONS FOR SELECTED LAND USES

6.1 Agriculture

6.1.1 Agricultural Capability

Agricultural capability ratings of the study area were derived from the soil information in combination with climatic capability for agriculture ratings. The agricultural capability ratings indicate the limitations placed on agricultural crop production by climatic and soil characteristics.

A. Climatic capability for agriculture

Climatic capability for agriculture ratings are based on defined climatic limits for each class. (Figure 61 illustrates the distribution of the climatic capability for agriculture classes within the study area). Definitions of the climatic limits for each climatic capability for agriculture class and examples of the types of crops which have potential for growth within that class as well as definitions of the subclasses and the map symbols used are given in the legend of Figure 61 (Resource Analysis Branch, 1978). Table 4 presents a summary of some climatic characteristics of selected locations in the Pemberton Valley.

Table 4: Summary of some climatic characteristics of selected locations in the Pemberton Valley

Station	Average Growing Degree Days Above 5°C	Average Freeze Free Period (days)	Average May to Sept. Precip. (mm)	Average May to Sept. Climatic Moisture Deficit (mm)
Pemberton	1661	No Data	194	-269
Pemberton Meadows	1801	150	187	-281
Mount Currie	1467	110	150	-354
Gingerbread Creek	1453	115	140	-329

Reference: Resource Analysis Branch, 1978

The climatic capability for agriculture ratings (Williams, 1977) for the study area range from Class 1a through 3, with irrigation. The most suitable climates, 1aF, occur south of where Ryan Creek enters the main Pemberton valley and along the Gates River valley bottom from Devine to Anderson Lake. The capability of these areas is restricted by the freeze free period (subclass F) which is less than 150 days. Additional Class 1a areas in the northeast corner of the Mt. Currie Indian reserve and east of Pemberton are limited by both insufficient freeze free period (subclass F) and insufficient growing degree days above 5°C (subclass G) and are labelled 1aFG.

The main Pemberton valley between Lillooet Lake and Wolverine Creek and up the Birkenhead River to Owl Creek has a rating, with irrigation, of Class 1F. The freeze free period in these areas is less than 120 days. Additional Class 1 areas limited by freeze free period (F) and growing degree days (G), and rated as Class 1FG, occur on the north side of the Pemberton valley near Wolverine Creek and west up the valley to the vicinity of Railroad Creek; along the Green River south of Pemberton; along the Birkenhead River where it enters the main Pemberton Valley near Mt. Currie village; and north of Eight Mile Creek along the Gates River to Anderson Lake.

Areas of climatic capability for agriculture Class 2F, limited by a freeze free period of less than 90 days, occur in the upper Lillooet River valley between the vicinity of Railroad Creek and west of North and South Creeks; north and west along the Birkenhead River to Fowl Creek and along the Gates River to Devine; and west along Blackwater Creek to Phelix Creek.

Regions of Class 3F, limited by a freeze free period of less than 75 days, are present in the vicinity of Birkenhead Lake between Phelix Creek and Fowl Creek; and west of North and South Creek, in the Lillooet River valley, to Meager Creek. The climatic capability for agriculture ratings west of Wolverine Creek along the Lillooet River are estimates only due to the lack of climatic information. The areas for which the climatic capability has been estimated are outlined in Figure 61 by dashed lines.

Legend for Figure 61: Provisional Climatic Capability for Agriculture

SUMMARY OF LIMITATIONS	CAPABILITY CLASSES					
	1a	1	2	3	4	5
Freeze free period(days)	120 to 150(interior) > 150(coast)	90 to 119(interior) > 150 (coast)	75 to 89(interior) 120 to 150(coast)	60 to 74(interior) 100 to 119(coast)	50 to 59(interior) 80 to 99(coast)	30 to 49 (interior) 60 to 79 (coast)
Growing degree days accumulated > 5°C	1505 to 1779	1310 to 1504	1170 to 1309	1030 to 1169	1030 to 1169	780 to 1029
Climatic moisture deficit		up to -40 mm	-40 to -115 mm	-116 to -190 mm	-191 to -265 mm	-266 to -340 mm
Climatic moisture surplus		< 0.33	0.34 to 0.55	0.56 to 0.75	0.76 to 1.00	> 100
Effective growing degree days			736 to 825	650 to 735	491 to 649	421 to 490
Range of Crops: examples	corn, apples, pears, cherries, raspberries, strawberries, asparagus, beans, beets, broccoli, brussel sprouts, cabbage, carrots, cauliflower, celery, kohlrabi, leeks, lettuce, parsnips, peas, potatoes, radish, rhubarb, spinach, Swiss chard, turnips, cereal grains, and forage crops	silage corn, strawberries, raspberries, blackberries, asparagus, beans, beets, broccoli, brussel sprouts, cabbage,carrots, cauliflower, celery, kohlrabi, leeks, lettuce, parsnips, peas, potatoes, radishes, rhubarb, turnips, spinach, Swiss chard, bulbs, cucurbits, tomatoes, onions, oil seed crops, pumpkins, filberts, some tree fruits	asparagus, beets, broccoli, brussel sprouts, cabbage, carrots, kohlrabi, leeks, lettuce, parsnips, radishes, rhubarb, turnips, spinach, Swiss chard, strawberries, raspberries, cauliflower, celery, peas, potatoes, hardy varieties of broad beans, oil seed crops, cereal grains and forage crops	cool loving vegetables (cabbage, cauliflower, lettuce, peas), potatoes, forage crops, and cereal crops	cool loving vegetables, forage crops, and cereal crops (periodically)	only forage crops

LIMITING SUBCLASSES

A - drought or aridity which occurs during the growing season resulting in moisture deficits limiting plant growth

F - any minimum temperature above or below freezing which damagingly affects plant growth during the growing season

G - insufficient heat units (Growing Degree Day or Effective Growing Degree Day) during the growing season. This does not include Corn Heat Units

EXAMPLE

bracketed capability class as determined by thermal limitations (moisture limitations have been reduced by irrigation and/or drainage).

Limiting subclass

5A (IaF)

capability class

unbracketed capability class as determined by the moisture and/or thermal regime limitations

Reference: Climatic Capability Classification for Agriculture in British Columbia,1978, Resource Analysis Branch.

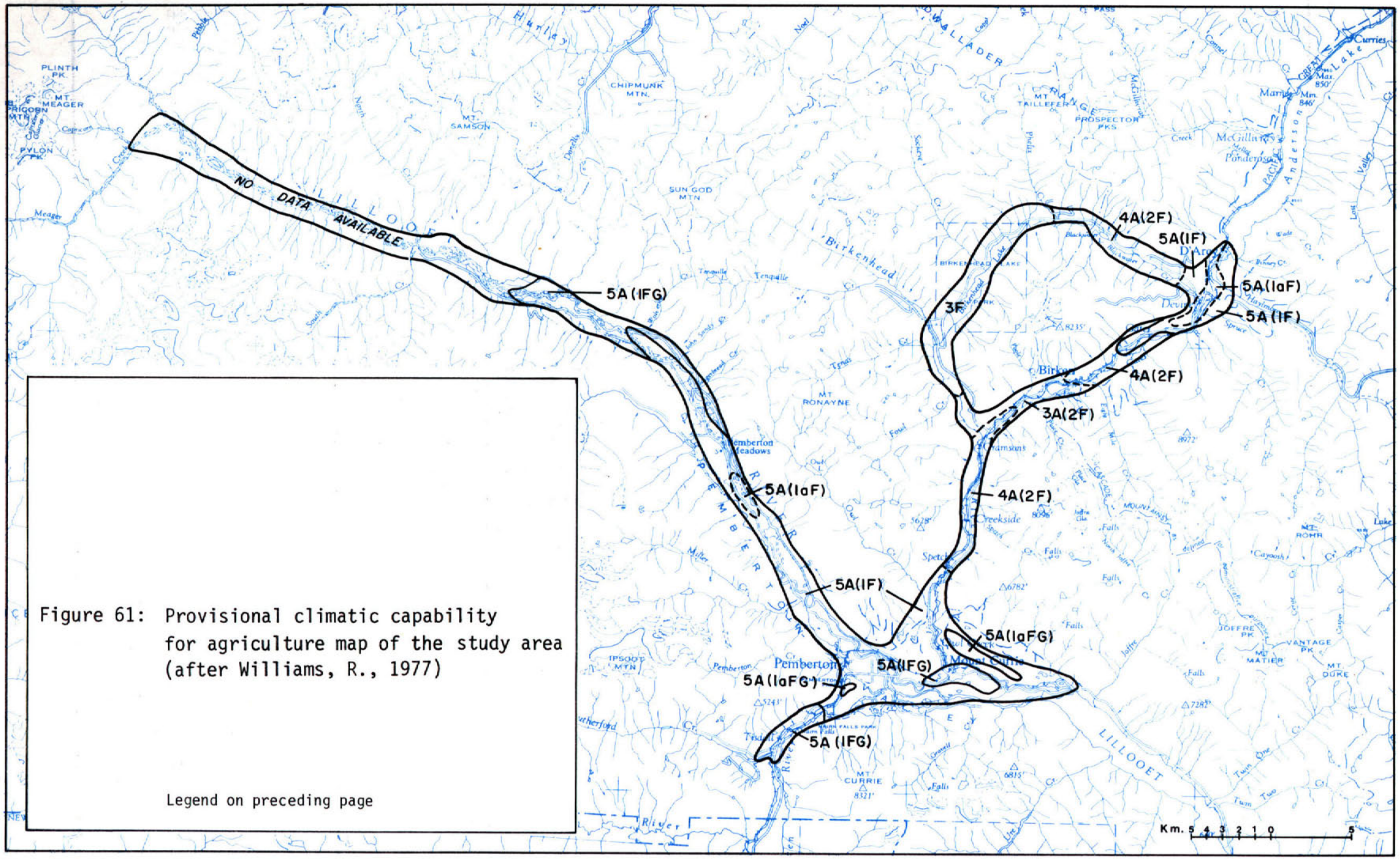


Figure 61: Provisional climatic capability for agriculture map of the study area (after Williams, R., 1977)

Legend on preceding page

B. Land capability for agriculture

Land capability for agriculture ratings are determined by climatic capability for agriculture in combination with soil characteristics. The classes and subclasses, which indicate the major limitations of the land for agriculture, and the symbols used to express these are defined in the legends of the capability maps presented in Figures 62 - 68. The capability of some soils can become greater through improvement procedures such as installation of irrigation and/or drainage. The improved capability ratings are indicated by () for irrigated and by [] for drained conditions. In some cases both are used. Even with such improvements, the regional climate is the ultimate factor limiting the capability of the soils for agricultural use.

The lands in the Blackwater Creek valley are generally Class 5^{T}_{M} with minor inclusions of 6^{T}_{M}, 7^{T}_{R}, or 7^{R}_{T} in steeper places along the valley sides. Along streams and adjacent to Blackwater Lake some of the land has been rated as 6^{W}_{I}, or 5^{W}_{I} improving to [3X] through artificial soil drainage. The remainder of the valley floor is generally rated either as 4W improving to [3X] with artificial soil drainage or 05^{W}_{F}, improving to [04^{F}_{W}] or [03^{F}_{W}] with artificial soil drainage (0 preceding the class rating indicates organic soils).

The slopes along Birkenhead Lake are predominantly Class 5^{T}_{M} with inclusions of 6^{M}_{T}, 6^{T}_{M} 7^{P}_{T}, 7^{T}_{M}, 6M, 7^{P}_{M} and 7^{R}_{T}. These low capability classes result from severe topographic, soil droughtiness, stoniness, and/or shallowness to bedrock limitations.

The Birkenhead River canyon area is severely limited by shallowness to bedrock, steeply sloping topography, stoniness, and/or soil droughtiness. Generally, the land in the canyon itself is Class 7, while on the upper, more level slopes it is Class 5 at times improving,through irrigation, to Class 4.

The Gates River valley from Gates Lake to Anderson Lake has a variety of land capability for agriculture ratings ranging from Class 4 to Class 7. Some of the Class 4 or 5 soils will improve to Class 3 or 4 with irrigation or drainage. The major limitations to the range of agricultural crops on the valley sides are stoniness, soil droughtiness, and adverse topography. Common ratings for these lands are 6^{T}_{P}, 7T, 5^{M}_{T}, 5^{P}_{M}, 7^{T}_{R} and 7^{P}_{M}. The major limitations to agriculture on the valley floor are seasonally high water tables, and susceptibility to periodic inundation resulting in ratings such as 7^{W}_{I}, 6^{W}_{I}, 5^{W}_{I} and 5W. Following ameliorization of these problems, minor problems of soil droughtiness and fertility remain.

The lands of Birkenhead River and Poole Creek valleys from Gates Lake to the junction with the Lillooet River valley are generally limited by topography, stoniness, shallowness to bedrock, and soil droughtiness on the valley slopes. This land is predominantly Class 5 which occasionally improves, with irrigation, to Class 4. The remainder is either Class 6 or Class 7. The limitations of the soils on the valley floor are predominantly seasonally high water tables, susceptibility to periodic inundation, and/or soil droughtiness. These lands are predominantly Classes 5^{W}_{I} ([3^{W}_{M}]) or ([4^{W}_{M}]), 3^{W}_{M} ([2X]), 5W ([4M]), 5M (4M), 5^{W}_{I} , 6M, 6^{P}_{M} or 7^{W}_{I}.

The upland areas adjacent to Pemberton and the Mount Currie village and in the Green River valley are limited in their capability by steeply sloping topography, shallow depths to bedrock, soil droughtiness and/or excessive stoniness. The capability classes in these areas include some Class 5 which may improve to Class 4 with irrigation but are dominantly Classes 6 or 7.

The lands in the Lillooet River valley from Lillooet Lake to approximately Wolverine Creek are rated as capability classes 3 or 4 in their unimproved state and are limited primarily by excessive wetness, soil droughtiness and, in some cases, low fertility. In most cases with adequate drainage and/or irrigation, these lands improve in capability to Class 2X or Class 1. Some limited areas of land are Class 2X or 2W which improve to Class 1 with irrigation or drainage. An extremely small area of Class 1 land (not requiring irrigation or drainage) is found in the valley. A relatively small proportion of the valley is Class 5 limited by excessive water, periodic inundation and/or soil droughtiness. This land generally improves to Class 4, and sometimes Class 3, with drainage and/or irrigation. Small areas of Class 05^{W}_{F} [04^{F}_{W}] also occur as do Classes 6^{W}_{I} and 7^{W}_{I} .

Upstream along the Lillooet River from Wolverine Creek to Meager Creek, the climate capability for agriculture becomes more limiting resulting in soils similar to those downstream having a lower capability rating. The majority of land in this portion of the valley is Class 3, 4 or 5 limited primarily by soil droughtiness, excessively high water tables, and/or periodic inundation. A significant proportion are Classes 6 or 7 limited by excessively high water tables, periodic inundation, excessive stoniness, and/or soil droughtiness.

Legend for Figures 62 - 68:

Land Capability for Agriculture **Maps**

CAPABILITY CLASSES FOR MINERAL SOILS

Class 1: Lands in this class have no significant limitations in use for crops.

Class 2: Lands in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.

Class 3: Lands in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.

Class 4: Lands in this class have severe limitations that restrict the range of crops or require special conservation practices, or both.

Class 5: Lands in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible.

Class 6: Lands in this class are capable only of producing perennial forage crops, and improvement practices are not feasible.

Class 7: Soils in this class have no capability for arable culture or permanent pasture.

CAPABILITY CLASSES FOR ORGANIC SOILS

Class 03: Organic soils in this class have moderately severe limitations that restrict the range of crops or require special management practices.

Class 04: Organic soils in this class have severe limitations that restrict the range of crops or require special management practices, or both.

Class 05: Organic soils in this class have very severe limitations that restrict their capability for the production of perennial forage and other specially adapted crops.

Class 06: Organic soils in this class, in the native state, have no capability for arable agriculture, but are capable of producing native perennial forage and some natural grazing if feasible.

CAPABILITY SUBCLASSES

C - adverse climate

F - low fertility

I - inundation by streams and lakes

M - moisture limitation

P - stoniness

R - consolidated bedrock

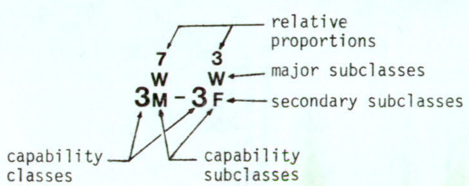
T - topography

W - excess water

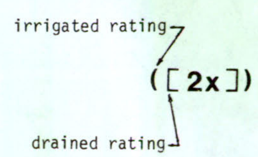
X - cumulative minor adverse characteristics

Example of Map Symbol

Unimproved Rating

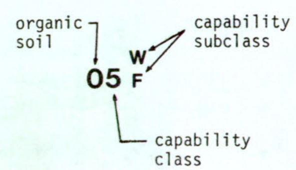


Improved Rating



Example of Map Symbol

Unimproved Rating



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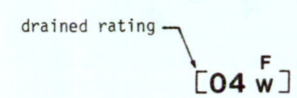


1:20 000 mapping available from:
The Librarian
Resource Analysis Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X4

Figure 62: Land capability for agriculture map, sheet 1

Figure 63: Land capability for agriculture map, sheet 2

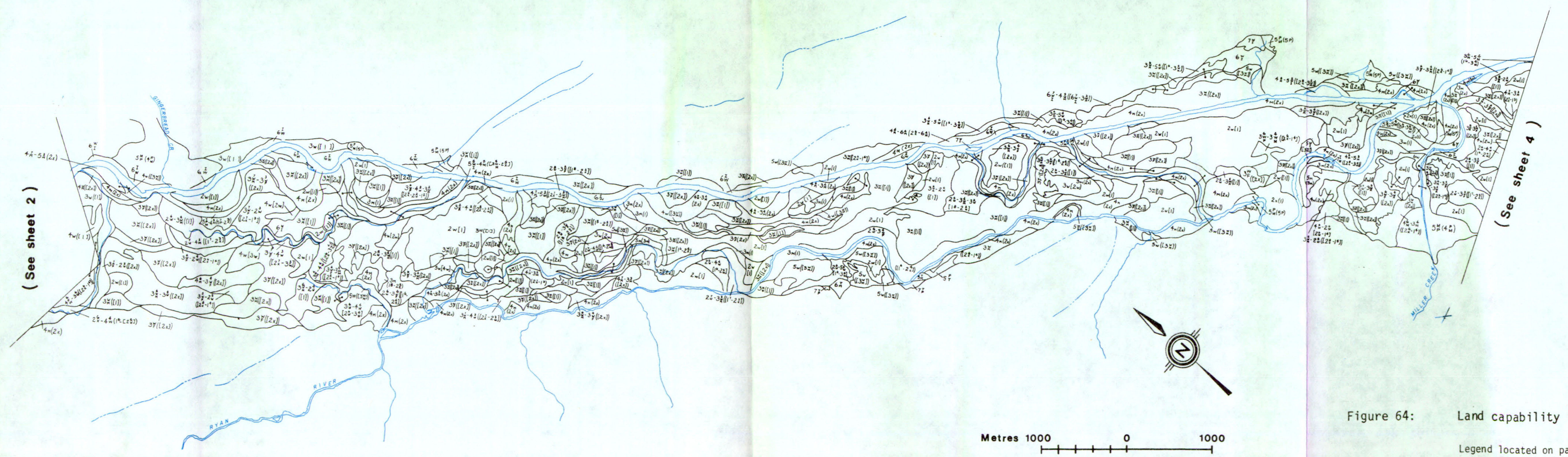


Figure 64: Land capability for agriculture map, sheet 3

Legend located on page 128

Figure 65: Land capability for agriculture map, sheet 4

Legend located on page 128

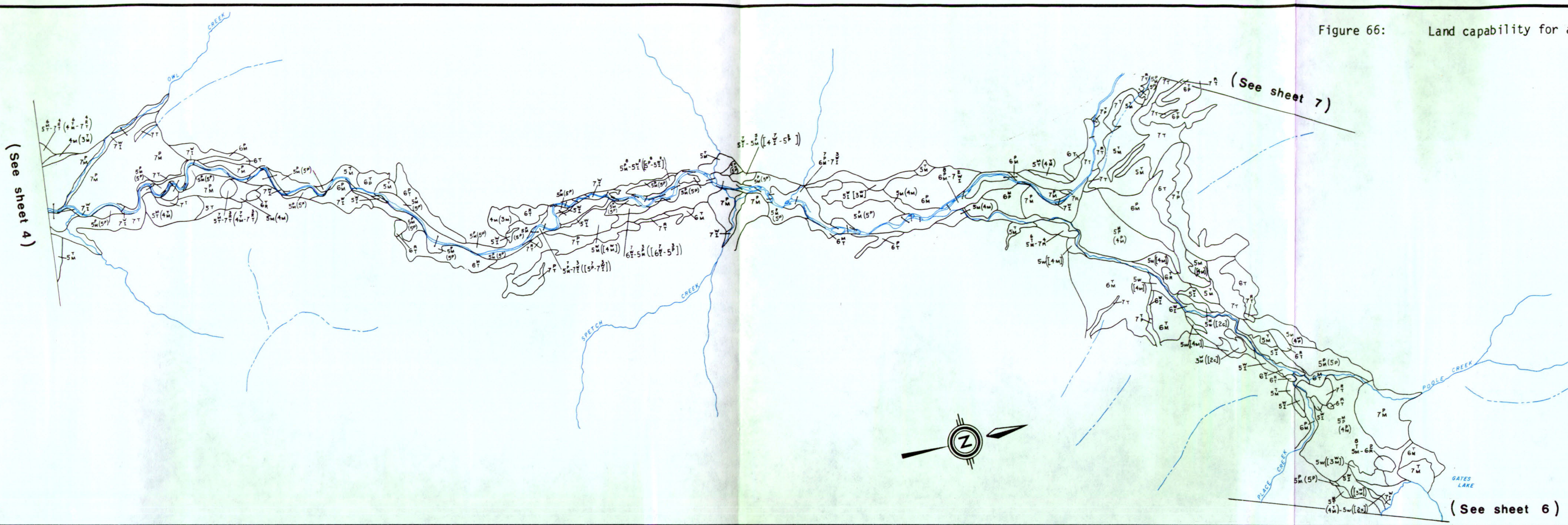


Figure 66: Land capability for agriculture map, sheet 5

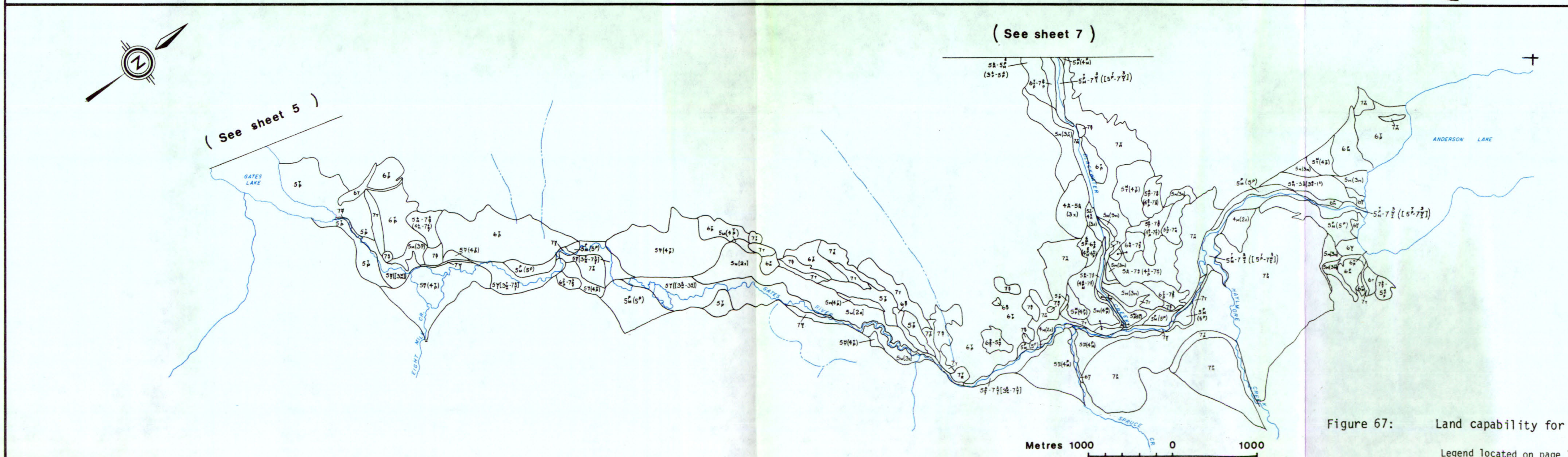


Figure 67: Land capability for agriculture map, sheet 6

Legend located on page 128

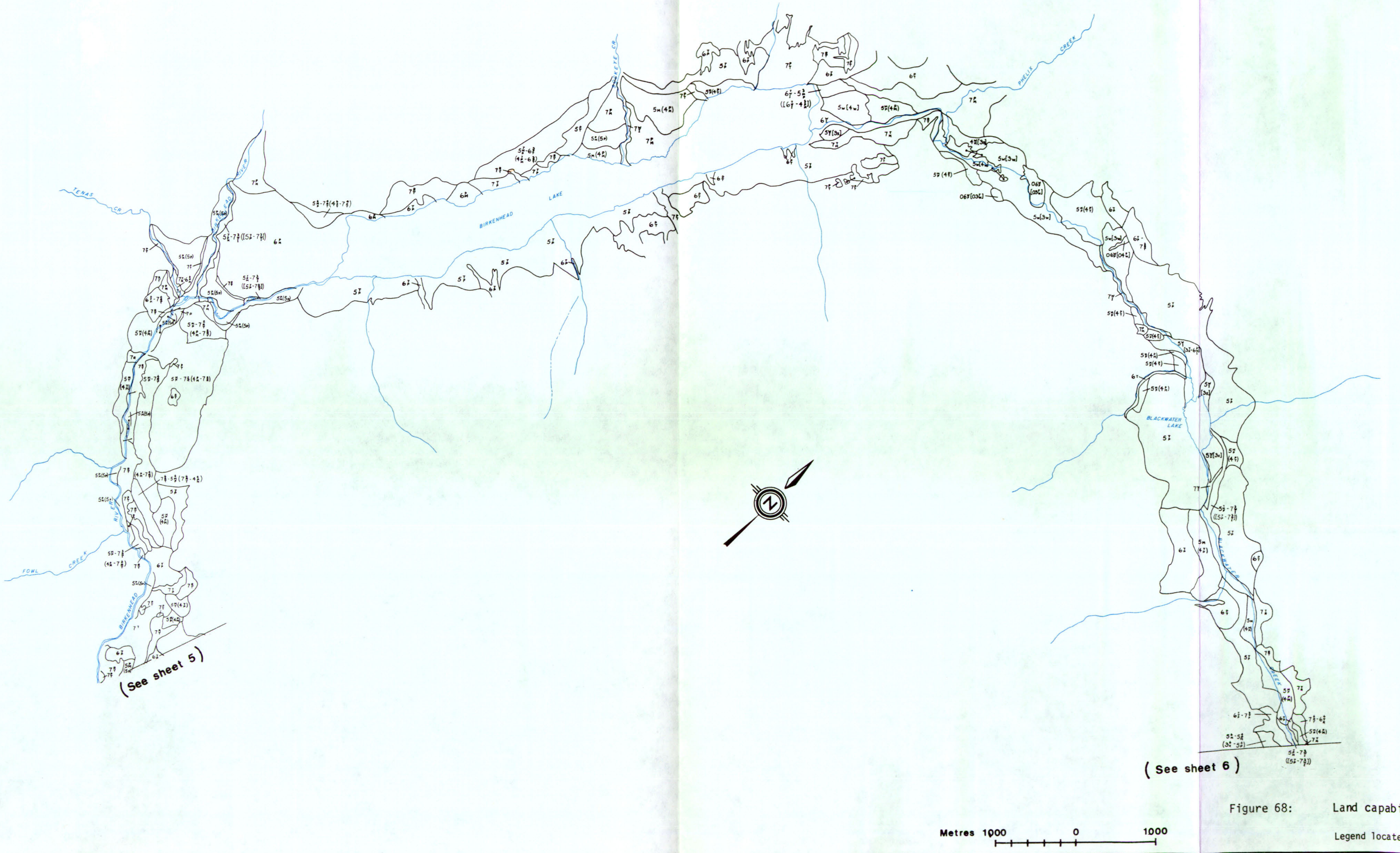


Figure 68: Land capability for agriculture map, sheet 7

Legend located on page 128

6.1.2 Chemical Characteristics of the Soils

Results of chemical analyses of selected soils of the study area are presented in Appendix 2. Selected chemical analysis of the surface horizons (upper 25 cm) of some of the more common soils of the Pemberton Valley are presented in Table 5. These analyses, required in part to determine soil classification, also provide an indication of the fertility levels of the soils and thus some idea of anticipated management needs. However, in order to determine the optimum fertilizer practices for individual farms or fields it is advisable to have independent analysis and interpretations conducted, because of the great variability found within the same soil from farm to farm due to differing past and present management practices.

A. Soil reaction

Soil reaction (pH) is expressed in values of 0 to 14. A value of seven indicates neutrality, decreasing values below seven indicate increasing acidity, while increasing values greater than seven indicate increasing alkalinity.

The reaction classes, as defined in the Canadian System of Soil Classification (1978), are:

acid	pH of 5.5 or less
neutral	pH between 5.5 and 7.4
alkaline	pH of 7.4 or greater

Applying these reaction classes, the majority of soils in the Lillooet River valley are acid.

The pH of the surface horizons is determined in large part by the mineralogy of the soils, the regional climatic conditions, the soil-water relationships, the organic matter content and the influences of some types of soil management (i.e. liming and kinds of fertilizer used). However, the origin of the soil parent materials and the ground and surface waters affecting the soils exert a very strong influence on the reaction of specific soils.

Table 5: Chemical characteristics of surface 25 cm of selected soils of the Pemberton Valley

Horizon	cm Depth	pH 1:1 H_2O	pH 1:2 $CaCl_2$	% C	% N	C/N	meq/100g Exchangeable Bases Ca	Mg	Na	K	CEC*	% Base Saturation	ppm Nutrients of Selected Soils P	S	B	Cu	Co
GATES LAKE Ah+Cgj	0- 6	5.3	4.8	2.92	0.196	14.9	5.33	1.11	0.26	0.06	11.04	61.2	2.53	4.0	0.34		
C_1	6- 19	5.3	4.7	0.18	0.006	30.0	0.87	0.24	0.07	0.06	1.68	73.8	3.01	0.6	0.25	2.85	0.13
Cgj_2	19- 24	5.4	4.7	0.21	0.006	35.0	1.36	0.28	0.13	0.07	2.89	63.7	3.01	1.5	0.26	6.00	0.28
GILMORE C_1	0- 10	5.5	4.7	0.16	0.006	26.7	0.96	0.16	0.07	0.04	1.68	73.2	10.01	2.2			
C_2	10- 18	6.0	5.0	0.03	0.020	1.5	0.94	0.15	0.08	0.03	1.63	73.6	3.00	0.2			
C_3	18- 39	6.0	5.1	0.03	0.020	1.5	0.91	0.14	0.07	0.04	1.70	68.2	2.00	0.5			
NAIRN FALLS Op	0- 18	1:2 5.3	1:4 4.6	13.49	0.875	15.4	20.79	7.58	1.15	0.60	41.06	73.4	9.69				
Cg	18- 35	1:2 5.4	1:4 4.6	6.80	0.306	22.2	5.80	1.96	0.29	0.32	23.31	35.9	7.77	2.0			
NESUCH Op	26- 14	1:2 4.8	1:2 4.3	16.63	0.928	17.8	22.63	2.20	0.47	0.11	53.89	47.0	5.07				
Of	14- 0	1:5 4.3	1:5 3.9	27.64	1.437	19.2	22.62	1.70	0.39	0.14	80.46	30.9	2.69				
NEWBERRY Om	20- 0	1:5 4.7	1:10 4.2	16.76	1.00	16.8	13.98	1.05	0.40	0.13	51.20	30.4	3.90				
Cg_1	0- 12	5.2	4.5	1.85	0.111	16.6	3.50	0.16	0.19	0.18	8.88	45.4	6.35	3.8			
QUAMELL Ah	0- 15	5.2	4.5	5.84	0.347	16.8	5.71	1.10	0.37	0.13	24.27	30.1	7.78	2.0			
Cg_1	15- 24	5.3	4.5	0.79	0.053	14.9	1.92	0.35	0.12	0.14	7.99	31.7	6.34	0.1			
RONAYNE Cg_1	0- 12	5.0	4.3	3.12	0.215	14.5	4.11	1.84	0.31	0.12	20.64	30.9	2.04	35.0			
II Cg_1	12- 21	5.0	4.3	0.77	0.040	19.2	0.82	0.52	0.09	0.02	3.51	41.3	1.50	10.7			
RENVILLE Ah	0- 6	1:5 5.0	1:10 4.5	15.00	0.839	17.8	12.48	3.46	0.85	0.18	65.08	26.1	9.76				
Cg_1	6- 13	1:2 4.7	1:4 4.3	5.64	0.432	13.0	5.58	1.94	0.52	0.18	33.08	24.8	7.81	28.8			
Cg_2	13- 29	5.0	4.4	2.11	0.132	16.0	3.79	1.71	0.38	0.17	15.76	38.4	10.16	15.8			
RANSON Of	10- 0	1:5 5.1	1:5 4.7	20.19	1.292	15.6	37.05	2.60	0.66	0.17	88.75	45.6	10.02				
Cg	0- 28	5.8	5.1	0.23	0.006	38.3	0.91	0.20	0.07	0.03	1.90	63.7	6.31	0.1	0.25	3.26	0.12
II Cg	28- 48												9.50	1.5	0.22	24.55	0.66
RUTHERFORD Cg1	0- 25	1:2 5.1	1:4 4.4	4.57	0.315	14.5	4.18	1.06	0.56	0.18	20.42	20.3	14.12	3.7	0.80	19.95	0.12
Cg2	25- 45												13.94	3.4	0.34	9.19	0.13
Cg3	45- 66												19.17	2.9	0.26	12.11	0.16
SANKEY Ap	0- 9	4.9	4.6	3.53	0.284	12.4	5.59	1.96	0.88	0.14	54.02	15.9	16.04	21.3			
Cg_1	9- 37	5.7	4.9	0.72	0.040	18.0	3.25	1.60	0.38	0.20	7.64	71.1	6.34	8.5			
SCOBIE Cg_1	0- 6	5.8	5.2	0.94	0.060	15.7	3.92	1.19	0.34	0.02	6.89	79.4	7.05	1.9	0.34	6.55	0.77
Cg_2	6- 14	6.0	5.2	0.40	0.020	20.0	2.00	0.77	0.34	0.03	4.17	75.2	5.93	1.6	0.42	6.91	0.45
II Cg+Ahb	14- 23	5.7	5.0	1.22	0.071	17.2	3.69	1.22	0.34	0.05	8.67	61.1	4.23	0.8	0.26	11.90	0.57
III Cg_1	23- 45												3.71	0.2		3.71	0.25
III Cg_2	45- 61												3.02	0.2		5.93	0.41
SHANTZ Ap1	0- 17	5.6	5.2	1.25	0.088	14.2	3.51	0.80	0.46	0.04	7.46	64.5	15.12	1.7			
Ap2	17- 27	5.0	4.4	2.80	0.160	17.5	4.51	1.24	0.13	0.27	20.13	30.6	8.13	0.5			
SISTER Ap	0- 25	4.9	4.7	1.71	0.136	12.6	5.65	1.76	0.31	0.30	14.20	56.5	8.93	4.4			

*CEC = cation exchange capacity

Table 5 cont'd: Chemical characteristics of surface 25 cm of selected soils of the Pemberton Valley

Horizon	cm Depth	pH 1:1 H_2O	pH 1:2 $CaCl_2$	% C	% N	C/N	meq/100g Exchangeable Bases Ca	Mg	K	Na	CEC*	% Base Saturation	ppm Nutrients of Selected Soils P	S	B	Cu	Co
SANGSTER																	
Ap	0- 21	5.5	5.0	1.54	0.144	10.9	4.85	0.57	0.26	0.05	5.73	73.9	6.34	1.8			
II Cg	21- 32	5.9	5.4	1.43	0.129	11.1	8.59	0.75	0.32	0.11	9.77	70.5	3.74	0.4			
SCULLARD																	
Ap	0- 17	5.5	4.8	1.61	0.125	12.9	3.85	0.78	0.85	0.09	10.74	51.9	54.53	3.4			
Cg_1	17- 47	5.5	4.8	1.01	0.085	11.9	2.85	0.50	0.50	0.14	9.64	41.4	44.87	1.0			
TENQUILLE																	
Ah	0- 13	6.6	6.2	5.09	0.331	15.4	18.58	3.90	0.86	0.05	28.12	83.2	6.06	6.8			
Bm_1	13- 18	6.3	5.8	2.26	0.178	12.7	11.12	2.40	0.97	0.06	20.59	70.7	3.88	1.1			
Bm_2	18- 25	5.9	5.3	2.29	0.179	12.8	10.61	1.82	0.66	0.08	20.27	65.0	4.28	0.9			
VALLEAU																	
Ap	0- 15	5.4	4.8	1.62	0.113	14.3	4.22	1.18	0.56	0.08	10.02	60.3	7.08	1.1			
Cg	15- 35	5.2	4.8	2.01	0.163	12.3	6.14	1.81	0.40	0.13	12.92	65.6	4.88	32.3			
VICCARS																	
Ap1	0- 11	1:2 4.5	1:4 4.3	4.88	0.327	14.9	6.03	1.50	0.43	0.10	18.70	43.1	14.61	0.0			
Ap2	11- 24	4.6	4.3	2.67	0.171	15.6	3.24	0.90	0.31	0.06	11.94	37.8	11.17	0.0			
VERLINDEN																	
Op	18- 0	1:5 5.1	1:10 4.7	10.44	0.642	16.2	19.86	0.99	0.11	0.13	38.53	54.7	4.35				
Cg	0- 24	5.1	4.5	0.33	0.010	33.0	1.21	0.10	0.05	0.07	3.27	43.7	5.93	3.2			
VICKBERG																	
Op	15- 0	1:5 4.6	1:10 4.3	28.68	1.525	18.8	30.28	4.65	0.60	0.19	87.89	40.6	7.51				
Cg	0- 9	1:5 4.7	1:10 4.2	3.87	0.215	18.0	5.54	1.18	0.45	0.12	20.10	36.3	12.56	27.4			
WALDEN																	
Ap	0- 19	5.6	4.9	1.63	0.116	14.0	4.83	0.57	0.19	0.01	9.14	61.3	8.07	0.1			
Cgj	19- 26	5.9	5.0	0.22	0.022	10.0	1.13	0.18	0.09	0.03	2.11	67.8	4.21	0.0			
WHITEHEAD																	
Cgj_1	0- 8	5.8	5.0	0.36	0.020	18.0	0.85	0.41	0.14	0.02	2.20	68.1	5.21	1.2			
Cgj_2	8- 23	5.7	4.9	0.16	0.020	8.0	0.94	0.27	0.16	0.02	1.88	73.9	5.21	0.7			
WITTAL																	
Ap	0- 20	5.4	4.7	1.95	0.198	9.8	4.67	0.58	0.32	0.05	9.60	58.5	18.49	0.7			
Cgj	20- 31	5.7	4.9	0.60	0.067	9.0	4.07	0.36	0.25	0.07	6.89	68.9	5.24	0.2			
WALLACE																	
Cgj_1	0- 8	6.2	5.4	0.40	0.035	11.4	3.79	0.82	0.32	0.05	6.23	79.9	5.93	0.8			
Cgj_2	8- 23	5.8	5.1	1.21	0.091	13.3	6.49	0.94	0.41	0.10	12.85	61.8	4.85	0.8			
WOLVERINE																	
Apj	0- 11	5.7	5.1	0.37	0.010	37.0	2.52	0.21	0.24	0.04	4.02	74.9	4.22	0.6	0.22	1.66	0.30
C1	11- 23	5.9	5.2	0.14	0.022	6.4	1.58	0.08	0.16	0.04	2.41	77.2	4.21	0.2	0.30	1.10	0.14
C2	23- 46												3.00	trace	0.25	0.70	0.03
Cgj_1	46- 52												4.82	0.2	0.20	2.86	0.17
WILDFONG																	
Ap	0- 16	6.5	5.9	1.11	0.062	17.9	5.36	0.98	0.24	0.03	7.95	83.1	11.07	1.2			
Cgj	16- 24	6.3	5.7	0.30	0.013	23.1	2.27	0.66	0.22	0.03	3.97	80.1	4.82	0.0			
ZURBRUGG																	
Om	56- 36	1:5 5.4	1:10 4.9	47.14	2.821	16.7	55.67	4.70	1.15	0.43	179.60	34.5	4.61				
Of	36- 0	1:5 5.3	1:10 4.8	51.03	2.523	20.2	38.01	3.31	0.40	0.31	168.95	24.9	5.33				
ZURCHER																	
Of1	114- 82	1:5 4.3	1:10 4.0	33.01	2.097	15.7	21.19	3.46	0.39	0.15	104.43	24.1	1.08				
Of2	82- 66	1:5 4.2	1:10 3.8	21.37	1.094	19.5	7.17	1.71	0.31	0.15	65.04	14.4	2.08				
ZOLTAY																	
Op	120- 90	1:2 4.5	1:2 4.3	15.38	0.993	15.5	20.18	1.74	0.30	0.13	58.39	38.3	5.04				
Cg1	90- 68	5.0	4.5	0.41	0.028	14.6	1.06	0.11	0.07	0.03	3.16	40.2	6.33	5.4			

*CEC = cation exchange capacity

The soil series in the Lillooet River Valley which tend to be strongly acidic (pH < 4.5, 0.01M $CaCl_2$) include Nesuch, Newberry, Ronayne, Renville, Rutherford, Viccars, Vickberg, Zurcher and Zoltoy series. Soil series which are moderately acidic (pH 4.5 to 5.0), and which are the largest proportion of soils in the valley, include Gates Lake, Gilmore, Nairn Falls, Quamell, Ranson, Sankey, Sister, Scullard, Valleau, Verlinden, Walden, Wildfong, Whitehead, and Zurbrugg. Weakly acid soil series (pH 5.1 to 5.5) include Scobie, Shantz, Sangster, Wolverine, and Wallace. The only neutral pH soils are Wittal series and Tenquille series.

As a general comment and depending on the type of crop to be grown, soils with pH values greater than 5.5 do not usually require liming whereas, soils with pH values between 5.5 and 5.0 require slight amounts of liming, the actual amounts determined by the texture of the soil, and soils with pH values below 5.0 require increasing amounts of lime with decreasing pH. In addition to natural acidity, applications of acidic fertilizers will render a soil more acidic and this should be considered in soil management.

B. Organic carbon

Organic carbon analysis is an indicator of the amount of organic matter in a soil. Soil organic matter results from the decomposition and incorporation of leaves, twigs, roots, mosses, reeds, and other organic material. The amount of organic matter which accumulates is related to precipitation, drainage, vegetation, temperature etc. The amount can vary from less than 1% in mineral soils to nearly 100% in organic soils. In cultivated soils, organic matter maintenance is very important. Organic matter improves the soils resistance to crusting, puddling and erosion, makes them more friable, improves aeration and increases their moisture holding and nutrient holding capacities.

A guide to levels of organic carbon as used in this report is as follows (modified after Luttmerding and Sprout, 1969):

low	< 2.0%
moderate	2.0 to 5.0%
moderately high	5.0 to 10.0%
high	10 to 17%
very high	> 17%

Recently formed soils and soils which have undergone limited cultivation are the lowest in organic carbon content in the surface 25 cm, with values of less than 1.0%. Included in this category are the Gates Lake, Gilmore, Ronayne, Scobie, Whitehead, Wallace and Wolverine series soils. Cultivated mineral soil series including Shantz, Sister, Sangster, Scullard, Valleau, Walden, Wildfong, and Wittal tend to be slightly higher but are still low in organic carbon content. These soils generally have values of organic carbon between 1.0 and 2.0%. Soils showing moderate to high levels of organic carbon are generally the Rego Gleysol:peaty phases, Rego Humic Gleysols, Gleyed Sombric Brunisols, and some Rego Gleysol:cumulic phases. The soil series which fall in the moderate group include Rutherford, Sankey, Tenquille, and Viccars; the moderately high group includes Quamell, Renville, and Ranson; and the high group includes Nairn Falls, Verlinden and Zoltay. The organic soils, i.e. Zurbrugg and Zurcher series and some mineral soils with organic surface layers, i.e. Nesuch, Newberry, and Vickberg series have very high organic carbon contents.

In general the carbon levels of the mineral soils are highest at the surface and decrease with increasing depth, except those soils which have buried layers enriched in organic matter. The organic soils tend to have values of organic carbon which remain relatively constant throughout the soil profile or increase slightly with increasing depth.

C. Nitrogen

Plants require large amounts of nitrogen for growth. This nitrogen is utilized chiefly in the form of nitrates which are readily leached from the soil. Soil organic matter and commercial fertilizers are the major sources of nitrogen. However, small amounts of nitrogen are washed into the soil from the atmosphere by rain, or fixed from the atmosphere by nitrogen fixing bacteria.

Micro-organisms play an important role in the provision of nitrogen to plants. Bacteria convert nitrogen in soil organic matter and the atmosphere into forms which are available for plant growth. In general, the nitrogen content of soil varies directly with the organic matter content. The amount of nitrogen which is released and available for plant growth during the growing season is determined mainly by soil drainage and temperature.

Under favourable soil conditions total nitrogen values can aid in estimating the nitrogen supplying power of the soil. For this purpose the following levels may serve as a guide (Luttmerding and Sprout, 1969):

low	< 0.25%
medium	0.25 to 0.40%
high	> 0.40%

In general the soils of the Pemberton Valley can be grouped into four levels of total organic nitrogen content in the surface 25 cm. These levels are: less than 0.15%, 0.20 to 0.35%, 0.60 to 1.55%, and greater than 2.00%.

The soils which have less than 0.15% total nitrogen are recently deposited soils and/or recently cultivated soils with very low organic matter contents. The series in this group are Gates Lake, Gilmore, Ronayne, Whitehead, Wallace, Wolverine, Wittal, Scobie, Shantz, Sister, Sangster, Scullard, Valleau, and Walden. The soils of the 0.20 to 0.35% group are primarily those which are organic enriched, loam to silty clay loam or have organic layers at the surface. Included in this group are Quamell, Rutherford, Sankey, Tenquille, Viccars, and Wildfong soils. Nairn Falls, Nesuch, Newberry, Renville, Ranson, Verlinden, Vickberg, and Zoltay soils are in the 0.60 to 1.55% group. These soils are primarily mineral soils with organic surfaces, or cultivated Organic soils. The soils with total nitrogen values greater than 2.00% are the non cultivated Organic soils, i.e. Zurcher and Zurbrugg series.

For most crops those soils having total nitrogen levels of greater than 0.40% in the surface 25 cm, are not likely to need much nitrogen fertilization, but since these values will vary widely from site to site, individual field determinations would be most reliable when devising a fertilization program. Soils with values less than 0.25% total nitrogen will generally require fertilization.

D. Phosphorus

Phosphorus is a major element required by plants for growth. Plants can utilize predominantly inorganic forms of phosphorus, therefore, most organic forms must be mineralized by micro-organisms before plant uptake is possible. Most phosphorus occurs as various organic and inorganic compounds in the soil, most of which are not immediately available for plant growth. The proportion of phosphorus available for plant growth to the total present in the soil at any one time is generally small.

The following table from Luttmerding and Sprout (1969), indicates the various levels of phosphorus availability:

very low	less than 5.0 ppm (parts per million)
low	5 - 10 ppm
medium	10 - 20 ppm
moderately high	20 - 30 ppm
high	greater than 30 ppm

The soils of the Pemberton area which have very low phosphorus values in the surface 25 cm are Gates Lake, Nesuch, Ronayne, Zurcher, Scobie, Tenquille, Wolverine and Zurbrugg. Gilmore, Newberry, Sangster, Valleau, Verlinden, Whitehead, Wallace, Walden, and Zoltay soils are low in available phosphorus. Soils series with medium levels of available phosphorus are Nairn Falls, Quamell, Renville, Ranson, Sister, Wittal, Rutherford, Sankey, Shantz, Viccars, Vickberg and Wildfong. The Scullard series is the only soil exhibiting a high available phosphorus content which is likely the result of recent inorganic fertilizer application.

Depending on the crop to be grown, soils with high phosphorus levels will generally require little or no fertilization, whereas those which have medium to very low values will require varying amounts of fertilization as determined by individual soil tests, and crops to be grown.

E. Cation exchange capacity

Cation exchange capacity is defined as the total amount of exchangeable cations that a soil can absorb. This is expressed as the milli-equivalents (meq) of cations required to balance the negative charge of 100 grams of soil at pH 7.0. The exchange sites are generally located on organic matter and clay minerals. Depending on the organic matter content and the kind and amount of clay minerals present, the exchange capacities can range from less than 10 to greater than 100 milli-equivalents per 100 grams (meq/100g) of soil. The following values can be used as a guide (modified after Luttmerding and Sprout, 1969) to the relative levels of the exchange capacities of soils:

very low	less than 5 meq/100g
low	5 - 10 meq/100g
medium	10 - 20 meq/100g
high	greater than 20 meq/100g

Very high (greater than 100 meq/100g) cation exchange capacities occur in the organic soils of the study area, particularly in the Zurbrugg and Zurcher series. High cation exchange capacity values of between 50 and 100 meq/100g are found in those soils having partially decomposed peaty surface layers particularly the Nesuch, Newberry, Ranson, Vickberg, and Zoltay series. The soils having cation exchange capacities in the range of 20 to 50 meq/100g include Quamell, Rutherford, Tenquille, Nairn Falls, Renville, Sankey, and Verlinden. These soils all have loam to silty clay loam surface mineral layers which have moderately low to high (5 - 20%) organic carbon contents. Shantz, Sister, Scullard, Valleau, and Viccars soils have medium values of cation exchange capacity. Low cation exchange capacities are found in Scobie, Sangster, Walden, Wildfong, Wallace and Wittal series soils. These soils are generally sand to fine sandy loam at the surface and have low levels of organic carbon. Very low cation exchange capacities are found in the soils which are sand to fine sandy loam at the surface and also have very low organic carbon contents. The soils included in this range are Gates Lake, Gilmore, Ronayne, Whitehead, and Wolverine series.

In general, the greater the cation exchange capacity the greater is the soils' ability to retain cations, and the less susceptible it is to leaching loss of many plant nutrients.

F. Exchangeable cations

Calcium, magnesium, sodium, and potassium ions are the most abundant exchangeable cations. Their proportions vary from soil to soil depending on soil characteristics and past management practices. Aluminum and hydrogen ions are very abundant in most soils, but are not measured directly, rather they are assumed to make up the remainder of the total cation exchange capacity that is not filled by the basic ions (Ca, Mg, Na, K). Aluminum and hydrogen ions predominate in acid soils. Calcium and magnesium are the most common in near neutral soils. Strongly alkaline or saline soils may contain significant proportions of exchangeable sodium (in comparison to acid and neutral soils), as well as calcium and magnesium. Exchangeable calcium and magnesium, which are removed by crops and lost by leaching, are usually replaced by aluminum which results in a decrease in pH.

In general the soils of the Pemberton Valley tend to be more acid than those of the Birkenhead River, Blackwater Creek and Gates River valley and are generally low in most exchangeable cations.

Potassium

Exchangeable potassium exists in equilibrium with the fixed forms in the soil. This equilibrium is disturbed when the exchangeable forms are removed. In order to re-establish the equilibrium, some fixed potassium is released to the system. Thus, the maintenance of an adequate supply is dependent on the reserve of potassium and its rate of release. As a guide, the following levels of exchangeable potassium (calculated after Luttmerding and Sprout, 1969) may be used:

very low	less than 0.076 meq/100g
low	0.076 - 0.15 meq/100g
moderate	0.15 - 0.23 meq/100g
moderately high	0.23 - 0.31 meq/100g
high	greater than 0.31 meq/100g

Low potassium values occur in the Gilmore, Ronayne, Gates Lake, Verlinden and Whitehead soil series. Moderate potassium levels are found in the surface layers of the Walden, Wolverine, and Wittal series soils. The surface layers of Shantz, Sister, Sangster, Wildfong and Zoltay soils exhibit moderately high levels of potassium. Potassium levels in the surface layers of Nesuch, Newberry, Quamell, Scobie, Viccars, Walden, Zurcher, Valleau, Renville, Ranson, Rutherford, Sankey, Scullard, and Vickberg series soils are in the high range (0.31 to 0.70 meq/100g). Very high (> 0.70 meq/100g) potassium levels occur in the surface layers of Tenquille, Nairn Falls and Zurbrugg series soils.

Generally those soils with high to very high levels of potassium will require little or no potassium fertilization, whereas those with moderate to very low levels of potassium will require increasing amounts of potassium fertilizer with decreasing levels of potassium. The required levels should be determined by individual soil tests and crop requirements.

Sodium

The exchangeable sodium values for all of the soils of the Lillooet River valley, excluding Nairn Falls (1.15 meq/100g), Sister (0.30 meq/100g), and Zurbrugg (0.43 meq/100g), are low to very low (all < 0.20 meq/100g).

Sodium is not considered an essential plant nutrient, and becomes toxic to many crops at high to very high levels. However, sodium levels are not a problem in the Pemberton valley soils.

Calcium

Calcium values of the Lillooet River valley soils are generally greater than 4 meq/100g. Exceptions are Gates Lake, Gilmore, Whitehead, Ronayne, Scobie, Scullard, and Wolverine soils which have calcium levels of less than 4 meq/100g. These soils are all sandy loams or gravelly sandy loams with low cation exchange capacities and low organic matter contents and have limited ability to retain such easily leached cations as calcium.

Specific calcium levels have not been generally defined for British Columbia crops. However, calcium: magnesium ratios are critical for some crops.

Magnesium

B.C. Soil Test Laboratory (1978) generally rates soil levels of magnesium as:

low	less than 0.86 meq/100g
medium	0.86 - 1.72 meq/100g
high	greater than 1.72 meq/100g

Magnesium levels of the Pemberton valley soils are generally between 1 and 4 meq/100g. However, Nairn Falls, Vickberg and Zurbrugg series magnesium levels are greater than 4 meq/100g. Soils with sandy surfaces, such as Gates Lake, Whitehead, Wolverine, Gilmore, Ronayne, Sangster, Scullard, Walden, Wildfong, Wallace, and Wittal, have magnesium values of less than 1 meq/100g.

Soils with high magnesium levels require little or no magnesium fertilization, while those with moderate to low levels with increasing amounts of magnesium fertilizer. As stated for other nutrients, the necessary amounts required should be determined by individual soil tests and requirements of the specific crops to be produced.

G. Base saturation

The base saturation percentage indicates how much of the total soil cation exchange capacity is occupied by calcium, magnesium, potassium, and sodium cations present in the soil. Aluminum and hydrogen ions generally occupy that portion of the total cation exchange capacity that is not satisfied by basic cations.

The ease with which cations are absorbed by plants is related to the degree of base saturation. For any given soil the availability of the basic cations increases with the degree of base saturation. For example a soil with a base saturation of 80% would provide cations to growing plants far more easily than the same soil with a base saturation of 40% (Tisdale and Nelson, 1966).

The sandy soils have the highest percentage of base saturation. Those soil series with the highest base saturation (> 60%) include Gates Lake, Gilmore, Scobie, Sangster, Tenquille, Valleau, Walden, Whitehead, Wildfong, Wallace, Wolverine and Wittal. Rutherford and Zurcher soils are the least base saturated with values of less than 30%.

H. Sulphur

Tentative B.C. Soil Test laboratory (1978) guidelines for sulphur levels in soils are:

low	less than 3 ppm
medium	3 - 6 ppm
high	greater than 6 ppm

Available sulphur, an essential element for plant growth, has a wide range of values in the soils of the Lillooet River valley. The highest values (> 10 ppm) appear to occur in the very poorly drained soils which also have high organic matter contents in their surface layers. These high values are found in Renville, Valleau, Vickberg, Ronayne and Sankey soils. The lowest values (< 1.0 ppm) occur in the sandy, well to imperfectly drained soils which have low organic matter content in their surface mineral layers. These soils include Gates Lake, Gilmore, Ranson, Scobie, Shantz, Sangster, Viccars, Wolverine, Walden, Whitehead, Wildfong, Wallace, and Wittal.

Analyses for available sulphur was not determined in most of the organic soil layers. The amount of available sulphate in organic soils is highly dependent on the rate of mineralization, which is controlled by local temporary environmental factors. These factors may change rapidly and thus any analyses would have little basis for extrapolation.

Soils with high sulphur levels require none or only slight sulphur fertilization for most crops. Soils with moderate to low levels of sulphur require varying additions of sulphur depending on the crop and the amount of sulphur available in the individual soils as determined by soil tests.

I. Boron, copper, cobalt

Analyses of available boron, copper, and cobalt levels were completed for a few representative soils in order to provide an indication of levels present in the study area.

Boron levels appear to be relatively constant in the soils analysed varying from 0.22 ppm to 0.34 ppm in the surface 25 cm, although values tend to be slightly higher (0.80 ppm) in the silt loam to silty clay loam Rutherford soils.

Copper values are highly variable in the limited number of samples analysed. They are highest at 19.95 ppm in the very poorly drained, silt loam to silty clay loam Rutherford soils. Wolverine series soils, which are sandy and imperfectly drained, have the lowest levels of copper (1.66 ppm) of the soils analysed.

Cobalt levels are generally low, less than 0.25 ppm, although the Scobie series has a substantially higher value of 0.60 ppm.

6.1.3 Soil Suitability for Crops (by N. Gough, British Columbia Ministry of Agriculture)

Climate largely determines the kinds or range of crops that may be grown in a region. Soil suitability, the ability of a soil to produce regionally adapted crops of economic importance, depends on factors other than climate. These factors include good management practices such as fertilizer use, adequate drainage and irrigation in combination with satisfactory topography.

In the Lillooet River Valley, northwest of Lillooet Lake to approximately North and South creeks some of the suitable crops include: cauliflower, cabbage, lettuce, parsnip, turnip, beets, carrot, early hybrid corn varieties, wheat, barley, oats, peas, onions, asparagus, pumpkin, squash, cucumber, timothy, clover, potato and strawberry. These crops have generally been grown successfully throughout the valley except in some minor unfavourable climatic locations, or on sandy and gravelly, rapidly drained soils and in some poorly to very poorly drained areas. Commercial tomato production is not recommended because of the high possibility of late spring frost damage and insufficient heat units available to bring the crop to maturity.

Among the legumes most commonly grown for hay in the valley, alfalfa is prone to failure on poorly to very poorly drained - high ground water table soils. This is most likely due to the high water tables that exist for parts of the year and low boron levels in many of the soils.

Organic or peaty phase mineral soils occupy a comparatively small percentage of the study area but these soils, if properly managed, can grow good crops of potato, onion, carrot, parsnip, beets, cabbage, cauliflower, sweet corn and lettuce.

Field trials of a limited number of crops have been carried out since 1949 by the Canada Department of Agriculture (now Agriculture Canada) and the B.C. Department of Agriculture (now Ministry of Agriculture). The yields of these trials, produced under various types of management and farming practices, do not necessarily represent the highest yields which may have been obtained under the best systems of management. It is almost impossible to relate most of the yields to soils that are now mapped since site specific locations of these trials are not usually available from reports.

Faulknor (1951) reported combined commercial and seed potato yields averaging 23 tonnes/ha and an average per hectare yield of 14 tonnes for turnips.

Reports compiled in the early 1950's by Hughes (1978) indicated fertilized oats in variety tests yielded up to 3.7 hl/ha in one location, while in another, up to 8.8 hl/ha were obtained on mineral soils. Wheat yields of 1.6 hl/ha and barley at 2.0 hl/ha were also reported at the first location.

In 1953 R.M. Hall (1959) had carried out fertilizer trials on potatoes. He obtained combined commercial and seed yields of up to 47 tonnes/ha. Similar fertilizer applications on potatoes over three subsequent years (1954, 1955 and 1956), gave highest average yields of 38 tonnes/ha. The 1954-1956 trials were carried out on Nairn Falls soils located on the old J.C. Collins' farm.

R.M. Hall (1959) in fertilizer trials conducted on oats in 1955, reported highest average yields of 6.6 hl/ha.

Snow Crest Packers has reported pea yields ranging from 3 to 9 tonnes/ha (Hughes, 1978).

If the soils maps acompanying this report are used to identify soils when future yield plot work is carried out, then it will not be long before valid predictions can be made on the potential productivity of the various soils.

6.2 Physical Properties Of The Soils And Their Implications For Use

6.2.1 Soil Texture and Drainage Classes

A. Soil texture

Soil texture refers to the relative proportions of sand, silt, and clay in a soil. Textural class groupings are those defined in the 1974 "System of Soil Classification for Canada" as follows:

a) coarse textured
   1. very coarse: sand and loamy sand
   2. moderately coarse: sandy loam and fine sandy loam

b) medium textured
   1. medium: loam, silt loam, and silt
   2. moderately fine: sandy clay loam, clay loam, and silty clay loam

c) gravelly textured - gravelly class names are added to the textural class names according to the following rule:

% gravel by volume	
<20	- use textural class name only
20-50	- gravelly and texture
50-90	- very gravelly and texture
>90	- cobble land type

Maps showing the distribution and extent of the textural class groups found within the study area are presented in Figures 69 - 75.

Legend for Figures 69 - 75: Soil Texture Maps

Map Symbol	Textural Classes	Soils Included
1	Bedrock	RO
2	Bouldery or cobbly, gravelly coarse and gravelly very coarse textured	CC, CD, CW, FB, CH:bv, FL, FR, GR, GU
3	20 to 50 cm or >50 cm of coarse textured material overlying bouldery, gravelly, coarse textured material	FC, FO
4	Gravelly, coarse textured	CA, CB, CE, CF, CG, CH, CI, GG, GI, FA, WH, WG
5	Gravelly, very coarse to moderately coarse textured	YA, YV
6	20 to 50 cm of very coarse to moderately coarse textured material overlying gravelly, coarse textured material	RA, RB, WD, WE, FA:cs
7	Very coarse to moderately coarse textured	GA, RI, RN, SC, WO
8	15 to 60 cm (fibric) or 40 cm (mesic) of peaty material overlying very coarse to moderately coarse textured material	NE
9	Alternating layers of very coarse to moderately coarse textured material interbedded with medium to moderately coarse textured material; coarse textured at the surface	SN, WI
10	15 to 40 cm (mesic) or 60 cm (fibric) organic material overlying alternating layers of medium to moderately fine and very coarse to moderately coarse textured material	NW
11	20 to 50 cm of very coarse to moderately coarse textured material overlying medium to moderately fine textured material with organic material interbedded	VE
12	20 to 50 cm of very coarse to moderately coarse textured material overlying medium to moderately fine textured material	SH, WT
13	20 to 50 cm of medium to moderately fine textured material overlying very coarse to moderately coarse textured material	RE, SM, SU, WL, WN
14	Alternating layers of medium to moderately fine and very coarse to moderately coarse textured materials; medium textured at surface	SI
15	Alternating layers of medium to moderately fine, very coarse to moderately coarse, and organic materials; 20 to 35 cm of medium textured material at surface	VC
16	Medium to moderately fine textured materials interbedded with organic materials; 20 to 35 cm of mineral material at surface	VA, VB, VI
17	Medium to moderately fine textured	QM, QU, RG, RU, SA, SE, TN
18	15 to 40 cm (mesic) to 60 cm (fibric) of organic material overlying medium to moderately fine textured material	NA, NB
19	Greater than 60 cm of fibric organic material interbedded with layers of mineral material	ZA, ZE, ZR
20	Greater than 40 cm of mesic organic material interbedded with layers of mineral material	ZO

NOTE:

Map symbols are assigned to a unit according to the largest proportion of that unit which is a specific textural class and sequence. Thus there may be significant inclusions of areas which are composed of contrasting textural classes within designated units.

1:20 000 mapping available from: The Librarian, Resource Analysis Branch, Ministry of Environment, Parliament Buildings, Victoria, B.C. V8V 1X4

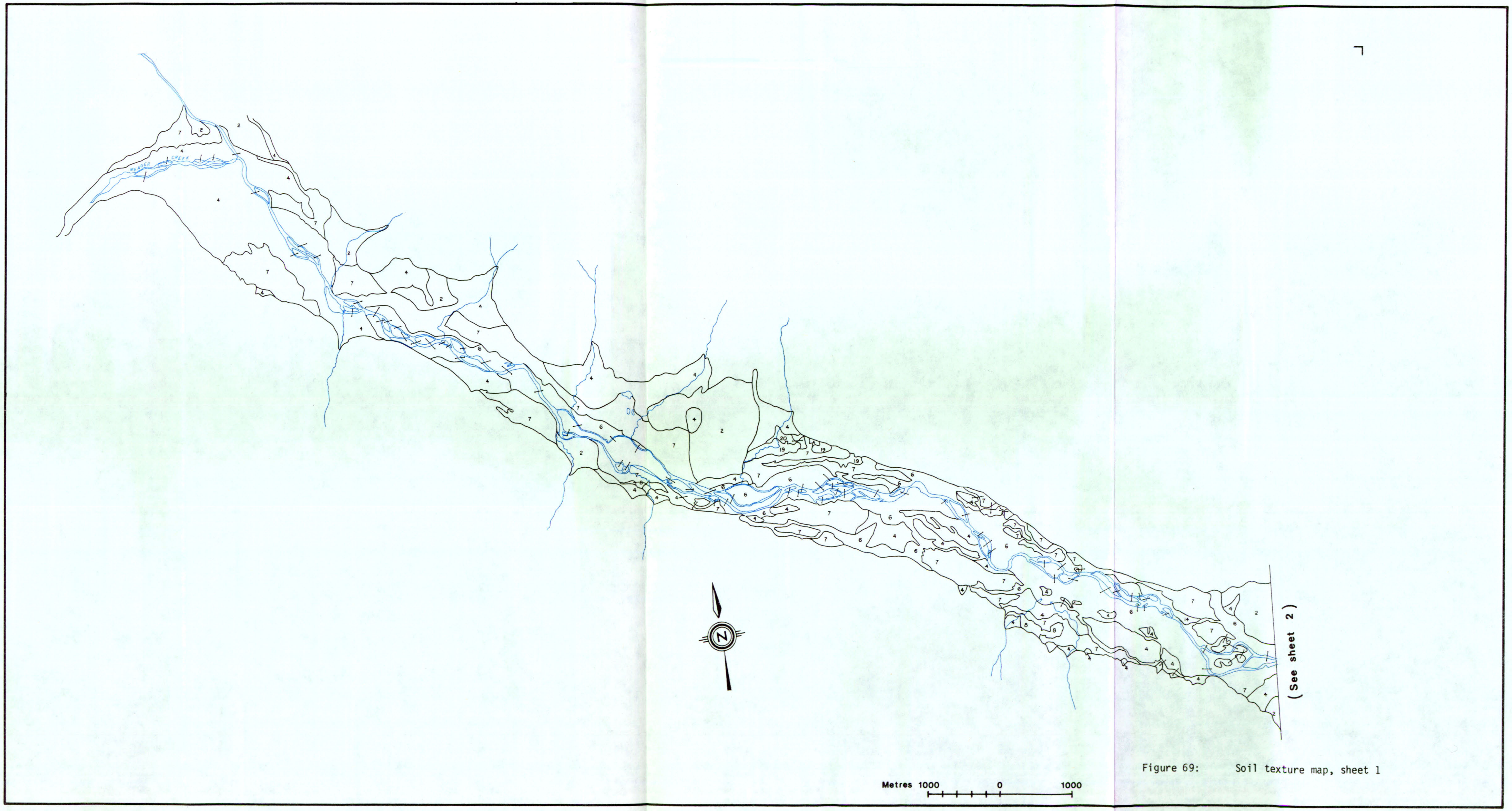


Figure 69: Soil texture map, sheet 1

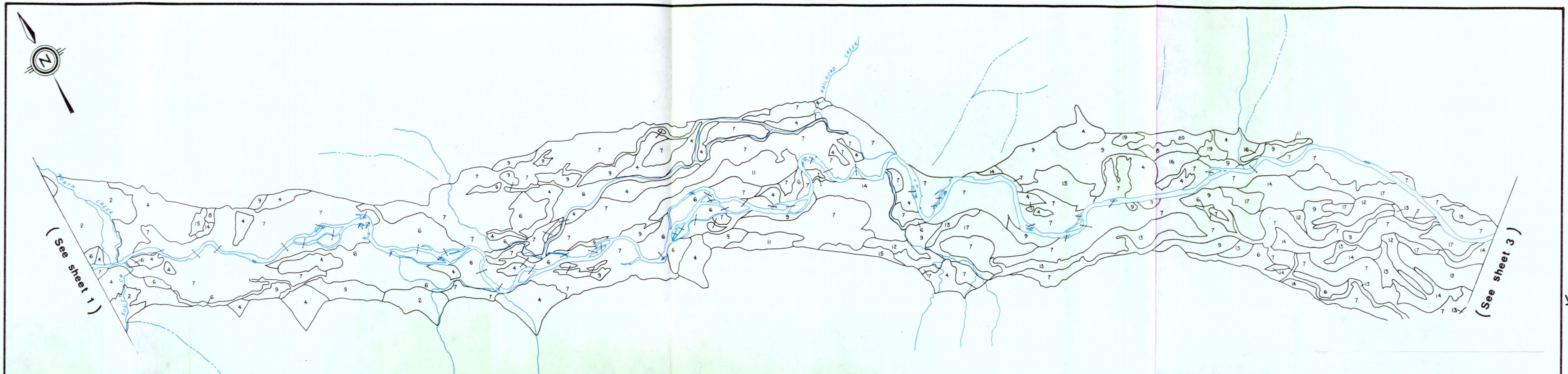


Figure 70: Soil texture map, sheet 2

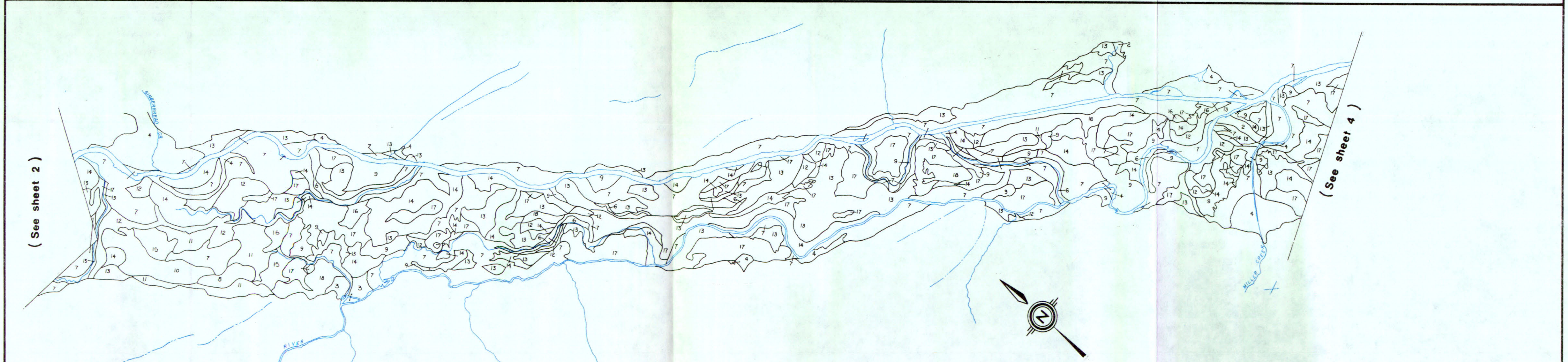
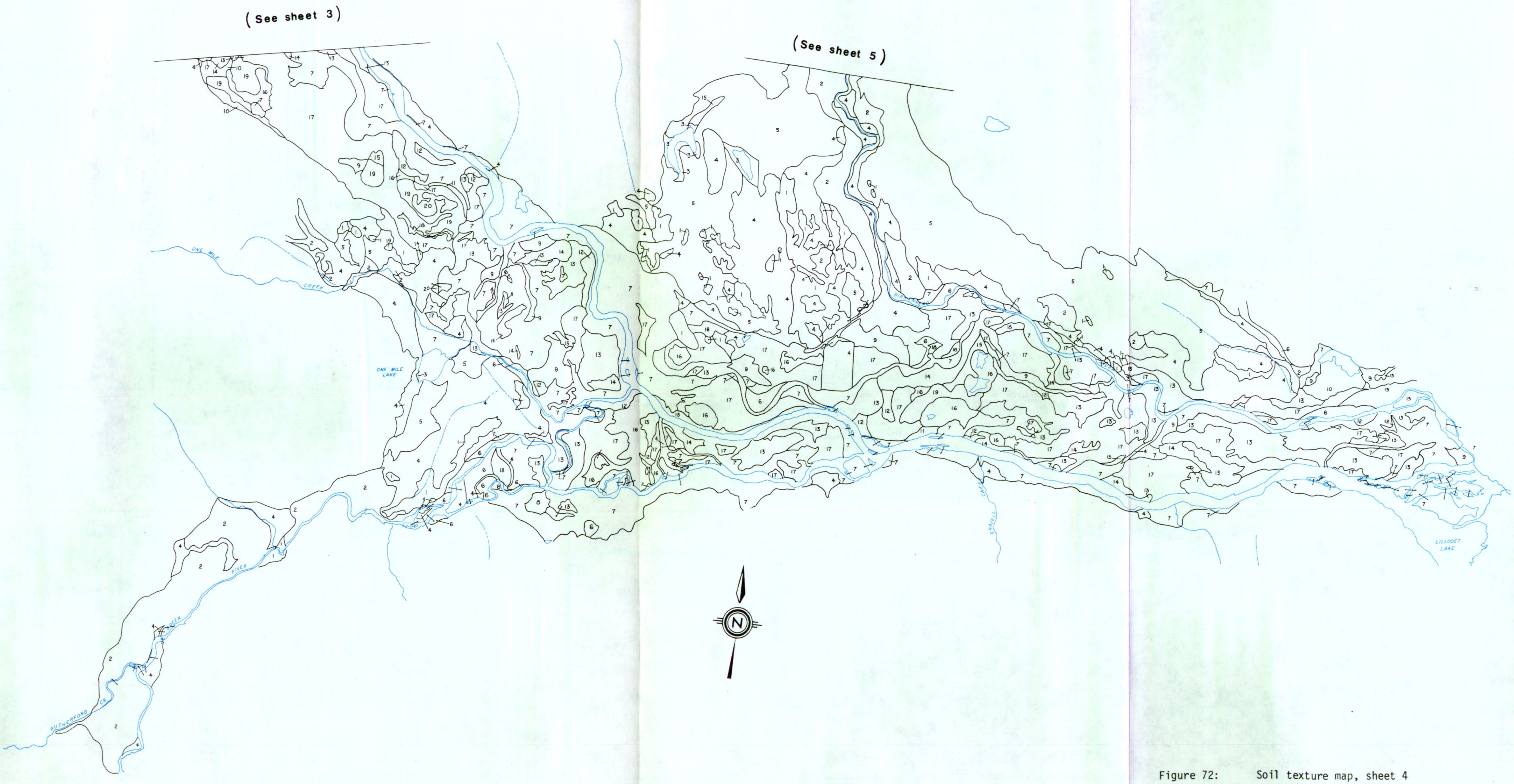


Figure 71: Soil texture map, sheet 3

Legend located on page 152



Metres 1000 0 1000

Figure 72: Soil texture map, sheet 4

Legend located on page 152

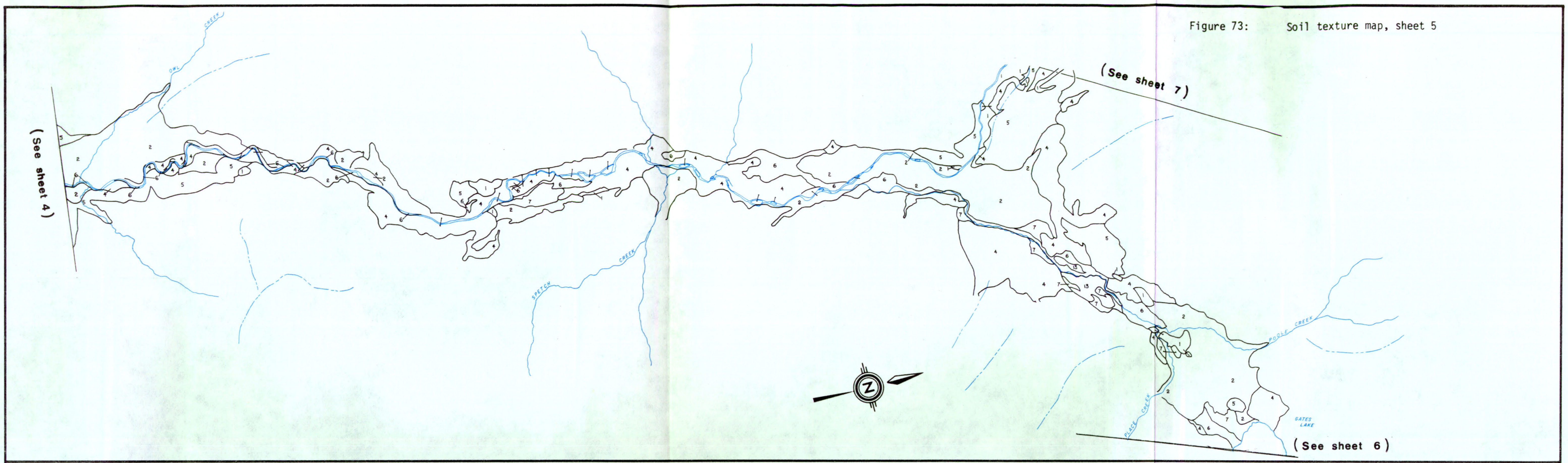


Figure 73: Soil texture map, sheet 5

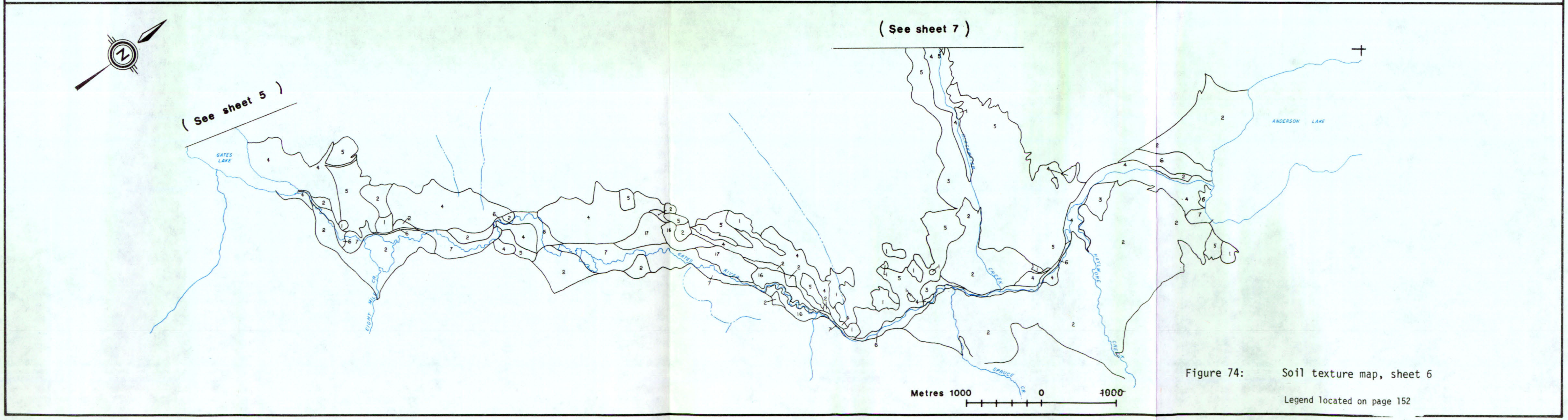


Figure 74: Soil texture map, sheet 6

Legend located on page 152

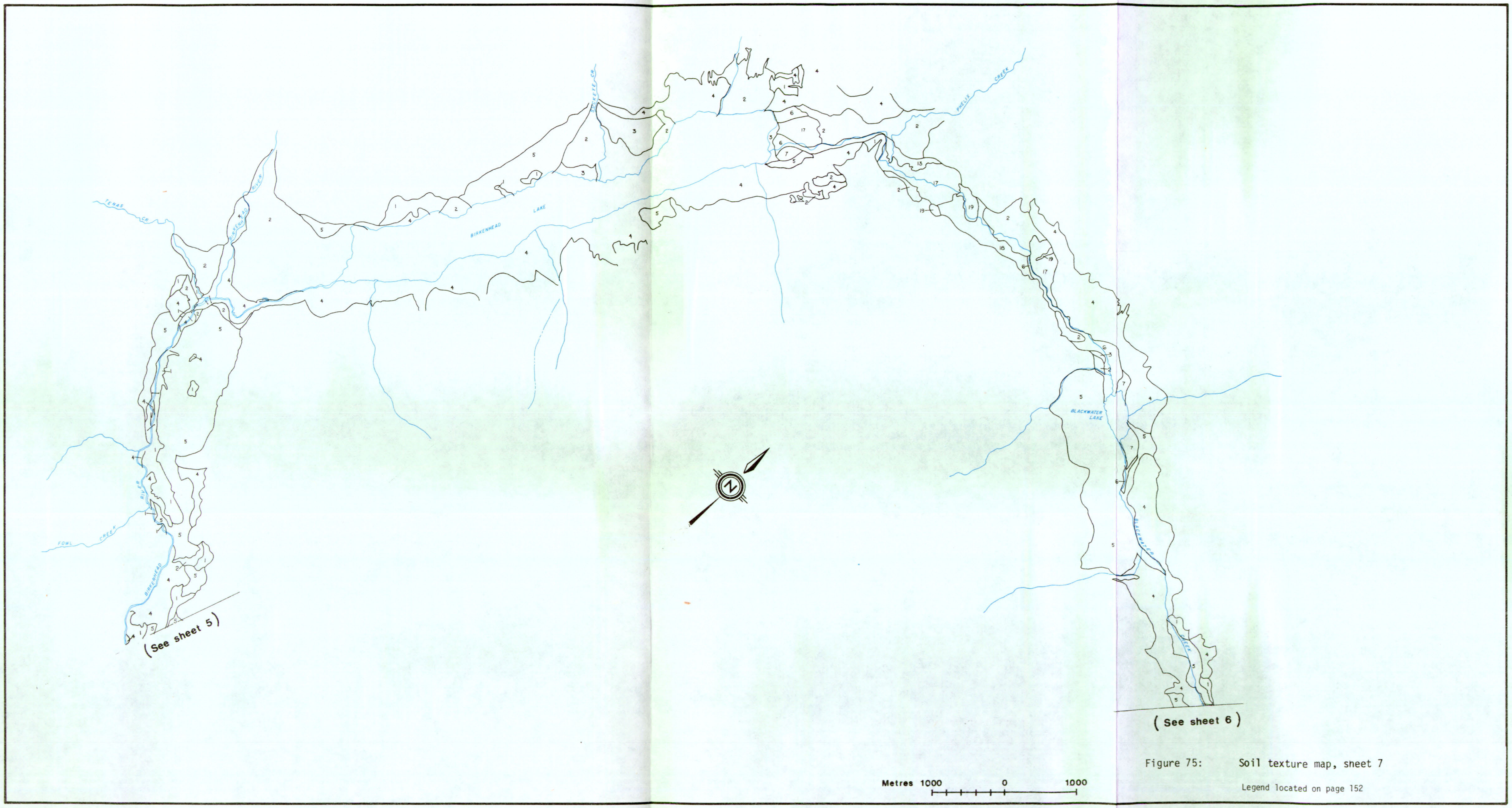


Figure 75: Soil texture map, sheet 7

Legend located on page 152

B. Soil drainage

Soil drainage classes were determined according to the "System of Soil Classification for Canada" (1974) and the "Cansis - Manual for describing soils in the field" (1975, 1978). Definitions of the seven soil drainage classes are as follows:

very rapidly drained	- Water is removed from the soil very rapidly in relation to supply.
rapidly drained	- Water is removed from the soil rapidly in relation to supply.
well drained	- Water is removed from the soil readily but not rapidly.
moderately well drained	- Water is removed from the soil somewhat slowly in relation to supply.
imperfectly drained	- Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season.
poorly drained	- Water is removed so slowly in relation to supply that the soil remains wet for a comparatively large part of the time the soil is not frozen.
very poorly drained	- Water is removed from the soil so slowly that the water table remains at or on the surface for the greater part of the time the soil is not frozen.

The distribution and extent of the drainage classes occurring in the study area is indicated in Figures 76 - 82.

Legend for Figures 76 - 82: Soil Drainage Maps

Map Symbol	Soil Drainage Classes	Soils Included
1	Rapidly drained	CD, RO, CW
2	Well to rapidly drained	CA, CB, CE, CG, FL, GR, GU, FR
3	Well drained	CC, CF, CH, CI, FA, FB, FC, FO, YA, YV
4	Well to moderately well drained	GA, GG, GI
5	Imperfectly drained	TN, WD, WE, WG, WH WI, WL, WN, WO, WT
6	Poorly drained	SA, SC, SE, SH, SI, SM, SN, SU, VA, VC, VE, VL, VN
7	Poorly to very poorly drained	NA, NB, NE, NW, QM, VB, ZA, ZE, ZO, ZR
8	Very poorly drained	QU, RA, RB, RE, RG, RI, RN, RU, VI

NOTE:

Map symbols are assigned to a unit according to the largest proportion of that unit which is a specific drainage class. Therefore, there may be significant inclusions of contrasting drainage classes within some units.

1:20 000 mapping available from: The Librarian
Resource Analysis Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X4

Figure 76: Soil drainage map, sheet 1

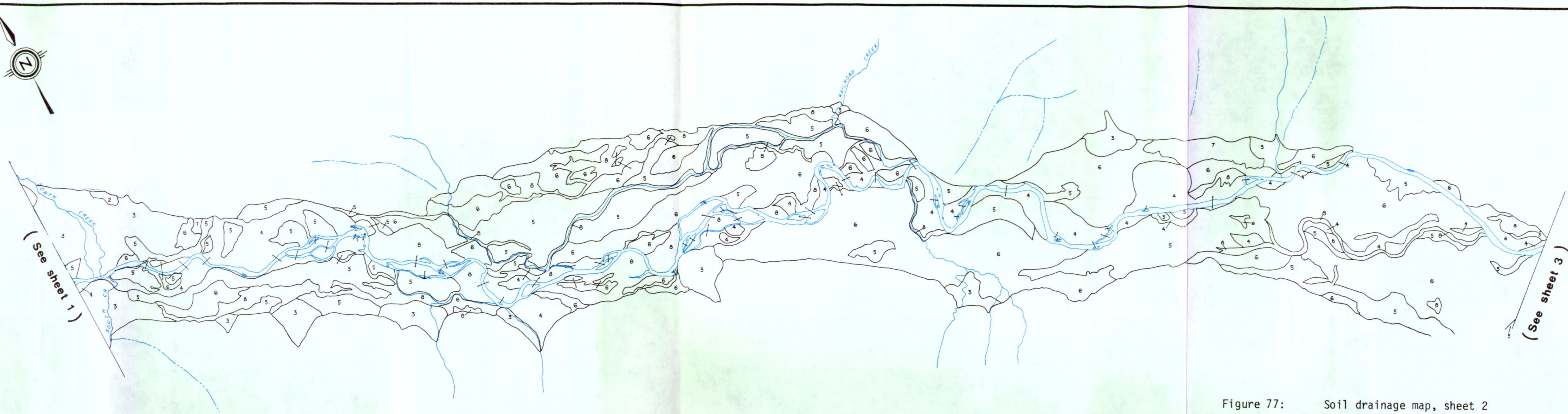


Figure 77: Soil drainage map, sheet 2

Figure 78: Soil drainage map, sheet 3

Legend located on page 164

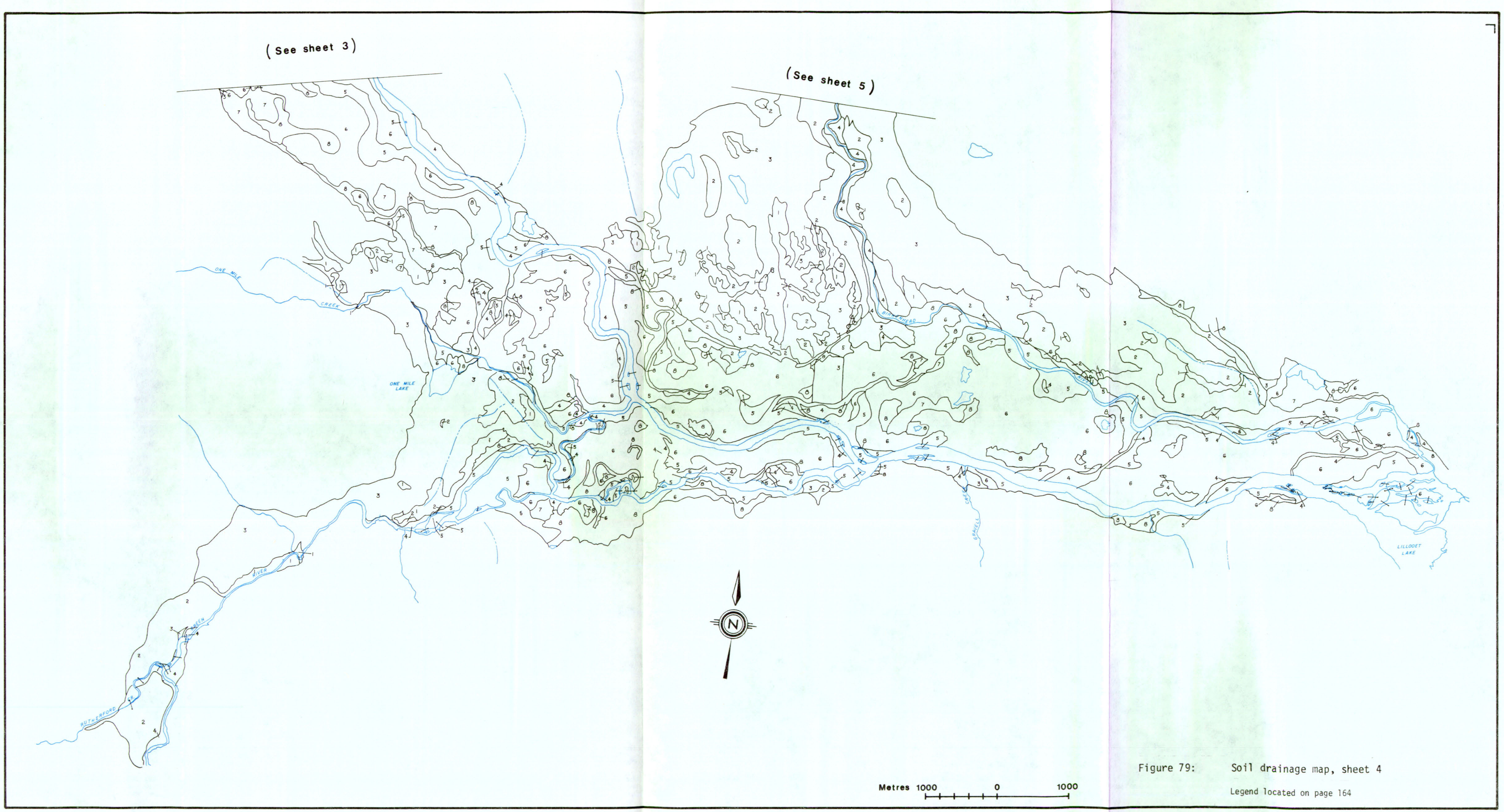


Figure 79: Soil drainage map, sheet 4

Legend located on page 164

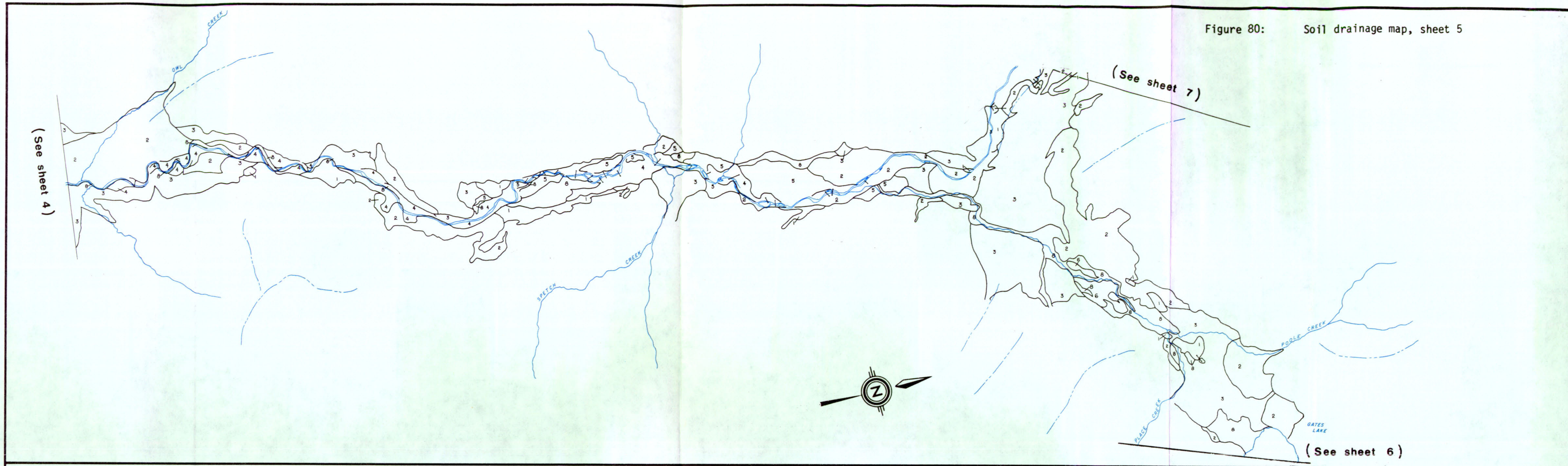


Figure 80: Soil drainage map, sheet 5

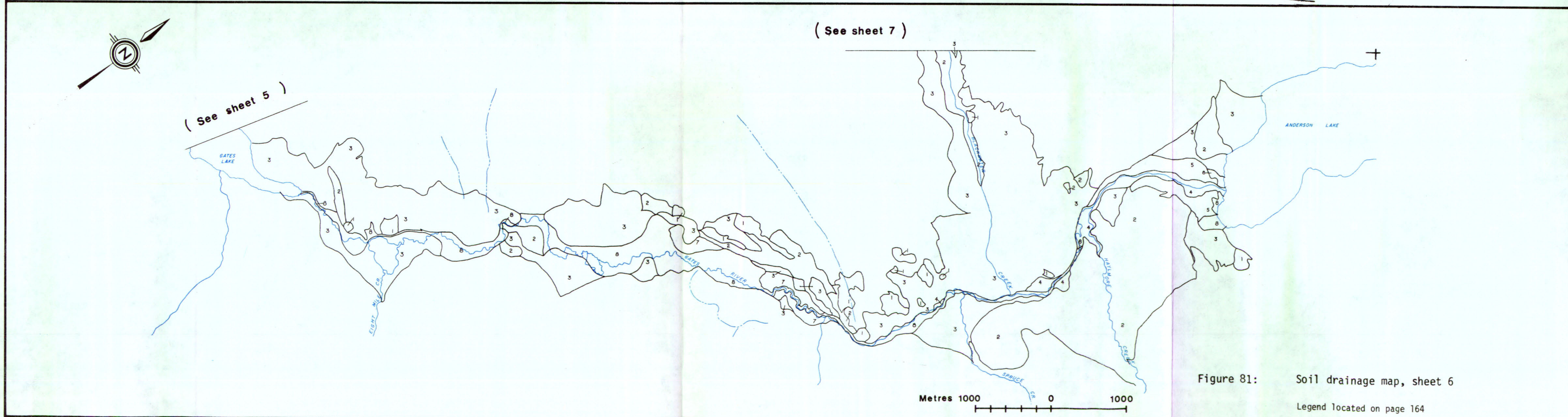


Figure 81: Soil drainage map, sheet 6

Legend located on page 164

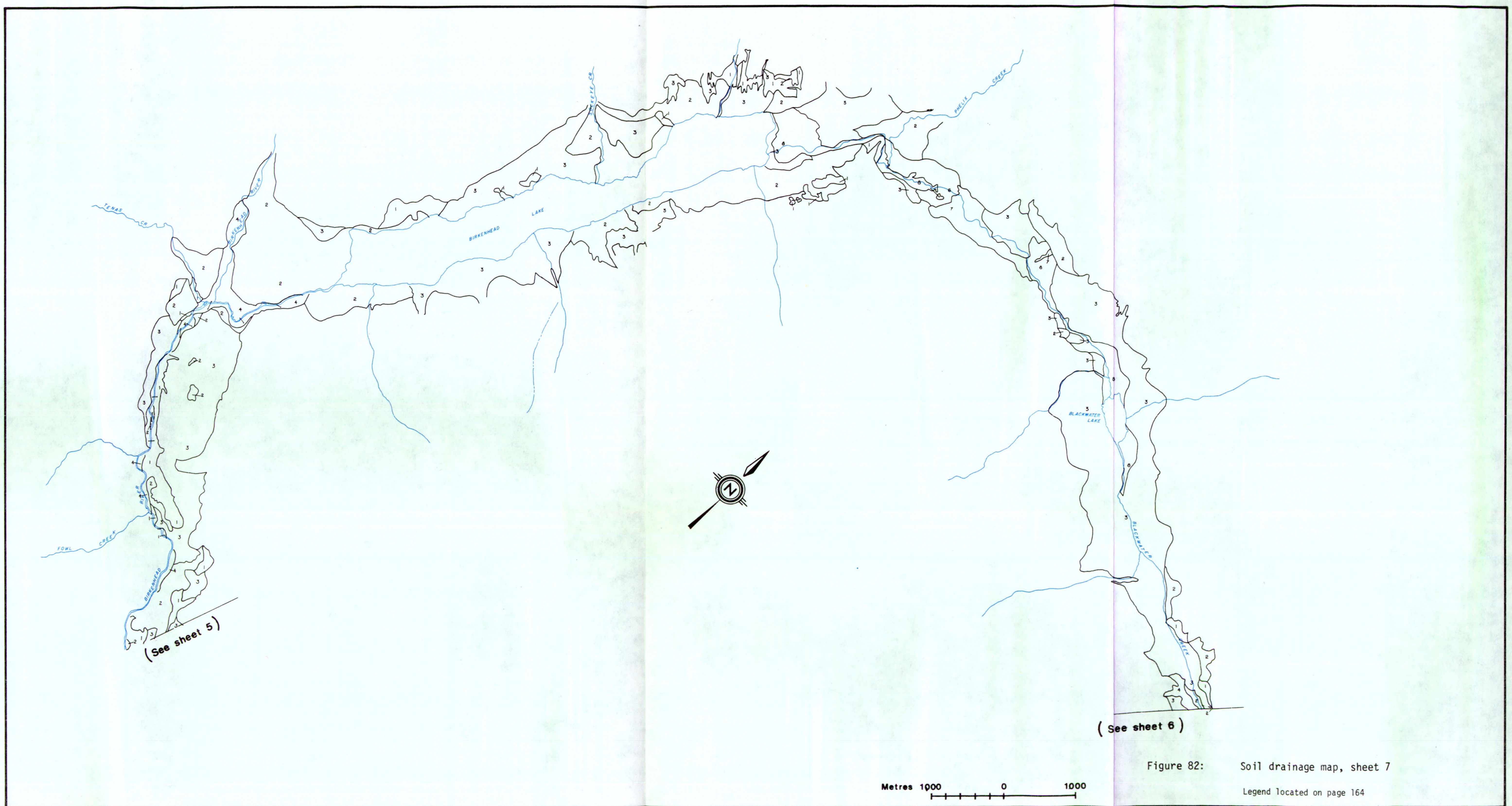


Figure 82: Soil drainage map, sheet 7

Legend located on page 164

6.2.2 Hydrologic Properties

Available water storage capacity is defined as the ability of a soil to retain that portion of water in a soil that can be readily absorbed by plant roots and therefore was determined on contrasting textured layers within the surface 50 cm of the soil profile. Bulk density, which is the mass of dry soil per unit bulk volume, was also determined in these layers as well as at the greatest depth within the sample pit. Saturated hydraulic conductivity, the rate of viscous flow of water in a soil at saturation was measured "in situ" (Van Beers, 1963) at depths of 180 and 100 cm wherever the water table was sufficiently high to allow these measurements to be made. The data from the above determinations are presented in Table 6.

Available water storage capacity (AWSC) is dependent primarily on the texture and organic matter content of the soil layers. Soils with silty textures and high organic matter content usually have the highest AWSC. Organic layers of the Nesuch series, and the Zoltay series have the highest AWSC, greater than 0.5 cm/cm. The AWSC of the sandy textured, low organic matter content layers of Gates Lake, Gilmore, Newberry, Ronayne, Ranson, Scobie, Whitehead, Wolverine, and Wittal series tend to be very low, less than 0.15 cm/cm. The higher the AWSC, the more water available for plant growth after drainage.

Bulk density depends largely on the texture and degree of compaction of the soils being evaluated and affects the hydraulic conductivity of the soil. Generally, the higher the bulk density, the more compact is the soil, the more poorly defined is the soil structure, and the smaller is the amount of pore space. The higher the bulk density for a given textural class, the smaller the amount of pore space present (Tisdale and Nelson, 1966). The bulk densities of the Lillooet River valley soils are relatively low with the majority of soils having values of less than 1.50 g/cm^3. The lower the porosity of the soil the more slowly water will drain through the soil. At very high bulk densities the flow of water and the penetration of roots may be impeded to such a point that plant growth is limited or restricted, whereas at very low bulk densities the water may be allowed to pass through the soil so quickly that they are left droughty.

Table 6: Comparative values of available water storage capacities, saturated hydraulic conductivities, and bulk densities for selected soils of the Pemberton Valley

Soil Name	Depth (as defined in profile description) cm	Soil Texture	Available Water Storage Capacity cm/cm	Bulk Density g/cm^3	Saturated Hydraulic Conductivity m/day
Gates Lake	0- 24	sl, fsl	0.06	0.66	*
	24- 35	ls	0.11		
	35- 56	ls	0.02		
	93-103	s		1.65	
Gilmore	0- 10	gs	0.01	***	*
	10- 50	s	0.004		
Nairn Falls	0- 52	sil	0.195	0.41	
	82-102	sicl		0.69	
	180				0.8
Nesuch	14- 0	peat	0.56		**
	0- 10	sil	0.81	1.17	
	10- 20	sl	0.09		
	104			1.24	
Newberry	0- 37	sl	0.08	0.58	
	37- 47	sil	0.24		
	80				2.2
	160				1.7
Quamell	0- 15	l	0.22		
	15- 66	sil	0.25	0.88	
	180				1.6
Ronayne	0- 12	sil	0.38	0.90	**
	12- 41	gls	0.015		
Renville	0- 29	sicl	0.25	0.83	**
	29- 50	fsl	0.12		
	76-106			1.08	
Ranson	0- 28	ls	0.03	1.33	
	28- 48	sil	0.34		
	48- 73	sl	0.12		
	170				1.4

Soil Name	Depth (as defined in profile description) cm	Soil Texture	Available Water Storage Capacity cm/cm	Bulk Density g/cm^3	Saturated Hydraulic Conductivity m/day
Rutherford	0- 25	sil	0.25	0.66	
	25- 60	sicl	0.28	0.85	
	180				1.2
Sankey	0- 50	sicl	0.38	1.18	
	50- 83			0.96	
	180				0.6
Scobie	0- 23	fsl	0.14		**
	23- 45	sl	0.05	1.15	
	45- 61	fsl	0.09		
	120			1.17	
Shantz	0- 17	l	0.22	1.25	**
	17- 55	fsl	0.14		
	80-100			1.23	
Sister	0- 36	sil	0.25	0.82	
	36- 64	ls	0.02		
	91-106	sil		0.47	
	180				8.1
Sangster	0- 21	fsl	0.25	1.64	**
	21- 32	sil	0.57		
	32- 42	fsl	0.21		
	42- 51	sicl	0.60		
	97-127	sil		2.03	
Scullard	0- 47	sicl	0.36	1.11	
	47- 60	l	0.27		
	120			1.07	
	180				0.5
Tenquille	0- 30	sil	0.21	0.84	*
	30- 58	sicl	0.24		
	105			1.13	

* unable to measure "in situ"; the water table was at greater than 2m depth
** unable to measure "in situ"; sands at depth filled in the auger hole, and adequate equipment was not available.
*** gravel - not sampled.

Soil Texture Terms:

fsl - fine sandy loam
sl - sandy loam
s - sand
ls - loamy sand
l - loam
sil - silt loam
sicl - silty clay loam
gs - gravelly sand
gsl - gravelly sandy loam

Table 6 cont'd: Comparative values of available water storage capacities, saturated hydraulic conductivities, and bulk densities for selected soils of the Pemberton Valley

Soil Name	Depth (as defined in profile description) cm	Soil Texture	Available Water Storage Capacity cm/cm	Bulk Density g/cm^3	Saturated Hydraulic Conductivity m/day
Valleau	0- 15	l	0.27		
	15- 35	sicl	0.31	0.93	
	35- 45	sil	0.37		
	45- 61	peat	0.23		
	70-100			0.41	
	180				0.3
Viccars	0- 24	l	0.21		
	24- 32	ls	0.02		
	32- 48	sicl	0.25	0.97	
	48- 71	sil	0.17		
	94-106	sil		1.13	
	180				7.4
Verlinden	18- 0	muck	0.26		
	0- 24	sl	0.07	1.00	
	24- 35	peat	0.69		
	35- 53	sic	0.30		
	64- 86	sil		1.00	
	162				0.3
Vickberg	0- 9	sicl	0.32	0.83	
	9- 19	peat	0.21		
	19- 39	fsl	0.55		
	39- 48	peat	0.22		
	100			0.70	
	180				3.4
Walden	0- 19	l	0.35	1.36	*
	26- 49	gs	0.02		
Whitehead	0- 8	gsl	0.04	***	*
	8- 63	gs	0.015		
Wittal	0- 20	fsl	0.33	1.14	*
	20- 31	sil	0.24		
	31- 40	lfs	0.03		
	40- 61	sil	0.31		
	61-101	sil		0.84	
Wallace	0- 23	sicl	0.30	0.90	*
	23- 31	ls	0.04		
	31- 57	sil	0.23		
	84-118	s		1.01	
Wolverine	0- 11	fsl	0.12	1.19	*
	11- 46	sl-ls	0.03		
	46- 52	fsl	0.10		
	120			1.20	
Wildfong	0- 16	fsl	0.17		*
	16- 24	sl	0.08		
	24- 32	sicl	0.31	1.05	
	32- 42	fsl	0.11		
	42- 63	sil	0.24		
	73-113	sl		1.18	
Zurbrugg	100				14.1
	180				8.7
Zurcher	114- 82	peat	0.08	0.23	
	82- 66	peat	0.12		
	66- 44	sil	0.17		
	44- 31	peat		0.63	
	14- 0				2.8
	66				2.6
Zoltay	120- 90	peat	0.50	1.06	**
	90- 68	ls	0.06		
	0			1.15	

* unable to measure "in situ"; the water table was at greater than 2 m depth.
** unable to measure "in situ"; sands at depth filled in the auger hole, and adequate equipment was not available.
*** gravel - not sampled

Soil Texture Terms:

fsl - fine sandy loam
sl - sandy loam
s - sand
ls - loamy sand
l - loam
sil - silt loam
sicl - silty clay loam
gs - gravelly sand
gsl - gravelly sandy loam

Hydraulic conductivity values range from moderate 0.3 m/day to rapid 14.1 m/day. Zurbrugg series, Sister series, and Viccars series soils have rapid hydraulic conductivities at 180 cm depth. However, Nairn Falls, Sankey, Scullard, Valleau, and Verlinden soil series have moderate hydraulic conductivities of less than 1m/day. A guide to hydraulic conductivity rates (British Columbia Drainage Guide, 1972) follows:

slow	less than 0.01 to 0.1 m/day
moderate	0.1 to 1.0 m/day
moderately-rapid	1.0 to 5 m/day
rapid	greater than 5 m/day

In general, the higher the hydraulic conductivity the easier a soil is to drain by artificial means.

The results of AWSC, bulk density and hydraulic conductivity determinations are useful in determining drainage tile spacings and irrigation requirements. However, in order to plan a drain tile or irrigation system for a specific farm it will be advantageous to conduct further on-site measurements. This is due to the variability of soils generally found on any one farm or even in one field.

6.2.3 Soil and Water Management (by M. Driehuyzen, British Columbia Ministry of Agriculture)

The water regime of the Pemberton Valley has a strong influence on land use and water management requirements for agricultural production. The valley floor forms the lower part of the Lillooet River basin above Lillooet Lake, through which runoff of an area of 3 100 km^2 or 1 915 000 ha finds its way via the Lillooet river to Lillooet Lake. In the course of this discharge, materials are either eroded or deposited along the way. Also fluctuations of the ground water levels are brought about which affect the use of the valley floor.

As the proportion of watershed area to valley floor area is in excess of 15 to 1, it is not difficult to understand that hydrologic events in the watershed can have significant consequences on the valley floor. Dikes have eliminated most of the flooding in the lower part of the valley but this protection is not present in the upper regions where hydraulic gradients increase and erosion and braiding occurs actively.

Before completion of diking in 1954 and in the presently undiked portion of the flood plain, periodic flooding caused and continues to cause deposition of river sediment. The coarsest materials accumulate close to the river bank while the finer ones accumulate further away at relatively lower elevations. Poor drainage conditions are generally encountered in the finer textured soils away from the main stream whereas dry or droughty conditions occur in the coarse textured soils closer to current, or abandoned stream channels. In general, the finer textured soils are at slightly lower elevations than the coarser textured soils.

Meltwater from accumulated winter snow brings about a prolonged period of discharge which peaks early in June, followed by a second, higher peak in mid July. Seepage from these high river stages can contribute significant amounts of soil moisture at the peak of the growing period of crops, thus mitigating drought conditions and reducing irrigation water requirements. The onset of fall rains brings about another discharge peak in October. Normally the fall discharge peak is lower than summer discharge, although the highest discharge volumes on record have occurred in October.

A. Drainage

The majority of soils in the Pemberton Valley are Regosolic, Gleysolic or Organic soils which are subject to high water table conditions during significant periods of the year. Melting of accumulated snow, high precipitation and low evapotranspiration in combination with low elevation, low hydraulic conductivity of the soil and poor outlet conditions are the main factors responsible for the adverse drainage conditions. The effects of poor drainage are variable, depending on land use and the degree of poor drainage. However, in general, such effects may vary from total land loss where soils are completely unsuitable for cropping, in severe cases, to reduced productivity and restricted land access. Most of the poorly to very poorly drained soils will benefit from improvements. Such improvements range from providing, or improving, outlet ditches to more detailed measures, including mole drainage and in some cases complete detailed under drainage usually consisting of a system of parallel tile (plastic) drains emptying into an outlet ditch. The depth and width of spacing of drains are closely related to each other. Under normal soil and outlet conditions a drain depth of 120 cm is used. The distance between drain lines (drain spacing) depends besides the drain depth, on a number of factors of which the hydraulic conductivity of the soil is of major importance. Although soil structure can have a strong bearing on the hydraulic conductivity it is usually texture that has the greatest influence. On the average, a drain spacing of 20 m gives good results. Finer textured soils generally require a spacing of 15 m or less, while coarser textured soils give good results with a spacing of 25 to 30 m (B.C. Drainage Guide, 1972).

Elimination of excess soil water as early as possible in spring is advisable, not only for improved growing and land-use considerations, but also in view of deteriorating outlet conditions as the main basin runoff builds up to a peak in early June. Unless drainage takes place before stream water levels have risen it will be more difficult or impossible to do so later on when river levels are high. This is particularly true in the Pemberton valley since ground water levels in this valley are highly dependent on Lillooet River levels. Melting of snow due to temperature fluctuations in early fall, together with high rainfall causes high discharge conditions during this period. Also, in view of the potential danger of crop loss during this period, proper drainage reduces such danger and facilitates harvesting. Good drainage facilities can be of dual benefit by providing water for sprinkler irrigation and in some cases for subirrigation.

Iron algae, produce a filamentous reddish brown growth called ochre, which is prevalent in many areas of the valley. Ochre combined with the bacteria that produce it can clog most drainage facilities and are particularly hazardous to underdrainage systems.

B. Irrigation

Low rainfall, in conjunction with limited available water storage capacity of many soils of the Pemberton valley, is responsible for a deficit of water available for plant growth during the summer. However, seepage and high ground water levels in early June and particularly during the second part of July have a considerable mitigating effect on this water deficit. Additional benefits can be derived from these high river levels by upgrading current drainage facilities and adapting them for subirrigation.

From climatic observations, an average seasonal water deficit ranging from 265 to 355 mm occurs if moisture stored in the soil is not taken into account. However, with an average available water storage capacity of 5 cm per 0.30 metres of soil at least 7.5 cm of water is available from the soil for shallow rooted crops (45 cm) and as much as 15 cm for most deeper rooted (90 cm) crops.

Organic and fine textured soils have higher storage capacities than that indicated above, reducing seasonal water requirements for those even further. However, since water normally is supplied before 50% of the stored water has been depleted the following general assumptions apply based on the average climatic water deficit, of 30 cm and water holding capacities presented in the B.C. Irrigation guide:

Seasonal Water Deficit

	Shallow rooted crops	Deep rooted crops
Sand	11.25 cm	11.0 cm
Sandy loam	10.9 cm	10.5 cm
Silt loam	10.1 cm	9.5 cm
Clay	10.2 cm	9.6 cm

Where the seepage conditions described earlier occur water deficits are substantially lower.

6.2.4 Suitability of Soils for Selected Engineering Uses

Analyses for engineering properties of soils includes determination of particle size distribution, plastic limit, liquid limit, and bulk density. These data are useful in determining the suitability of individual soils for engineering uses such as dwellings, septic tank effluent disposal systems, and sand and gravel sources. The results of the engineering analyses are presented in Table 7.

The suitability of the individual soils for specified uses and the limitations are presented in Table 8.

The engineering uses selected for interpretation are: suitability for dwellings with and without basements, septic tank effluent disposal fields, shallow excavations, and sources of sand and gravel.

Table 7: Engineering properties of selected soils of the Pemberton Valley

Soil Name	Depth cm	Particle Size Distribution %														Atterberg Limits		Bulk Density g/cm^3	Textural Class
		>1/2 inch	1 inch	3/4 inch	3/8 inch	4.76	2.00	0.84	0.42 mm	0.25	0.105	0.074	Sand	Silt	Clay	Plastic Limit % water	Liquid Limit content		
Gates Lake	93-103	0	0	0	0.2	0.5	2.2	6.3	31.5	53.8	2.2	3.2	90.2	8.2	1.6	NP	NL	1.65	sand
Gilmore	73-100						no		sample										
Nairn Falls	82-102	0	0	0	0	0	0	0.2	0.2	0.5	0.9	0.4	0.2	65.3	34.5	45.66	59.71	0.71	silty clay loam
Nesuch	72- 97	0	0	0	0	0	0	0.3	4.2	37.3	44.0	4.6	91.3	7.2	1.5	NP	NL	1.24	sand
Newberry	47- 57	0	0	0	0	0	0	0.1	0.2	0.2	0.3	0.2	0.7	78.2	21.1	31.28	33.95	*	silt loam
Quamell	66- 91	0	0	0	0	0	0	0	0.1	0.2	3.0	1.5	*	*	*	NP	NL	*	*
Ronayne	21- 41	10.6	18.5	6.3	12.1	12.1	9.0	7.9	12.0	5.8	3.9	0.4	85.3	12.5	2.2	NP	NL	*	gravelly loamy sand
Renville	76-106	0	0	0	0	0	0	0.1	0.4	0.3	0.9	0.6	1.4	79.4	19.2	37.4	42.0	1.08	silt loam
Ranson	48- 73	0	0	0	0	0	0	0.1	0.3	0.3	2.2	1.0	62.2	33.3	4.5	NP	NL	*	sandy loam
Rutherford	78- 93	0	0	0	0	0	0	0.5	0.8	0.6	0.9	3.3	55.1	37.0	7.9	35.89	39.90	0.85	sandy loam
Sankey	102-117	*	*	*	*	*	*	*	*	*	*	*	13.1	46.8	40.1	*	*	0.96	silty clay loam
Scobie	98-108	0	0	0	0	0	0	trace	0.6	5.2	55.3	16.5	83.7	14.3	2.0	NP	NL	1.17	loamy sand
Shantz	80-100	0	0	0	0	0	0	0.5	0.7	0.3	1.4	1.6	9.7	79.6	10.7	NP	NL	1.23	silt loam
Sister	91-106	0	0	0	0	0	0	0.8	1.1	0.7	0.8	0.2	0.4	78.9	20.7	NP	NL	0.47	silt loam
Sangster	97-127	0	0	0	0	0	0	0.1	0.3	0.4	7.2	2.4	22.0	73.9	4.1	NP	NL	2.03	silt loam
Scullard	84-114	0	1.1	0	0	0	0	0.2	0.6	0.7	7.5	4.3	25.8	65.2	6.3	NP	NL	1.07	silt loam
Tenquille	86-101	0	0	0	0	0	0	0.2	0.3	1.3	9.6	2.2	35.5	46.4	18.1	21.96	22.98	1.13	silt loam
Valleau	70-100	0	0	0	0	0	0	5.4	6.9	4.4	6.0	1.6	0.3	66.1	33.6	68.94	81.79	0.41	silty clay loam
Viccars	94-106	0	0	0	0	0	0	0.1	0.2	0.2	5.2	9.2	21.0	72.1	6.9	NP	NL	1.13	silt loam
Verlinden	86- 91	0	0	0	0	0	0	0.2	0.4	0.3	2.4	8.3	32.0	63.3	4.7	NP	NL	1.00	silt loam
Vickberg	74- 77						no		sample									0.70	
Walden	94-116	19.4	11.9	8.4	13.2	9.6	9.2	9.1	4.9	7.5	5.1	0.4	91.9	6.6	1.6	NP	NL	*	gravelly sand
Whitehead	23- 68	15.3	14.7	11.1	17.1	10.2	7.1	5.6	9.0	6.6	2.8	0.1	88.7	9.6	1.7	NP	NL	*	gravelly sand
Wittal	124-134	0	0	0.4	1.0	3.5	13.1	31.0	25.0	12.3	7.7	0.5	*	*	*	NP	NL	0.84	*
Wallace	84-118	0	0	0	0	0	0	1.2	1.8	2.3	11.9	9.3	90.7	7.5	1.8	NP	NL	1.01	sand
Wolverine	83-113	0	0	0	0	0	0	trace	trace	2.7	73.9	12.5	68.4	29.5	2.1	NP	NL	1.20	sandy loam
Wildfong	73-113	0	0	0	0	0	0	trace	trace	trace	6.2	2.9	48.5	46.0	5.5	NP	NL	1.20	sandy loam
Zurbrugg	0- 10	0	0	0	0	0	0	0.1	0.2	0.2	0.6	0.8	4.0	84.7	11.3	40.59	44.92	*	silt
Zurcher	31- 14						no		sample									0.63	
Zoltay	0- 10	0	0	0	0	0	1.1	6.4	22.0	29.3	31.4	2.6	86.3	12.0	1.7	NP	NL	1.15	loamy sand

* missing data NP-nonplastic NL-nonliquid

Table 8: Suitability of soils within the study area for selected engineering uses

INTERPRETATIONS OF SUITABILITY FOR:							
Soil Name	Map Unit	Slope* Classes	Dwellings With Basements	Dwellings Without Basements	Septic Tank Absorption Fields	Sand and Gravel Source	Shallow Excavations
Callaway Chumley	CA CB	5,6	**$M^{13}_{5,6}$***	$M^{13}_{5,6}$	$M^{3}_{5,6}$	M^{13}	$L_{5,6,8}$
		7,8,9,10	$L^{5,13}_{6}$	$L^{5,13}_{6}$	$L^{3,5}_{6}$	$L^{5,13}$	$L^{5}_{6,8}$
Clausen	CC	1,2,3,4	M_{6}	M_{6}	$M_{3,6}$	M_{8}	$M_{6,8}$
		5,6	$M_{5,6}$	$M_{5,6}$	$M_{3,5,6}$	$M_{8,16}$	$M_{5,6,8,16}$
		7,8,9,10	$L^{5,16}_{6}$	$L^{5,16}_{6}$	$L^{5,16}_{6}$	$L^{5,16}_{8}$	$L^{5,16}_{6,8}$
Cloutier Combow	CD CW	1,2,3,4	$L^{6,16}$	$L^{6,16}$	$L^{3,4,6,16}$	$L^{6,8}$	$L^{6,16}$
		5,6	$L^{6,16}_{5}$	$L^{6,16}_{5}$	$L^{3,4,6,16}_{5,13}$	$L^{6,8,16}_{13}$	$L^{6,16}_{5,13}$
		7,8,9,10	$L^{5,6,16}$	$L^{5,6,16}$	$L^{3,4,5,6,16}$	$L^{6,13,18\ 16}$	$L^{5,6,13,16}$
Collister	CE	1,2,3,4	$L^{7,10}$	M^{7}_{10}	$L^{3,4,7,10}$	M^{14}_{8}	$L^{7,10}_{8}$
		5,6	$L^{7,10}_{5}$	$M^{7}_{5,10}$	$L^{3,4,7,10}$	$M^{14,16}_{8}$	$L^{7,10}_{5,8}$
		7,8,9,10	$L^{5,7,10}$	$L^{5,7}_{10}$	$L^{3,4,5,7,10}$	$L^{5,14,16}_{8}$	$L^{5,7,10}_{8}$
Conroy	CF	1,2,3,4	M_{10}	H	M^{3}_{10}	M^{14}_{8}	H
		5,6	$M_{5,10}$	M_{5}	$M^{3}_{5,10}$	$M^{14,16}_{8}$	$M_{5,10}$
		7,8,9,10	L^{5}_{10}	L^{5}_{10}	$L^{3,5}_{10}$	$L^{5,14,16}_{8}$	L^{5}_{10}
Cosulich	CG	1,2,3,4	$L^{7,10}$	M^{7}_{10}	$L^{3,4,7,10}$	M^{14}_{8}	$L^{7,10}_{8}$
		5,6	$L^{7,10}_{5}$	$M^{7}_{5,10}$	$L^{3,4,7,10}_{5}$	$M^{14,16}_{5,8}$	$L^{7,10}_{5,8}$
		7,8,9,10	$L^{5,7,10}$	$L^{5,7}_{10}$	$L^{3,4,5,7,10}$	$L^{5,14,16}_{8}$	$L^{5,7,10}_{8}$
Cottingham Cowell	CH CI	5,6	$M^{16}_{5,13}$	$M^{16}_{5,13}$	$M_{3,5,6}$	$M_{8,13}$	$M^{16}_{5,13}$
		7,8,9,10	$L^{5,13,16}$	$L^{5,13,16}$	$L^{5}_{3,6}$	$L^{5,13}_{8}$	$L^{5,13,16}$

Soil Name	Map Unit	Slope* Classes	Dwellings With Basements	Dwellings Without Basements	Septic Tank Absorption Fields	Sand and Gravel Source	Shallow Excavations
Farmer	FA	1,2,3,4	M^{2}	M^{2}	$M^{2}_{3,12}$	M^{2}	M^{2}_{8}
		5,6	M^{2}_{5}	M^{2}_{5}	$M^{2}_{3,5,12}$	M^{2}	$M^{2}_{5,8}$
Fougberg	FB	1,2,3,4	M^{2}_{6}	M^{2}_{6}	$M^{2}_{3,6,12}$	M^{2}_{6}	$M^{2}_{6,8}$
		5,6	$M^{2}_{5,6}$	$M^{2}_{5,6}$	$M^{2}_{3,5,6,12}$	M^{2}_{6}	$M^{2}_{5,6,8}$
Franks	FC	1,2,3,4	M^{2}_{6}	M^{2}	M^{2}_{6}	$M^{2}_{6,8}$	$M^{2}_{6,8}$
Flichel Frontier	FL FR	1,2,3,4	M^{6}	M^{6}	$L^{3,4,6}$	M^{6}_{8}	M^{6}_{8}
		5,6	M^{6}_{5}	M^{6}_{5}	$L^{3,4,6}_{5}$	$M^{6}_{5,8}$	$M^{6}_{5,8}$
Fotsch	FO	1,2,3,4	M^{2}_{6}	M^{2}	$L^{2,12}_{6}$	$M^{2}_{6,8}$	$M^{2}_{6,8}$
		5,6	$M^{2}_{5,6}$	M^{2}_{5}	$L^{2,12}_{5,6}$	$M^{2}_{5,6,8}$	$M^{2}_{5,6,8}$
Gates Lake Gilmore:cd	GA GI:cd	1,2,3,4	L^{2}_{1}	L^{2}	$L^{2,12}_{1}$	M^{2}_{1}	$M^{2}_{1,8}$
Giguere Gilmore	GG GI	1,2,3,4	L^{2}_{1}	L^{2}	$L^{2,3,4,12}_{1}$	M^{2}_{1}	$M^{2,8}_{1}$
Grundy Guthrie	GR GU	1,2,3,4	M^{6}	M^{6}	$M^{6}_{3,4}$	M^{6}	$M^{6,8}$
		5,6	M^{6}_{5}	M^{6}_{5}	$M^{6}_{3,4,5}$	M^{6}_{5}	$M^{6,8}_{5}$
		7,8,9,10	$L^{5,6}$	$L^{5,6}$	$L^{5,6}_{3,4}$	$L^{5,6}$	$L^{5,6,8}$
Nairn Falls Naylor Newberry	NA NB NW	1,2,3,4	$L^{1,2,4}$	$M^{2}_{1,4}$	$L^{1,2,4,12}$	$L^{1,2,8}$	$L^{1,2,4}$
Nesuch	NE	1,2,3,4	$L^{1,2,4}$	$M^{2}_{1,4}$	$L^{1,2,4,12}$	$L^{1,2}_{8}$	$L^{1,2,4}$
Quamell Questt	QM QU	1,2,3,4	$L^{1,2,4}$	$L^{1,2,4}$	$L^{1,2,4,12}$	$L^{1,2,8}$	$L^{1,2,4}$
Ronayne Rivers	RA RB	1,2,3,4	$L^{1,2,4}$	$L^{1,2,4}$	$L^{1,2,4,12}$	$L^{1,2}$	$L^{1,2,4,8}$

Table 8 cont'd: Suitability of soils within the study area for selected engineering uses

Soil Name	Map Unit	Slope* Classes	Dwellings With Basements	Dwellings Without Basements	Septic Tank Absorption Fields	Sand and Gravel Source	Shallow Excavation
Renville	RE	1,2,3,4	$L^{1,2,4}$	$L^{1,2,4}$	$L^{1,2,4,12}$	$L^{1,2,8}$	$L^{1,2,4}$
Regand Rutherford	RG RU	1,2,3,4	$L^{1,2,4}$	$L^{1,2,4}$	$L^{1,2,4,12}$	$L^{1,2,8}$	$L^{1,2,4}$
Rivett Ranson	RI RN	1,2,3,4	$L^{1,2,4}$	$L^{1,2,4}$	$L^{1,2,4,12}$	$L^{1,2}_{8}$	$L^{1,2,4}_{8}$
Sankey Sinnes	SA SA:an SA:fv SA:cd SA:dv SE	1,2,3,4	$L^{1,2,4}$	$L^{2,4}_{1}$	$L^{1,2,4,12}$	$L^{1,2,8}$	$L^{1,2,4}$
Scobie	SC	1,2,3,4	$L^{1,2,4}$	$M^{2}_{1,4}$	$L^{1,2,4,12}$	$L^{1,2,4}_{8}$	$L^{1,2,4,8}$
Shantz Scobie:md	SH SC:md	1,2,3,4	$L^{1,2,4}$	$M^{2}_{1,4}$	$L^{1,2,3,4,12}$	$L^{1,2,4,8}$	$L^{1,2,4}_{8}$
Sister Sangster	SI SN	1,2,3,4	$L^{1,2,4}$	$M^{2}_{1,4}$	$L^{1,2,3,4,12}$	$L^{1,2,4,8}$	$L^{1,2,4}$
Summerskill Scullard	SM SU	1,2,3,4	$L^{1,2,4}$	$M^{2}_{1,4}$	$L^{1,2,4,12}$	$L^{1,2,4}_{8}$	$L^{1,2,4,8}$
Tenquille	TN	1,2,3,4	$L^{2,4}_{8}$	$M^{2}_{4,8}$	$M^{2}_{3,4,12}$	$L^{2,8}_{1}$	M^{2}_{4}
Valleau Valleau:cd Van Beem Verlinden Vickberg	VA VA:cd VB VE VI	1,2,3,4	$L^{1,2,4}_{8}$	$L^{2,4}_{1,8}$	$L^{1,2,4,12}_{8}$	$L^{2,8}_{1}$	$L^{2,4}$
Viccars Verlinden:md	VC VE:md	1,2,3,4	$L^{1,2,4}$	$L^{2,4}_{1}$	$L^{1,2,4,12}$	$L^{2,8}_{1}$	$L^{2,4}$
Walden Wheeler Wuschke Whitehead	WD WE WG WH	1,2,3,4	$L^{2,4}$	M^{2}_{4}	$L^{2,3,4,8,12}$	M^{2}_{1}	$L^{2,4,8}$
Wildfong	WI	1,2,3,4	$L^{2,4}$	M^{2}_{4}	$M^{2}_{4,12}$	$L^{2,8}$	M^{2}_{4}
Wallace Winters	WL WN	1,2,3,4	$L^{2,4}$	M^{2}_{4}	$M^{2}_{3,4,12}$	$L^{2,8}$	$M^{2}_{4,8}$
Wolverine	WO	1,2,3,4	$L^{2,4}$	M^{2}_{4}	$L^{2,3,12}_{4}$	M^{2}_{8}	$L^{2,8}$
Wittal	WT	1,2,3,4	$L^{2,4}_{8}$	$L^{2,4}_{8}$	$M^{2}_{3,4,12}$	$L^{2,8}$	$M^{2}_{4,8}$

Soil Name	Map Unit	Slope* Classes	Dwellings With Basements	Dwellings Without Basements	Septic Tank Absorption Fields	Sand and Gravel Source	Shallow Excavations
Yantzie Yvonne	YA YV YV:cv	1,2,3,4	H	H	H	M_{8}	M_{8}
		5,6	M_{5}	M_{5}	M_{5}	M_{8}	$M_{5,8}$
		7,8,9,10	L^{5}	L^{5}	$L^{3,5}$	L^{5}_{8}	L^{5}_{8}
Yantzie Yvonne	YA:sv YV:sv YV:cv,sv	1,2,3,4	M^{10}_{7}	$M_{7,10}$	$M^{3}_{7,10}$	$M_{8,18}$	$L^{7,8,10}$
		5,6	$M^{10}_{5,7}$	$M_{5,7,10}$	$M^{3}_{5,7,10}$	$M_{8,18}$	$L^{7,8,10}_{5}$
		7,8,9,10	$L^{5,7,10}$	$L^{5,7,10}$	$L^{3,5,7,10}$	$L^{5}_{8,18}$	$L^{5,7,8,10}$
Zurbrugg Zurcher Zoltay Zaruba	ZA ZE ZO ZR	1,2,3,4	$L^{1,2,4,8}$	$L^{1,2,4,8}$	$L^{1,2,3,4,8}$	$L^{1,2,8}$	$L^{1,2,4,8}$

*Slope Classes

1,2,3,4	0 to 9%
5,6	10 to 30%
7,8,9,10	> 30%

**Suitability Interpretations

H High Potential - no or slight limitations for the specific use interpretation

M Medium Potential - some limitations for the specific use interpretations; these limitations need to be recognized but can be overcome with good management and design
- # ← severe limiting factor #, 1 or none (superscripted)
- # ← moderate limiting factor #('s), 3 or less (subscripted)

L Low Potential - enough limitations to make use questionable; however, with careful planning and management, the limitations may be overcome, but economic feasibility may then become limiting.
- # ← severe limiting factor #(s), 2 or more alone (superscripted)
- # ← moderate limiting factor #(s), 3 or more alone (subscripted)

Limiting Factors

1. apparent water table
2. flood hazard
3. perviousness class
4. soil drainage class
5. slope class
6. stoniness (>25 cm) class
7. rockiness class
8. soil textural class (or unified system)
9. frost heave potential
10. shallow depth to bedrock or impermeable layer
11. unsuitable overburden
12. ground water contamination hazard
13. mass movement hazard
14. deposit depth
15. shrink - swell potential
16. evidence of previous slope and surface instability

The factors considered in compiling the above interpretations include the following:

1. seasonally high water table
2. flood hazard
3. perviousness class
4. soil drainage class
5. slope class
6. stoniness (>10" size) class
7. rockiness class
8. textural class or unified soil group
9. frost heave potential
10. depth to bedrock or impermeable layer
11. unsuitable overburden
12. groundwater contamination hazard
13. mass movement hazard
14. depth of deposit
15. shrink-swell potential
16. evidence of previous slope and surface instability

The guidelines and methodology utilized in determining the suitabilities are appended in Appendix 3.

A. Dwellings

Yantzie, Yvonne, and Yvonne series:calcareous variant on slopes of up to 9% are highly suited for dwellings (with and without basements).

Those soils which have medium potential suitability for dwellings with basements include Callaway, Chumley, Clausen, Cottingham and Cowell on slopes of less than 30%; and Farmer, Fougberg, Franks, Flichel, Frontier, Fotsch, Grundy, Guthrie, Yantzie:sv, Yvonne:shallow variant, Yantzie, Yvonne, and Yvonne:calcareous varient on slopes of between 9 and 30%. These soils are moderately limited by one or more of flooding hazard, steep slopes, excessive stoniness, excessive rockiness, shallowness to bedrock, mass movement hazard, and/or evidence of previous slope or surface instability.

The remaining soils of the study area have low potential suitability for dwellings with basements due to severe limitations imposed by the above factors as well as seasonally high water tables, poor to very poor drainage, and/or unsuitable soil textures.

Soils having medium potential suitability for dwellings without basements include, those previously listed as being suitable for dwellings with basements as well as Collister and Cosulich soils on slopes of less than 30%; and Nairn Falls, Naylor, Nesuch, Newberry, Scobie, Shantz, Sister, Sangster, Summerskill, Scullard, Tenquille, Walden, Wheeler, Wuschke, Whitehead, Wildfong, and Wolverine series. These soils are moderately limited by excessive rockiness, shallow depth to bedrock and steep slopes, or by potential flood hazard, high ground water tables, and poor drainage.

B. Septic tank absorption fields

Yantzie, Yvonne and Yvonne:cv soils on less than 9% slopes have high potential suitability for septic tank absorption fields.

Those series having medium potential suitability are Callaway, Chumley, Clausen, Conroy, Cottingham, Cowell, Farmer, Fougberg, Franks, Grundy, Guthrie, Yantzie, Yantzie:shallow variant, Yvonne, Yvonne:calcareous variant, and Yvonne:shallow variant all on slopes of less than 30%, as well as Tenquille, Wildfong, Wallace, Winter, and Wittal series. The first group are moderately limited primarily by low perviousness, excessive slope, excessive stoniness, shallow depth to bedrock or impermeable layer and/or potential flood hazard and possible groundwater contamination hazard (i.e. Farmer, Fougberg,and Franks series). The second group are moderately limited by potential for flooding, unsuitable perviousness class, poor soil drainage, and/or some potential for groundwater contamination.

C. Sand and/or gravel sources

None of the soils in the study area are highly suited as sand and gravel sources. The soils most suited include Grundy and the Guthrie series, which are moderately limited by excessive stoniness. Giguere, Gilmore, Walden, Whitehead, Wuschke, Wheeler, and Farmer soils also have potential as sources of sand and/or gravel but are moderately limited by seasonally high water tables, and high potential for flooding during certain times of the year. The Callaway and Chumley soils are moderately limited primarily by mass movement hazard. Potential flooding hazard, excessive stoniness, and/or only moderately suitable textures moderately limit Fougberg, Franks, Flichel and Frontier soils as sources of sand and/or gravel. Clausen, Conroy, Collister, Cosulich, Yantzie, and Yvonne series have some potential, but are moderately limited by only moderately suitable textures, excessive stoniness, shallow deposit depths, and steep slopes.

D. Shallow excavations

Conroy series soils on slopes of less than 9% have high potential suitability for the construction of shallow excavations. Clausen, Flichel, Frontier, Grundy and Guthrie soils are only moderately suited for shallow excavations due to moderate limitations of excessive stoniness and gravelly soil textures. Shallowness to apparent water table, potential flooding hazard, gravelly textures, and/or excessive slopes and excessive stoniness are moderately limiting to the construction of shallow excavations in the Farmer, Fougberg, Franks, Fotsch, Gates Lake, Giguere,and Gilmore soils. Tenquille, Wildfong, Wallace, Winters, and Wittal soils are moderately limited by occasional susceptibility to flooding, inadquate soil drainage, and/or sandy subsurface soil textures. The remaining soils of the study area have low potential suitability for shallow excavations.

6.3 Outdoor Recreational Carrying Capacity

A variety of environmental factors set limits beyond which increases in outdoor recreational use should not occur. If increases occur beyond these limits, excessive damage to the physical environment may result. The inherent ability of the landscape to sustain recreational use is its physical carrying capacity for outdoor receation (R.A.B., 1976). Detailed definitions of terms and methods used for determining recreational carrying capacity can be found in the Recreation Capability Inventory manual (R.A.B., 1976).

The recreation carrying capacity interpretations presented in the following sections apply mainly to spring, summer and fall recreational use since all of the data necessary to derive winter recreation carrying capacity interpretations is not available.

Generally, when outdoor recreation carrying capacity interpretations are made, wildlife, vegetation and climatic inputs are incorporated in order to broaden the scope of the interpretations. However, in this survey, detailed information of this nature is not available thus the interpretations in Table 9 are related directly to the inherent ability of the soils to sustain both intensive and extensive recreational use.

Table 9: Physical carrying capacity of soils in the study area to sustain use for most types of outdoor recreation

Soil Name	Map Unit	Slope Class	Recreational Carrying Capacity Class	Limitations*
Callaway Chumley	CA CB	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	5	sc3 sb2 sm2 LP Ts3, Ts4, Ts5**
Clausen	CC	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	2 to 5	sb3 Ts1, Ts2, Ts3, Ts4, Ts5
Cloutier Combow	CD CW	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	5	sc3 sb3 sm2 Ts1, Ts2, Ts3, Ts4, Ts5
Collister	CE	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	3 to 5	sr2 sk3 sm2 Ts1, Ts2, Ts3, Ts4, Ts5
Conroy	CF	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	2 to 5	sk2 sm2 Ts1, Ts2, Ts3, Ts4, Ts5
Cosulich	CG	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	2 to 5	sr2 sk3, sk2 sm2 Ts1, Ts2, Ts3, Ts4, Ts5
Cottingham Cowell	CH CI	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	3 to 5	sb2 La Ts1, Ts2, Ts3, Ts4, Ts5
Farmer Fougberg	FA FB	1, 2 3, 4, 5	2 - 3	sc2 Ts1, Ts2 Hi2
Franks	FC	1, 2, 3, 4, 5	2 to 3	Hi2 Ts1, Ts2
Flichel Frontier	FL FR	1, 2 3, 4, 5	2 or 3	sb3 Ts1, Ts2
Fotsch	FO	1, 2 3, 4, 5	3	Hi3 Ts1, Ts2
Gates Lake Gilmore:cd	GA GI:cd	1, 2 3, 4, 5	2 or 5	Ts1, Ts2 Hi2, Hi3

Soil Name	Map Unit	Slope Class	Recreational Carrying Capacity Class	Limitations*
Giguere Gilmore	GG GI	1, 2 3, 4, 5	3 or 5	sc3 sb2 Ts1, Ts2 Hi3
Grundy Guthrie	GR GU	1, 2 3, 4, 5 6, 7, 8 8, 9, 10	3 or 5	sc2 sb3 Ts1, Ts2, Ts3, Ts4, Ts5
Nairn Falls Naylor Newberry	NA NB NW	1, 2 3, 4, 5	3 to 4	sf2 sw3 so2 Ts1, Ts2
Nesuch	NE	1, 2 3, 4, 5	3 to 4	sw3 so2 Ts1, Ts2
Quamell Questt	QM QU	1, 2 3, 4, 5	3 to 4	sf2 sw3 Ts1, Ts2
Ronayne Rivers	RA RB	1, 2 3, 4, 5	3 to 4	sc2 sb2 sw3 Ts1, Ts2
Renville	RE	1, 2 3, 4, 5	4	sf2 sw3 Ts1, Ts2 Hi3
Regand Rutherford	RG RU	1, 2 3, 4, 5	3 to 4	sf2 sw3 Ts1, Ts2 Hi2
Rivett Ranson	RI RN	1, 2 3, 4, 5	4 to 5	sw3 Ts1, Ts2 Hi3
Sankey Sinnes	SA SE SA:an SA:fv SA:cd SA:cv	1, 2 3, 4, 5	3 to 4	sf2 sw3 Ts1, Ts2 Hi2
Scobie Shantz Sangster	SC SH SN	1, 2 3, 4, 5	3	sw3 Ts1, Ts2 Hi2
Sister Summerskill Scullard	SI SM SU	1, 2 3, 4, 5	3 to 4	sf2 sw3 Ts1, Ts2 Hi2

Limitations and class described on following page.

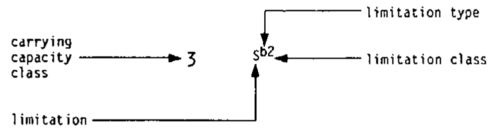
Table 9 cont'd: Physical carrying capacity of soils in the study area to sustain use for most types of outdoor recreation

Soil Name	Map Unit	Slope Class	Recreational Carrying Capacity Class	Limitations*
Tenquille	TN	1, 2	2	S^{f2} S^{w2}
Valleau Van Beem Viccars Vickberg	VA VB VC VI	1, 2	3	S^{f2} S^{w3} H^{i2}
Verlinden	VE	1, 2	3	S^{w3} H^{i2}
Walden Wheeler	WD WE	1, 2 3, 4, 5	3	S^{w2} T^{s1}, T^{s2} H^{i3}
Wuschke Whitehead	WG WH	1, 2 3, 4, 5	3	S^{c3} S^{b3} S^{w2} T^{s1}, T^{s2} H^{i2}
Wildfong Wittal Wolverine	WI WT WO	1, 2 3, 4, 5	2	S^{w2} T^{s1}, T^{s2} H^{i3}
Wallace Winters	W: WN	1, 2 3, 4, 5	2 to 3	S^{f2} S^{w2} T^{s1}, T^{s2} H^{i2}
Yantzie Yvonne	YA YV YV:cv	1, 2 3, 4, 5 6 7, 8 8, 9, 10	1 to 5	T^{s1}, T^{s2}, T^{s3}, T^{s4}, T^{s5}
	YA:sv YV:sv YV:cv,sv	1, 2 3, 4, 5 6 7, 8 8, 9, 10	3 to 5	S^{k2} T^{s1}, T^{s2}, T^{s3}, T^{s4}, T^{s5}
Zurbrugg Zurcher Zoltay Zaruba	ZA ZE ZO ZR	1, 2	4 to 5	S^{w3} S^{o3}

* Limitations listed are all of those which exist for each group of soils as they occur on various slope classes. On a map, only the most severely limiting factors would be indicated. These interpretations are meant to cover the range of limitations that occur for each soil mapped, depending on the map unit description.

** Where 2 or more limitation classes are noted for one group of soils, only 1 limitation class would be used on a map for each unit indicated on that map.

Symbol:



Recreational Carrying Capacity Classes

1 - Very high
2 - High
3 - Moderate
4 - Low
5 - Very low

Limitations

S - soil
L - landform modifying processes
T - topographic
H - hydrologic

Limitation Type

S^f - fine textured soil limitation
S^c - coarse textured soil limitation
S^b - coarse materials (> 7.5 cm size)
S^r - bedrock/rockiness
S^k - shallowness to bedrock
S^w - soil wetness
S^m - soil dryness
S^o - surface organic accumulation

L^a - avalanching
L^p - solifluction, cryoturbation, nivation
T^s - simple slope
H^i - flooding

Topographic limitations	Slope Class	Percentage
T^{s1}	1, 2	0 - 2.5%
T^{s2}	3, 4, 5	2.5 - 16%
T^{s3}	6	16 - 30%
T^{s4}	7, 8	30 - 60%
T^{s5}	8, 9, 10	> 60%

Limitation Classes

1 - slight
2 - moderate
3 - severe

The carrying capacity classes for each map unit are based on the number and severity of physical soil limitations for a wide range of recreational uses, both intensive and extensive. They do not reflect social or economic factors nor do they consider present land ownership, lack of access, or distance from cities.

There are five carrying capacity classes. Class 1 indicates that high amounts of intensive recreational use can be sustained. The remaining four classes with their increasing number and/or severity of limitations reflect a decreasing ability to sustain intensive use. However, lower carrying capacity classes permit extensive use activities in certain landscapes.

Callaway, Chumley, Cloutier and Combow soils which occur on active talus slopes are rated as carrying capacity Class 5, severely limited by very coarse soil textures, active rock fall, and/or steep slopes. Clausen, Collister, Conroy, Cosulich, Cottingham, Cowell, Yantzie and Yvonne soil series range in carrying capacity from Class 2 to 5. They are restricted primarily by moderate to severe limitations of very coarse soil textures, excessive amounts of coarse fragments and stones, rapid drainage, and/or shallowness to bedrock. Increasing steepness of slopes results in a general reduction of the carrying capacity class. Soils occurring on a wide range of slopes also have a wide range of carrying capacities which are determined primarily by the slope class.

Renville, Rivett, Ranson, Zurbrugg, Zurcher, Zoltay and Zaruba soils generally are rated as Class 4 or 5 carrying capacity. The major limitations are poor to very poor soil drainage, fine soil textures or high organic matter contents and/or susceptibility to flooding.

Because of the high risk of periodic flooding, Gates Lake, Gilmore:coarse at depth, Giguere and Gilmore series are generally Class 5 improving to Class 3 in areas where the risk of flooding is minimal. Grundy and Guthrie soils are Class 3, becoming Class 5 where slopes are excessive.

The soil series in Class 3 to 4 include Fotsch, Nairn Falls, Naylor, Nesuch, Newberry, Quamell, Questt, Ronayne, Rivers, Regand, Rutherford, Sankey, Sinnes, Scobie, Shantz, Sangster, Sister, Summerskill, Scullard, Valleau, Van Beem, Viccars, Vickberg, and Verlinden. They are moderately limited, primarily by poor to very poor soil drainage and/or potential susceptibility to flood.

Walden, Wheeler, Wuschke, and Whitehead soils are rated Class 3 due to their gravelly textures and potential for flooding.

The few Class 2 soils include Farmer, Fougberg, Franks, Flichel, Frontier, Wildfong, Wittal, Wolverine, Tenquille, Wallace and Winters. The first five are limited primarily by gravelly or stony surface textures. The following three are limited mainly by susceptibility to occasional flooding and imperfect soil drainage. The remaining three are limited by fine surface textures, imperfect soil drainage, and/or susceptibility to occasional flooding.

On level slopes (<2%), Yantzie and Yvonne soils have Class 1 carrying capacity.

6.4 Wildlife and Fisheries

Although the report is mainly oriented toward description and use interpretations of the soils found within the study area, there are other resources which should be taken into consideration when any short or long range planning is envisaged. Wildlife and fisheries are two of these.

There is limited documented information available on wildlife and fisheries in the study area. However, by personal observation and through discussions with local residents, some general statements can be made.

Moose inhabit the upper reaches of the Lillooet River valley in the general area between North and South creeks and Meager Creek. Deer extensively utilize the steep southern aspect slopes in this same area as winter range. Deer also utilize the Birkenhead River, Gates River and Blackwater Creek valleys as winter range. Small bands of mountain goat occur in the mountainous areas adjacent to the study area.

Cutthroat and rainbow trout inhabit both the mainstem Lillooet River and the lower reaches of many small tributaries, where critical spawning and rearing areas are located. Of particular importance is Sampson Creek, which supports both trout and salmon (coho and sockeye).

The Birkenhead River is a prime salmon spawning river which contributes substantially to the diet of the native Indians on the Mt. Currie reserve as well as contributing significantly to the Fraser River salmon fishery. The Gates River system also supports spawning salmon, enhancement of which has been attempted by artificial spawning channels at D'Arcy.

Both the provincial Fish and Wildlife Branch and the federal Fisheries and Marine Services have stressed the potential productivity of the Lillooet and Birkenhead river areas under proper management (M. Flynn and T. Richardson, 1977).

6.5 Forest Site Class – Soil Relationships

Forest cover maps, which have been compiled by the B.C. Forest Service, give an indication of the good, medium, poor or low forest site classes. These classes are defined for individual tree species on the basis of site index or height growth at a reference age. Detailed definitions of the site classes can be found in the Forestry Handbook for B.C.(U.B.C., 1971).

The lands of the Lillooet River valley from Lillooet Lake to Meager Creek are generally described as being medium site class for black cottonwood and western red cedar. Other species (including common paper birch, red alder, Sitka spruce, coast Douglas-fir, lodgepole pine and some western white pine) occur on the well drained soils of the North Creek fan which also has a southerly aspect. Coast Douglas-fir, western hemlock, and western red cedar are found largely on medium sites on northerly aspects, on the South Creek fan and on the flood plain of the Lillooet upstream from North and South Creeks. In this area, medium sites for western white pine also occur.

Coast Douglas-fir and lodgepole pine with limited amounts of western red cedar, western hemlock, common paper birch and red alder occur on poor sites in the uplands of the study area near Pemberton and Mt. Currie settlements. Western red cedar, western hemlock, and coast Douglas-fir in these areas are found on northeast aspects on well drained Yvonne series soils.

The Birkenhead River, Poole Creek and Birkenhead River canyon areas are poor forest site class lands. These areas support primarily Rocky Mountain Douglas-fir and lodgepole pine, with limited western red cedar, common paper birch, western hemlock and black cottonwood.

The Birkenhead Lake area, at the south end and on the west side of the lake has a significant proportion of medium and minor proportion of high forest site lands. The land at the south end of Birkenhead Lake supports lodgepole pine with some Rocky Mountain Douglas-fir. Land on the west side of the lake supports Rocky Mountain Douglas-fir with some western hemlock, western red cedar, common paper birch, black cottonwood and minor lodgepole and western white pine stands.

The Blackwater Creek valley is made up of land with poor forest site classes, and minor areas of medium forest site classes. The forest species found in this valley are Rocky Mountain Douglas-fir, western hemlock, and western red cedar, with some associated western white pine, common paper birch, black cottonwood, and Sitka spruce.

Rocky Mountain Douglas-fir and ponderosa pine are the major tree species found within the Gates River valley between Devine and Anderson Lake. These species are found generally on poor forest site class land. Other tree species in this area include western red cedar, lodgepole pine, common paper birch and alpine fir.

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GLOSSARY OF TERMS

GLOSSARY OF TERMS

amorphous mineral	(i) A mineral that has no definite crystalline structure. (ii) A mineral that has a definite crystalline structure, but appears amorphous because of the small crystallite size.
apron(s)	A relatively gentle slope at the foot of a steeper slope, and formed by geological materials derived from the steeper upper slope.
braided channel	A stream channel pattern that repeatedly divides into branches that rejoin each other.
colour	Defined for soils by the Munsell colour system which specifies the relative degrees of the three simple variables of colour: hue, value and chroma. For example, 10YR 6/4 is the colour of a soil having a hue of 10YR, value of 6, and chroma of 4. These notations can be translated into several different systems of colour names.
consistence	(i) The resistance of a material to deformation or rupture. (ii) The degree of cohesion or adhesion of the soil mass. In engineering practice "consistency" has essentially the same meaning as "consistence".
control section, soil	The vertical section on which the taxonomic classification of a soil is based. The control section usually extends to a depth of 100 cm in mineral materials and to 160 cm in organic materials.
exchangeable cations	Those cations which are absorbed to the exchanges sites of soil colloids which commonly include calcium, magnesium, potassium, sodium, ammonium, aluminum, iron, and hydrogen which are held by varying degrees of tenacity. The proportions of these cations present is determined in part by the nature and amount of the organic and mineral soil colloids.
fan	A fan-shaped form of unconsolidated geological material that can be likened to the segment of a cone, and possessing a perceptible gradient from apex to toe.
humid	A soil moisture regime class which is defined for a soil which is not dry in any part as long as 90 consecutive days in most years.
hydrolysis	The process by which a substrate is split to form two end products by the intervention of a molecule of water.
mapping unit	A soil mapping unit is identified on a map by a symbol. A soil mapping unit that bears the name of a taxonomic unit consists of this defined taxonomic unit and sometimes inclusions.
modal	The site described is representative of the central concept of the soil series in question.
oxidation	The addition of oxygen to or the removal of hydrogen from an element.
perhumid	A soil moisture regime class in which a soil remains moist all year and is seldom dry.
reaction, soil	The degree of acidity or alkalinity of a soil, usually expressed as a pH value.
semiarid	A soil moisture regime class in which the soil is dry in some parts when soil temperature is $> 5°C$ in most years. Moderately severe water deficits occur in the growing season.

slope classes — The slope classes are defined as follows:

slope class	percent slope	approximate degrees	terminology
1	0. - 0.5	0	level
2	0.5- 2.5	0.3 - 1.5	nearly level
3	2 - 5	1 - 3	very gentle slopes
4	6 - 9	3.5 - 5	gentle slopes
5	10 - 15	6 - 8.5	moderate slopes
6	16 - 30	9 - 17	strong slopes
7	31 - 45	17 - 24	very strong slopes
8	46 - 70	25 - 35	extreme slopes
9	71 -100	35 - 45	steep slopes
10	>100	> 45	very steep slopes

solution, soil — The aqueous liquid phase of the soil and its solutes consisting of ions dissociated from the surfaces of the soil particles and of other soluble materials.

structure, soil — The combination or arrangement of primary soil particles into secondary particles, units, or peds. These peds may be, but usually are not, arranged in the profile in such a manner as to give a distinctive characteristic pattern. The peds are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades.

talus — Angular blocky bedrock derived material fallen from cliffs and collected at the base.

taxonomic unit — A group of soils that have specified limits of variation. Each unit consists of (1) a single modal profile representing the most usual condition of each property of all soils in the class, and (2) many other closely related profiles that vary from this central concept within precisely defined limits.

texture, soil — The relative proportions of the various soil separates in a soil as described by the classes of soil texture shown in Figure 83. The names of the textural soil classes may be modified by adding suitable adjectives when coarse fragments are present in substantial amounts. The sand, sandy loam, and loamy sand are further subdivided on the bases of the proportion of the various sand separates present.

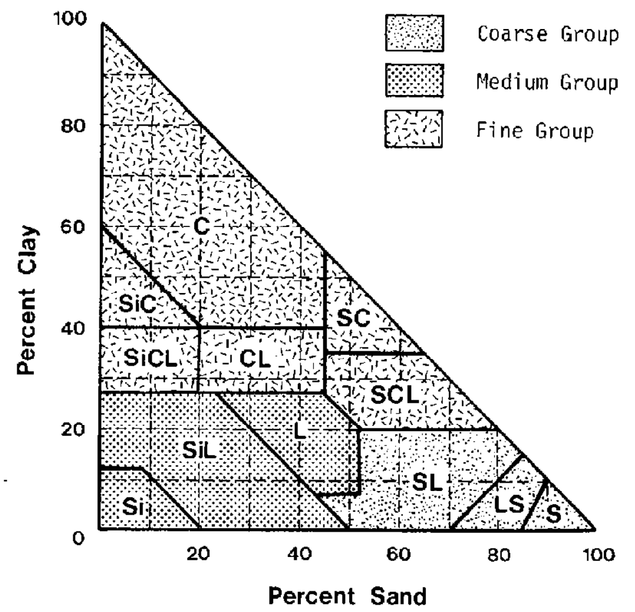

Figure 83: Soil textural triangle

APPENDICES

Appendix 1: Factors for Metric Conversion

Source: British Columbia Ministry of Agriculture, 1977, Fertilizer guide for the Lower Mainland

Imperial Units	Approximate conversion factor	Results in:	
LINEAR			
inch	x 25	millimetre	(mm)
foot	x 30	centimetre	(cm)
yard	x 0.9	metre	(m)
mile	x 1.6	kilometre	(km)
AREA			
square inch	x 6.5	square centimetre	(cm^2)
square foot	x 0.09	square metre	(m^2)
acre	x 0.40	hectare	(ha)
VOLUME			
cubic inch	x 16	cubic centimetre	(cm^3)
cubic foot	x 28	cubic decimetre	(dm^3)
cubic yard	x 0.8	cubic metre	(m^3)
bushel	x 0.36	hectolitre	(hl)
WEIGHT			
pound	x 0.45	kilogram	(kg)
short ton (2000 lb)	x 0.9	tonne	(t)
TEMPERATURE			
degree fahrenheit	F -32 x 0.56 (or F -32 x 5/9)	degree Celsius	(C)
AGRICULTURE			
bushels per acre	x 0.90	hectolitres per hectare	(hl/ha)
tons per acre	x 2.24	tonnes per hectare	(t/ha)
pounds per acre	x 1.12	kilograms per hectare	(kg/ha)

Examples: 2 miles x 1.6=3.2 km; 15 bu/ac x 0.90=13.5 hl/ha

Appendix 2: Detailed morphological, chemical and physical descriptions of selected soil series within the study area, with instructions for retrieval of information on others including the location of soil sampling sites

The selected soil series for which detailed morphological, chemical, and physical data is included are:

Gates Lake Series	Sangster Series
Newberry Series	Scullard Series
Rutherford Series	Valleau Series
Sankey Series	Wildfong Series
Scobie Series	Wolverine Series
Sister Series	Zurcher Series

This type of detailed information for most of the remaining soil series described in this report is available from the B.C. Soil Data File by contacting:

Director
Resource Analysis Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C. V8V 1X4

Include in your request a geographical description of the area of interest, i.e. latitude and longitude or National Topographic mapsheet (NTS) number such as 92J/7. Additional useful information to be included in the request would be the name of the soil series for which information is required.

Figure 84 indicates the location of the detailed soil profile sampling sites.

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SOIL: GATES LAKE | RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

PROJECT: 92J - NTS: 92J 7 SUMMARY DATE: JULY 03,1979 PAGE: 01

****

GATES LAKE SERIES

DATE OF SURVEY: 29 09 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 18 00
LONGITUDE(W): 122 46 00
PRECISION (SEC): 30
ELEVATION (M): 198
AIR PHOTOGRAPH: BC7467-114

CLASSIFICATION

ORTHIC REGOSOL(1978)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: MIDDLE
LENGTH (M): 30
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: SANDY
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SANDY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 103 CM.

SEEPAGE: ABSENT
FLOOD HAZARD: RARE
MOISTURE CLASS: SUB-HUMID

DRAINAGE: MODERATELY WELL DRAINED
RUNOFF: SLOW
STONINESS: NON-STONY
PERVIOUSNESS: RAPID

ADDITIONAL NOTES

1 BAR MOISTURE FOR CGJ2=2.7,2C=4.0,2C2=1.2.
AH AND CGJ1 ARE GROUPED FOR CHEMICAL ANALYSIS.

****

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	TEXTURE	STRUCTURE 1	STRUCTURE 2
A H	0- 3	2- 4	CLEAR SMOOTH	10.0YR3.0/2.0 MATRIX MOIST	LOAM	MASSIVE	WEAK MEDIUM GRANULAR
C GJ1	3- 6	2- 6	CLEAR SMOOTH	2.5Y4.0/2.0 MATRIX MOIST	FINE SANDY LOAM	MASSIVE	WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO
C	6- 19	7- 24	ABRUPT BROKEN	2.5Y5.0/2.0 MATRIX MOIST	SANDY LOAM	MASSIVE LAMINATED(< 1 CM)	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
C GJ2	19- 24	0- 9	ABRUPT BROKEN	2.5Y4.0/2.0 MATRIX MOIST	FINE SANDY LOAM	MASSIVE	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
II C 1	24- 35	4- 14	DIFFUSE SMOOTH	2.5Y5.0/2.0 MATRIX MOIST 5.0Y4.0/1.0 MATRIX DRY	LOAMY SAND	MASSIVE	STRUCTURELESS SINGLE GRAIN
II C 2	35- 56	21- 21	NONE SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	LOAMY SAND	MASSIVE	STRUCTURELESS SINGLE GRAIN
II C 3	56- 86	11- 36	GRADUAL SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	LOAMY SAND	MASSIVE	STRUCTURELESS SINGLE GRAIN
II C GJ1	86- 93	0- 8	CLEAR SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	LOAMY SAND	MASSIVE	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
II C GJ2	93-103	8- 32		10.0YR5.0/2.0 MATRIX MOIST	SAND	MASSIVE	STRUCTURELESS SINGLE GRAIN

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	CONSISTENCE	ROOTS 1	MOTTLES 1	MOISTURE AT SAMPLING
A H	0- 3	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY PLASTIC	ABUNDANT FINE VERTICAL EX PED		MOIST
C GJ1	3- 6	SLIGHTLY STICKY VERY FRIABLE NONPLASTIC	PLENTIFUL FINE VERTICAL IN PED	PROMINENT 10.0YR4.0/6.0	MOIST
C	6- 19	NON STICKY VERY FRIABLE NONPLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED		MOIST
C GJ2	19- 24	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED	PROMINENT 10.0YR4.0/6.0	MOIST

SOIL: GATES LAKE

PROJECT: 92J - NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979 PAGE: 02

II C 1	24- 35	NON STICKY LOOSE NONPLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED		MOIST
II C 2	35- 56	NON STICKY LOOSE NONPLASTIC	VERY FEW VERY FINE OBLIQUE IN PED		MOIST
II C 3	56- 86	NON STICKY LOOSE NONPLASTIC	FEW MEDIUM HORIZONTAL IN PED		MOIST
II C GJ1	86- 93	NON STICKY VERY FRIABLE NONPLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED	COMMON MEDIUM PROMINENT 5.0YR4.0/6.0	MOIST
II C GJ2	93-103	NON STICKY LOOSE NONPLASTIC	FEW MEDIUM HORIZONTAL IN PED	FEW FINE PROMINENT 10.0YR5.0/6.0	MOIST

PHYSICAL & CHEMICAL DATA

HORIZON	DEPTH(CM.)	SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	PH 1 METHOD	PH 1 VALUE	PH 2 SAMPLE STATE	PH 2 METHOD	PH 2 VALUE	ORGANIC CARBON %	NITROGEN %
A H	0- 3	761456	2	2	5.3	2	4	4.8	2.92	.20
C GJ1	3- 6									
C	6- 19	761457	2	1	5.3	2	4	4.7	.18	.01
C GJ2	19- 24	761458	2	1	5.4	2	4	4.7	.21	.01
II C 1	24- 35	761459	2	1	5.4	2	4	4.7	.05	.00
II C 2	35- 56	761460	2	1	5.2	2	4	4.5	.04	.01
II C 3	56- 86	761461	2	1	5.2	2	4	4.5	.02	.01
II C GJ1	86- 93	761462	2	1	5.3	2	4	4.6		
II C GJ2	93-103	761463	2	1	5.5	2	4	4.8		

HORIZON	DEPTH(CM.)	EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	B PPM.	BULK DENSITY
A H	0- 3	5.33	1.11	.06	.26	11.0	2.5	4.0	.3	
C GJ1	3- 6									
C	6- 19	.87	.24	.06	.07	1.7	3.0	.6	.3	
C GJ2	19- 24	1.36	.28	.07	.13	2.9	3.0	1.5	.3	
II C 1	24- 35	.66	.11	.06	.07	1.3	2.0	.7	.3	
II C 2	35- 56	.28	.05	.03	.09	1.4	2.0	1.0	.3	
II C 3	56- 86	.48	.09	.07	.11	1.5	2.0	.1	.2	
II C GJ1	86- 93	.53	.09	.05	.08	1.6	2.5	.2		
II C GJ2	93-103	.72	.17	.03	.07	1.3	2.0	.2		1.64

HORIZON	DEPTH(CM.)	MOISTURE STATUS 1/3 BAR.	15 BAR.	PART. SIZE ANALY.(% PASSING) 8 MM	#4	#10	#25	#45	#60	#170	PARTICLE SIZE(%) TOTAL SAND	50-2 U SILT
A H	0- 3											
C GJ1	3- 6											
C	6- 19											
C GJ2	19- 24	5.3	1.4									
II C 1	24- 35	8.5	1.7									
II C 2	35- 56	2.2	1.0									
II C 3	56- 86											
II C GJ1	86- 93											
II C GJ2	93-103			99.90	99.20	97.00	90.70	59.20	5.40	3.20	90	8

HORIZON	DEPTH(CM.)	PARTICLE SIZE(%) 2U CLAY TOTAL
A H	0- 3	
C GJ1	3- 6	
C	6- 19	
C GJ2	19- 24	
II C 1	24- 35	
II C 2	35- 56	
II C 3	56- 86	
II C GJ1	86- 93	
II C GJ2	93-103	2

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

METHODS

FIELD SAMPLING	SITE SELECTION
SIZE FRACTION BASE	2 MM.
% ORGANIC CARBON	
ACID DICHROMATE DIGESTION, FESO4 TITRATION	
% CACO3 EQUIVALENT	
-HCL TREATMENT	WEIGHT GAIN
BULK DENSITY	
-SAMPLE STATE	OVEN DRY
-METHOD	VOLUMETER METHOD
ATTERBERG LIMITS	
PLASTIC LIMIT	
-SAMPLE STATE	OVEN DRY
-METHOD	EVAPORATION
LIQUID LIMIT	
-SAMPLE STATE	OVEN DRY
-METHOD	EVAPORATION
CATIONS(BUFFERED)	
-METHODS	NH4AC, PH 7.0...DISPL. DIST.
-ANALYTICAL PROC.	ATOMIC ABSORPTION

SAMPLE PREPARATION	AIR DRY WITH GRINDING
FIELD PH	PH-METER
% NITROGEN	KJELDAHL (SEMI-MICRO)
ELECTRICAL CONDUCT.	
-PASTE	SATURATED, MIXED
-INSTRUMENT	CONDUCTIVITY CELL - CAP
AVAILABLE P1	SOLUBLE IN DILUTE ACID FLUORIDE
AVAILABLE P2	BRAY 2
EXTRACTABLE CU	PERCHLORIC ACID
EXTRACTABLE ZN	PERCHLORIC ACID
B	HOT WATER SOLUBLE
MN	0.1 MOLAR CALCIUM CHLORIDE
SAND, SILT, AND CLAY	
-ORDER OF MATERIAL REMOVED	CARBONATES
	ORGANIC MATTER
	SALTS
-DISPERSION	SODIUM HEXAMETAPHOSPHATE
-METHOD	
SPECIFIC GRAVITY	PYCNOMETER METHOD
MOISTURE STATUS	
-SAMPLE PREP.	GROUND AND SIEVED
-SAMPLE STATE	OVEN DRY
-METHOD	PRESSURE PLATE
SHRINKAGE LIMIT	
-SAMPLE STATE	OVEN DRY
-METHOD	EVAPORATION
CEC-BUFFERED	NH4AC, PH 8.2

NEWBERRY SERIES

DATE OF SURVEY: 18 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 21 00
LONGITUDE(W): 122 51 00
PRECISION (SEC): 30
ELEVATION (M): 213
AIR PHOTOGRAPH: BC7549-102

CLASSIFICATION

REGO GLEYSOL(1978)
STATUS: MODAL SOIL
PHASE: PEATY

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: LOWER SLOPE
LENGTH (M): 403
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SANDY
SPEC. CLASTIC 2: SILTY
COMM. CLASTIC 1: FINES
ORGANIC: MESIC
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 47 CM.

SEEPAGE: PRESENT
FLOOD HAZARD: RARE
GROUNDWATER -DEPTH: .8 M
-KIND: APPARENT
MOISTURE CLASS: AQUIC

DRAINAGE: VERY POORLY DRAINED
RUNOFF: VERY SLOW
STONINESS: NON-STONY
PERVIOUSNESS: SLOW

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	TEXTURE	STRUCTURE 1	STRUCTURE 2
O M	20- 0	10- 30	ABRUPT IRREGULAR	10.0YR2.0/2.0 MATRIX MOIST	PEATY		
C G1	0- 12	8- 16	CLEAR SMOOTH	5.0Y5.0/3.0 MATRIX MOIST 10.0YR2.0/1.0 MATRIX DRY	SANDY LOAM	MASSIVE	WEAK MEDIUM ANGULAR BLOCKY PSEUDO
C G2	12- 37	23- 30	ABRUPT SMOOTH	5.0Y5.0/2.0 MATRIX MOIST	SANDY LOAM	MASSIVE	WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO
II C G1	37- 47	8- 14	ABRUPT SMOOTH	2.5Y4.0/2.0 NATURAL WET/REDUCED	SILT LOAM	MASSIVE	WEAK COARSE PLATY PSEUDO
II C G2	47- 57			5.0Y5.0/2.0 NATURAL WET/REDUCED	SILT LOAM	MASSIVE	

HORIZON	THICKNESS DEPTH(CM)	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
O M	20- 0		ABUNDANT MEDIUM OBLIQUE	ABUNDANT MEDIUM RANDOM IN PED CONTINUOUS DENDRITIC TUBULAR		MOIST
C G1	0- 12	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR		MOIST
C G2	12- 37	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM VERTICAL IN PED	PLENTIFUL FINE VERTICAL IN PED CONTINUOUS DENDRITIC TUBULAR	FEW COARSE DISTINCT 2.5Y4.0/4.0	MOIST
II C G1	37- 47	SLIGHTLY STICKY PLASTIC	PLENTIFUL FINE HORIZONTAL IN PED	PLENTIFUL FINE HORIZONTAL IN PED CONTINUOUS DENDRITIC TUBULAR		WET
II C G2	47- 57					WET

SOIL: NEWBERRY

PROJECT: 92J - NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979 PAGE: 02

PHYSICAL & CHEMICAL DATA

		SAMPLE #	PH 1			PH 2				
HORIZON-DEPTH(CM.)		LAB SAMPLE #	SAMPLE STATE	METHOD	VALUE	SAMPLE STATE	METHOD	VALUE	ORGANIC CARBON %	NITROGEN %
O M	20- 0	761637	2	2	4.7	2	4	4.2	16.76	1.00
C G1	0- 12	761638	2	1	5.2	2	4	4.5	1.85	.11
C G2	12- 37	761639	2	1	5.3	2	4	4.7	.74	.05
II C G1	37- 47	761640	2	1	5.3	2	4	4.6	1.54	.09
II C G2	47- 57	761641	2	1	5.3	2	4	4.6	1.73	.10

PHYSICAL & CHEMICAL DATA

		EXCHANGEABLE CATIONS BUFF.(ME/100G)				C. E. C.				ATTERBURG LIMITS	
HORIZON-DEPTH(CM.)		CA	MG	NA	K	DETERMINED	P1 PPM.	S PPM.	BULK DENSITY	PLASTIC LIMIT	LIQUID LIMIT
O M	20- 0	13.98	1.05	.13	.40	51.2	3.9		.58		
C G1	0- 12	3.50	.16	.18	.19	8.9	6.4	3.8			
C G2	12- 37	2.60	.13	.13	.11	5.6	6.3	1.6			
II C G1	37- 47	3.97	.20	.18	.19	10.5	12.6	2.6			
II C G2	47- 57	4.59	.25	.21	.23	11.7	14.6	3.3		31.3	34.0

		PART. SIZE ANALY.(% PASSING)					PARTICLE SIZE(%)		
HORIZON-DEPTH(CM.)		#25	#45	#60	#170	#200	TOTAL SAND	50-2 U SILT	2U CLAY TOTAL
O M	20- 0								
C G1	0- 12								
C G2	12- 37								
II C G1	37- 47								
II C G2	47- 57	99.90	99.70	99.50	99.20	99.00	1	78	21

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SOIL: RUTHERFORD
PROJECT: 92J - NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979 PAGE: 01

RUTHERFORD SERIES

DATE OF SURVEY: 14 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 20 00
LONGITUDE(W): 122 50 00
PRECISION (SEC): 30
ELEVATION (M): 213
AIR PHOTOGRAPH: BC7549- 25

CLASSIFICATION

GLEYED REGOSOL(1978)

STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: LOWER SLOPE
LENGTH (M): 403
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: FINE LOAMY AND FINE SILTY
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SILTY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 66 CM.

SEEPAGE: PRESENT
FLOOD HAZARD: RARE
GROUNDWATER -DEPTH: .9 M
-KIND: APPARENT
MOISTURE CLASS: SUB-AQUIC

DRAINAGE: VERY POORLY DRAINED
RUNOFF: VERY SLOW
STONINESS: NON-STONY
PERVIOUSNESS: SLOW

ADDITIONAL NOTES

1 BAR MOISTURE FOR CG1=49.0,CG2,CG3=35.4.

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	TEXTURE	STRUCTURE 1	STRUCTURE 2
C G1	0- 25	23- 28	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	SILT LOAM	MASSIVE	WEAK MEDIUM PLATY PSEUDO
C G2	25- 45	18- 23	CLEAR SMOOTH	5.0Y6.0/2.0 MATRIX MOIST	SILT LOAM	MASSIVE	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
C G3	45- 66	20- 23	ABRUPT SMOOTH	5.0Y5.0/2.0 MATRIX MOIST	SILTY CLAY	MASSIVE	WEAK COARSE PLATY PSEUDO
C G4	66- 75	8- 10	ABRUPT SMOOTH	2.5Y5.0/2.0 NATURAL WET/REDUCED	SILTY CLAY LOAM	MASSIVE	WEAK COARSE PLATY PSEUDO
OF B	75- 78	2- 5	ABRUPT SMOOTH	10.0YR4.0/2.0 NATURAL WET/REDUCED			
II C G	78- 93	13- 16	ABRUPT SMOOTH	5.0Y4.0/1.0 NATURAL WET/REDUCED	SANDY LOAM	MASSIVE	WEAK COARSE ANGULAR BLOCKY PSEUDO

HORIZON	THICKNESS DEPTH(CM)	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
C G1	0- 25	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON FINE PROMINENT 7.5YR4.0/4.0	MOIST
C G2	25- 45	STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM PROMINENT 10.0YR4.0/6.0	MOIST
C G3	45- 66	STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW COARSE PROMINENT 10.0YR4.0/6.0	MOIST

C G4	66- 75	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	WET
OF B	75- 78		PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	WET
II C G	78- 93		PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	WET

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	METHOD	VALUE	PH 2 SAMPLE STATE	METHOD	VALUE	ORGANIC CARBON %	NITROGEN %
C G1	0- 25	761590	2	2	5.1	2	4	4.4	4.57	.32
C G2	25- 45	761591	2	1	5.3	2	4	4.4	.97	.07
C G3	45- 66	761592	2	1	5.4	2	4	4.6	.65	.06
C G4	66- 75	761593	2	2	5.1	2	4	4.9	6.17	.32
OF B	75- 78	761594	2	2	5.0	2	4	4.3	18.12	.81
II C G	78- 93	761595	2	1	5.0	2	4	4.2		

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	B PPM.	MOISTURE STATUS 1/3 BAR.	15 BAR.
C G1	0- 25	4.18	1.06	.18	.56	20.4	14.1	3.7	.8	66.0	28.3
C G2	25- 45	3.89	1.03	.22	.32	14.4	13.9	3.4	.3	44.0	11.5
C G3	45- 66	3.81	1.19	.18	.33	11.1	19.2	2.9	.3	44.0	11.5
C G4	66- 75						13.3	10.6			
OF B	75- 78						6.1	9.4			
II C G	78- 93						12.4	2.0			

HORIZON-DEPTH(CM.)		ATTERBURG LIMITS PLASTIC LIMIT	LIQUID LIMIT	PART. SIZE ANALY.(% PASSING) #25	#45	#60	#170	#200	PARTICLE SIZE(%) TOTAL SAND	50-2 U SILT	2U CLAY TOTAL
C G1	0- 25									78	22
C G2	25- 45									80	20
C G3	45- 66								1	45	54
C G4	66- 75										
OF B	75- 78										
II C G	78- 93	35.9	39.9	99.50	98.70	98.10	97.20	93.90	55	37	8

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SOIL: SANKEY

PROJECT: 92J - NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979 PAGE: 01

SANKEY SERIES

DATE OF SURVEY: 7 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 21 00
LONGITUDE(W): 122 50 00
PRECISION (SEC): 30
ELEVATION (M): 213
AIR PHOTOGRAPH: BC7549- 25

CLASSIFICATION

REGO GLEYSOL(1978)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: UPPER SLOPE
LENGTH (M): 403
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: FINE LOAMY AND FINE SILTY
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SILTY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 85 CM.

SEEPAGE: PRESENT
FLOOD HAZARD: RARE
GROUNDWATER -DEPTH: 1.2 M
-KIND: APPARENT
MOISTURE CLASS: HUMID

DRAINAGE: POORLY DRAINED
RUNOFF: VERY SLOW
STONINESS: NON-STONY
PERVIOUSNESS: SLOW

ADDITIONAL NOTES

1 BAR MOISTURE STATUS FOR AP,CG1,CG2=30.0

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	COLOUR 2	TEXTURE	STRUCTURE 1
A P	0- 9	6- 11	CLEAR SMOOTH	10.0YR4.0/3.0 MATRIX MOIST		SILTY CLAY LOAM	MASSIVE
C G1	9- 37	26- 30	ABRUPT WAVY	2.5Y5.0/2.0 MATRIX MOIST		SILTY CLAY LOAM	MASSIVE
C G2	37- 50	10- 15	CLEAR SMOOTH	5.0Y5.0/1.0 MATRIX MOIST		SILTY CLAY LOAM	MASSIVE
C G3	50- 83	31- 36	ABRUPT SMOOTH	5.0Y5.0/1.0 MATRIX MOIST		SILTY CLAY LOAM	MASSIVE
C G4	83- 94	9- 18	ABRUPT SMOOTH	5.0Y5.0/1.0 MATRIX MOIST		SILTY CLAY LOAM	MASSIVE
II C G	94-102	5- 13	ABRUPT SMOOTH	5.0Y4.0/1.0 MATRIX MOIST		SANDY LOAM	MASSIVE
III C G	102-117			5.0Y5.0/2.0 NATURAL WET/REDUCED	5.0Y5.0/3.0 NATURAL WET/REDUCED	SILTY CLAY LOAM PEATY	MASSIVE

HORIZON	THICKNESS DEPTH(CM)	STRUCTURE 2	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
A P	0- 9	WEAK TO MODERATE COARSE GRANULAR	STICKY VERY FRIABLE PLASTIC	ABUNDANT FINE OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR		MOIST
C G1	9- 37	WEAK MEDIUM TO COARSE SUBANGULAR BLOCKY PSEUDO	STICKY FRIABLE PLASTIC	PLENTIFUL FINE VERTICAL IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM DISTINCT 2.5Y4.0/4.0	MOIST
C G2	37- 50	WEAK FINE TO MEDIUM SUBANGULAR BLOCKY PSEUDO	STICKY FRIABLE PLASTIC	FEW FINE OBLIQUE IN PED	FEW FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM PROMINENT 10.0YR4.0/6.0	MOIST
C G3	50- 83	WEAK COARSE SUBANGULAR BLOCKY PSEUDO	STICKY FRIABLE PLASTIC	VERY FEW FINE OBLIQUE IN PED	FEW FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW FINE PROMINENT 5.0Y5.0/6.0	MOIST

C G4	83- 94	WEAK COARSE PLATY LAMINATED(< 1 CM)	STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED CONTINUOUS DENDRITIC INTERSTITIAL	FEW FINE PROMINENT 2.5Y4.0/4.0	MOIST
II C G	94-102	WEAK FINE TO MEDIUM SUBANGULAR BLOCKY PSEUDO	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR		MOIST
III C G	102-117	WEAK COARSE PLATY LAMINATED(< 1 CM)	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED CONTINUOUS DENDRITIC INTERSTITIAL		WET

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	METHOD	VALUE	PH 2 SAMPLE STATE	METHOD	VALUE	ORGANIC CARBON %	NITROGEN %
A P	0- 9	761540	2	1	4.9	2	4	4.6	3.53	.28
C G1	9- 37	761541	2	1	5.7	2	4	4.9	.72	.04
C G2	37- 50	761542	2	1	5.2	2	4	4.6	.48	.04
C G3	50- 83	761543	2	1	5.0	2	4	4.3	.78	.05
C G4	83- 94	761544	2	2	5.0	2	4	4.3	3.10	.14
II C G	94-102	761545	2	1	4.9	2	4	4.3	.67	.03
III C G	102-117	761546	2	2	4.8	2	4	4.4	7.01	.34

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	BULK DENSITY	MOISTURE STATUS 1/3 BAR.	15 BAR.
A P	0- 9	5.59	1.96	.14	.88	54.0	16.0	21.3	1.18	42.3	10.0
C G1	9- 37	3.25	1.60	.20	.38	7.6	6.3	8.5		42.3	10.0
C G2	37- 50	2.78	1.85	.20	.28	7.1	7.1	35.3		42.3	10.0
C G3	50- 83	3.06	1.73	.20	.28	7.7	8.2	14.5			
C G4	83- 94						12.4	18.2			
II C G	94-102						10.0	23.1			
III C G	102-117						11.2	55.2	.96		

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SCOBIE SERIES

DATE OF SURVEY: 19 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 28 00
LONGITUDE(W): 122 55 00
PRECISION (SEC): 30
ELEVATION (M): 229
AIR PHOTOGRAPH: BC7548-118

CLASSIFICATION

REGO GLEYSOL(1978)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: GENTLY UNDULATING
ASPECT (DEG): 360
PROFILE SITE: UPPER SLOPE
LENGTH (M): 403
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: SANDY
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SANDY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 98 CM.

SEEPAGE: ABSENT
FLOOD HAZARD: RARE
MOISTURE CLASS: PERHUMID

DRAINAGE: POORLY DRAINED
RUNOFF: SLOW
STONINESS: NON-STONY
PERVIOUSNESS: MODERATE

ADDITIONAL NOTES

1 BAR MOISTURE FOR CG1=11.9,CG2=5.9,CGGAHB=12.2,CG3=4.9,CG4=4.7.

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	COLOUR 2	TEXTURE	STRUCTURE 1
LFH	5- 0	0- 8	ABRUPT BROKEN	5.0Y6.0/2.0			
C G1	0- 6	0- 8	ABRUPT BROKEN	5.0Y5.0/2.0 MATRIX MOIST		SILT LOAM	MASSIVE
C G2	6- 14	6- 12	ABRUPT WAVY	2.5Y5.0/2.0 MATRIX MOIST	10.0YR2.0/2.0 MATRIX MOIST	FINE SANDY LOAM	MASSIVE
C G+AHB	14- 23	6- 11	ABRUPT WAVY	2.5Y5.0/2.0 MATRIX MOIST		FINE SANDY LOAM	MASSIVE
C G3	23- 45	16- 31	ABRUPT WAVY	5.0Y5.0/1.0 MATRIX MOIST		SANDY LOAM	MASSIVE
C G4	45- 61	13- 20	ABRUPT WAVY	2.5Y5.0/2.0 MATRIX MOIST		FINE SANDY LOAM	MASSIVE
C G5	61- 70	5- 15	ABRUPT SMOOTH	5.0Y5.0/1.0 MATRIX MOIST		FINE SANDY LOAM	MASSIVE
II C G1	70- 91	19- 23	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST		LOAMY SAND	MASSIVE
C G6	91- 98	5- 8	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST		FINE SANDY LOAM	MASSIVE
II C G2	98-108					LOAMY SAND	MASSIVE

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	STRUCTURE 2	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
LFH	5- 0			ABUNDANT MEDIUM OBLIQUE IN PED			MOIST
C G1	0- 6	WEAK MEDIUM ANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED	PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL	FEW FINE PROMINENT 10.0YR4.0/6.0	MOIST
C G2	6- 14	WEAK COARSE PLATY PSEUDO	SLIGHTLY STICKY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL VERY FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL	FEW MEDIUM PROMINENT 10.0YR4.0/6.0	MOIST
C G+AHB	14- 23	WEAK COARSE PLATY PSEUDO	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED	PLENTIFUL VERY FINE HORIZONTAL IN PED DISCONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM PROMINENT 10.0YR4.0/6.0	MOIST
C G3	23- 45	VERY WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM RANDOM IN PED	PLENTIFUL VERY FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL	FEW MEDIUM FAINT 10.0YR4.0/6.0	MOIST

C G4	45- 61	WEAK MEDIUM ANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY FRIABLE PLASTIC	FEW FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON COARSE PROMINENT 10.0YR4.0/6.0	MOIST
C G5	61- 70	WEAK MEDIUM ANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY FRIABLE SLIGHTLY PLASTIC	FEW FINE OBLIQUE IN PED	PLENTIFUL VERY FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON COARSE FAINT 2.5Y4.0/6.0	MOIST
II C G1	70- 91	WEAK COARSE PLATY LAMINATED(< 1 CM)	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC	FEW FINE HORIZONTAL IN PED	PLENTIFUL VERY FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW COARSE PROMINENT 2.5Y4.0/4.0	MOIST
C G6	91- 98	WEAK MEDIUM PLATY PSEUDO	SLIGHTLY STICKY FRIABLE SLIGHTLY PLASTIC	FEW FINE HORIZONTAL IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	MANY COARSE PROMINENT 7.5YR4.0/4.0	MOIST
II C G2	98-108	WEAK MEDIUM PLATY PSEUDO	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC		PLENTIFUL FINE HORIZONTAL IN PED CONTINUOUS DENDRITIC TUBULAR	FEW COARSE PROMINENT 10.0YR4.0/6.0	MOIST

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	METHOD	VALUE	PH 2 SAMPLE STATE	METHOD	VALUE	ORGANIC CARBON %	NITROGEN %
LFH	5- 0	761668	2	1	6.1	2	4	5.5	24.43	1.09
C G1	0- 6	761669	2	1	5.8	2	4	5.2	.94	.06
C G2	6- 14	761670	2	1	6.0	2	4	5.2	.40	.02
C G+AHB	14- 23	761671	2	1	5.7	2	4	5.0	1.22	.07
C G3	23- 45	761672	2	1	5.6	2	4	4.9	.23	.01
C G4	45- 61	761673	2	1	5.5	2	4	4.7	.35	.02
C G5	61- 70	761674	2	1	5.4	2	4	4.7		
II C G1	70- 91	761675	2	1	5.4	2	4	4.7		
C G6	91- 98	761676	2	1	5.4	2	4	4.7		
II C G2	98-108	761677	2	1	5.4	2	4	4.6		

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	B PPM.	BULK DENSITY
LFH	5- 0	38.45	7.88	.10	1.78	73.8	18.9			
C G1	0- 6	3.92	1.19	.02	.34	6.9	7.1	1.9	.3	1.15
C G2	6- 14	2.00	.77	.03	.34	4.2	5.9	1.6	.4	1.15
C G+AHB	14- 23	3.69	1.22	.05	.34	8.7	4.2	.8	.3	1.15
C G3	23- 45	1.41	.44	.04	.18	2.9	3.7	.2		
C G4	45- 61	1.45	.66	.05	.22	4.1	3.0	.2		
C G5	61- 70						5.2	.8		
II C G1	70- 91						5.1	.7		
C G6	91- 98						5.2	.5		
II C G2	98-108						6.3	1.1		1.20

HORIZON-DEPTH(CM.)		MOISTURE STATUS 1/3 BAR.	15 BAR.	PART. SIZE ANALY.(% PASSING) #45	#60	#170	#200	PARTICLE SIZE(%) TOTAL SAND	50-2 U SILT	2U CLAY TOTAL
LFH	5- 0									
C G1	0- 6	22.0	7.4							
C G2	6- 14	13.8	3.6							
C G+AHB	14- 23	20.0	8.6							
C G3	23- 45	7.3	3.0							
C G4	45- 61	10.8	3.0							
C G5	61- 70									
II C G1	70- 91									
C G6	91- 98									
II C G2	98-108			99.40	94.20	38.90	22.40	84	14	2

PH METHODS, CODES:
1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SISTER SERIES

DATE OF SURVEY: 22 10 76 SURVEYOR: RB VIC, RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 30 00
LONGITUDE(W): 122 58 00
PRECISION (SEC): 30
ELEVATION (M): 244
AIR PHOTOGRAPH: BC7546-236

CLASSIFICATION

REGO GLEYSOL(1976)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: UPPER SLOPE
LENGTH (M): 806
MICROTOPOGRAPHY: LEVEL

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SILTY
SPEC. CLASTIC 2: SANDY
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 64 CM.
FLOOD HAZARD: RARE
MOISTURE CLASS: AQUIC

DRAINAGE: POORLY DRAINED
RUNOFF: VERY SLOW
STONINESS: NON-STONY
PERVIOUSNESS: MODERATE

ADDITIONAL NOTES

1 BAR MOISTURE FOR AP1,CG=33.0,2CG1=5.7.

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	COLOUR 2	TEXTURE	STRUCTURE 1
A P	0- 25	22- 30	ABRUPT SMOOTH	10.0YR4.0/3.0 MATRIX MOIST		SILT LOAM	VERY WEAK COARSE SUBANGULAR BLOCKY
C G	25- 36	10- 12	ABRUPT SMOOTH	5.0Y5.0/2.0 MATRIX MOIST		SILT LOAM	WEAK MEDIUM GRANULAR PSEUDO
II C G1	36- 64	23- 33	CLEAR WAVY	2.5Y4.0/2.0 MATRIX MOIST		LOAMY SAND	MASSIVE
II C G2	64- 76	11- 15	ABRUPT SMOOTH	2.5Y4.0/2.0 MATRIX MOIST		LOAMY SAND	MASSIVE
III C G1	76- 91	14- 17	ABRUPT SMOOTH	5.0Y5.0/1.0 MATRIX MOIST		SILTY CLAY LOAM	MASSIVE
III C G2	91-106			5.0Y5.0/1.0 MATRIX MOIST	10.0YR2.0/2.0 MATRIX MOIST	SILT LOAM	MASSIVE

HORIZON	THICKNESS DEPTH(CM)	STRUCTURE 2	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	CLAY FILMS 1
A P	0- 25	WEAK FINE ANGULAR BLOCKY	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL FINE RANDOM IN PED	PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC TUBULAR	MANY FINE PROMINENT 5.0YR3.0/4.0	
C G	25- 36	WEAK FINE GRANULAR PSEUDO	SLIGHTLY STICKY FRIABLE PLASTIC	FEW FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	MANY FINE PROMINENT 5.0YR3.0/4.0	
II C G1	36- 64	VERY WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO	NON STICKY VERY FRIABLE NONPLASTIC	VERY FEW FINE OBLIQUE IN PED	PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL	COMMON COARSE PROMINENT 2.5Y4.0/6.0	
II C G2	64- 76	VERY WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO	NON STICKY VERY FRIABLE NONPLASTIC		PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL	FEW MEDIUM PROMINENT 10.0YR3.0/6.0	

III C G1	76- 91	WEAK MEDIUM PLATY PSEUDO	STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON COARSE PROMINENT 10.0YR4.0/6.0	FEW VERY THIN IN VOIDS AND OR CHANNELS ONLY
III C G2	91-106	WEAK COARSE PLATY PSEUDO	STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS SIMPLE TUBULAR		

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	MOISTURE AT SAMPLING
A P	0- 25	MOIST
C G	25- 36	MOIST
II C G1	36- 64	MOIST
II C G2	64- 76	MOIST
III C G1	76- 91	MOIST
III C G2	91-106	MOIST

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	PH 1 METHOD	PH 1 VALUE	PH 2 SAMPLE STATE	PH 2 METHOD	PH 2 VALUE	ORGANIC CARBON %	NITROGEN %
A P	0- 25	761728	2	1	4.9	2	4	4.7	1.71	.14
C G	25- 36	761729	2	1	5.5	2	4	4.8	.87	.07
II C G1	36- 64	761730	2	1	5.5	2	4	4.9	.16	.00
II C G2	64- 76	761731	2	1	5.5	2	4	4.7		
III C G1	76- 91	761732	2	1	5.3	2	4	4.7		
III C G2	91-106	761733	2	1	4.9	2	4	4.3	2.22	

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	MOISTURE STATUS 1/3 BAR.	15 BAR.
A P	0- 25	5.65	1.76	.30	.31	14.2	8.9	4.4	41.6	11.0
C G	25- 36	5.51	1.56	.24	.20	13.4	3.1	1.4	41.6	11.0
II C G1	36- 64	1.09	.42	.09	.09	2.6	4.2	.1	7.9	2.9
II C G2	64- 76						11.0	.5		
III C G1	76- 91						13.2	1.1		
III C G2	91-106						10.7	8.1		

HORIZON-DEPTH(CM.)		PART. SIZE ANALY.(% PASSING) #25	#45	#60	#170	#200	PARTICLE SIZE(%) 62-2 U SILT	2U CLAY TOTAL
A P	0- 25							
C G	25- 36							
II C G1	36- 64							
II C G2	64- 76							
III C G1	76- 91							
III C G2	91-106	99.20	98.10	97.40	96.60	96.40	79	21

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SANGSTER SERIES

DATE OF SURVEY: 12 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 10 00
LONGITUDE(W): 122 45 00
PRECISION (SEC): 30
ELEVATION (M): 198
AIR PHOTOGRAPH: BC7467-135

CLASSIFICATION

REGO GLEYSOL(1978)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: UPPER SLOPE
LENGTH (M): 300
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SANDY
SPEC. CLASTIC 2: SILTY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 79 CM.

SEEPAGE: ABSENT
FLOOD HAZARD: RARE
MOISTURE CLASS: PERHUMID

DRAINAGE: POORLY DRAINED
RUNOFF: SLOW
STONINESS: NON-STONY
PERVIOUSNESS: MODERATE

ADDITIONAL NOTES

1 BAR MOISTURE FOR AP=13.7,2CG1=30.3,CG2=9.5,2CG2=30.0.

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	COLOUR 2	TEXTURE	STRUCTURE 1
A P	0- 21	20- 23	CLEAR SMOOTH	10.0YR3.0/3.0 MATRIX MOIST		FINE SANDY LOAM	WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO
II C G1	21- 32	9- 13	GRADUAL SMOOTH	5.0Y5.0/2.0 MATRIX MOIST	10.0YR2.0/2.0 MATRIX MOIST	SILT LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
C G1	32- 42	6- 13	CLEAR SMOOTH	2.5Y5.0/2.0 MATRIX MOIST		FINE SANDY LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
II C G2	42- 51	7- 12	CLEAR SMOOTH	2.5Y4.0/2.0 MATRIX MOIST		SILTY CLAY LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
C G2	51- 56	4- 6	GRADUAL SMOOTH	2.5Y5.0/2.0 MATRIX MOIST		FINE SANDY LOAM	WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO
II C G3	56- 63	5- 8	GRADUAL WAVY	5.0Y5.0/2.0 MATRIX MOIST		SILT LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
C G3	63- 71	6- 12	CLEAR SMOOTH	2.5Y5.0/2.0 MATRIX MOIST		FINE SANDY LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
II C G4	71- 76	4- 6	CLEAR SMOOTH	5.0Y5.0/2.0 MATRIX MOIST		SILT LOAM	WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO
C G4	76- 79	2- 4	CLEAR SMOOTH	2.5Y5.0/2.0 MATRIX MOIST		SANDY LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
II C G5	79- 87	6- 10	CLEAR SMOOTH	5.0Y5.0/2.0 MATRIX MOIST		SILT LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
C G5	87- 97	9- 11	CLEAR SMOOTH	5.0Y5.0/2.0 MATRIX MOIST		FINE SANDY LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
II C G6	97-127			5.0Y5.0/3.0 MATRIX MOIST		SILT LOAM	WEAK COARSE SUBANGULAR BLOCKY PSEUDO

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	STRUCTURE 2	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
A P	0- 21	WEAK MEDIUM GRANULAR	SLIGHTLY STICKY FRIABLE SLIGHTLY HARD SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR		MOIST
II C G1	21- 32	WEAK TO MODERATE MEDIUM GRANULAR PSEUDO	SLIGHTLY STICKY FRIABLE SLIGHTLY HARD PLASTIC	PLENTIFUL MEDIUM VERTICAL IN PED	PLENTIFUL FINE VERTICAL IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM PROMINENT 10.0YR3.0/6.0	MOIST
C G1	32- 42	WEAK MEDIUM GRANULAR PSEUDO	STICKY VERY FRIABLE SOFT PLASTIC	PLENTIFUL MEDIUM VERTICAL IN PED	PLENTIFUL MEDIUM VERTICAL IN PED CONTINUOUS DENDRITIC TUBULAR	FEW MEDIUM DISTINCT 10.0YR4.0/6.0	MOIST

II C G2	42- 51	WEAK FINE SUBANGULAR BLOCKY PSEUDO	STICKY FRIABLE SLIGHTLY HARD PLASTIC	PLENTIFUL MEDIUM VERTICAL IN PED	ABUNDANT MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW FINE DISTINCT 10.0YR4.0/6.0	MOIST
C G2	51- 56	WEAK MEDIUM GRANULAR PSEUDO	SLIGHTLY STICKY VERY FRIABLE SOFT SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	ABUNDANT FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON COARSE DISTINCT 10.0YR5.0/4.0	MOIST
II C G3	56- 63	WEAK FINE SUBANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY HARD PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	ABUNDANT FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	MANY COARSE DISTINCT 10.0YR5.0/6.0	MOIST
C G3	63- 71	WEAK MEDIUM GRANULAR PSEUDO	SLIGHTLY STICKY VERY FRIABLE SOFT SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON COARSE DISTINCT 10.0YR5.0/4.0	MOIST
II C G4	71- 76	WEAK FINE SUBANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY HARD PLASTIC	VERY FEW FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	MANY MEDIUM PROMINENT 10.0YR4.0/4.0	MOIST
C G4	76- 79	WEAK FINE SUBANGULAR BLOCKY PSEUDO	NON STICKY VERY FRIABLE SOFT NONPLASTIC	VERY FEW FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW MEDIUM PROMINENT 10.0YR3.0/6.0	MOIST
II C G5	79- 87	WEAK FINE SUBANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY HARD PLASTIC		PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	MANY MEDIUM PROMINENT 10.0YR4.0/6.0	MOIST
C G5	87- 97	WEAK FINE SUBANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY FRIABLE SLIGHTLY HARD SLIGHTLY PLASTIC		ABUNDANT MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	MANY COARSE PROMINENT 10.0YR4.0/6.0	MOIST
II C G6	97-127	WEAK FINE SUBANGULAR BLOCKY PSEUDO	SLIGHTLY STICKY VERY FRIABLE SOFT SLIGHTLY PLASTIC		PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON COARSE PROMINENT 10.0YR4.0/6.0	MOIST

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	METHOD	VALUE	PH 2 SAMPLE STATE	METHOD	VALUE	ORGANIC CARBON %	NITROGEN %
A P	0- 21	761564	2	1	5.5	2	4	5.0	1.54	.14
II C G1	21- 32	761565	2	1	5.9	2	4	5.4	1.43	.13
C G1	32- 42	761566	2	1	6.1	2	4	5.5	.35	.04
II C G2	42- 51	761567	2	1	6.2	2	4	5.5	.66	.09
C G2	51- 56	761568	2	1	6.1	2	4	5.6	.21	.05
II C G3	56- 63	761569	2	1	6.4	2	4	5.4	.28	.05
C G3	63- 71	761570	2	1	6.2	2	4	5.6		
II C G4	71- 76	761571	2	1	6.2	2	4	5.6		
C G4	76- 79	761572	2	1	6.5	2	4	5.6		
II C G5	79- 87	761573	2	1	6.3	2	4	5.5		
C G5	87- 97	761574	2	1	6.4	2	4	5.6		
II C G6	97-127									

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	PI PPM.	S PPM.	BULK DENSITY	MOISTURE STATUS 1/3 BAR.	15 BAR.
A P	0- 21	4.85	.57	.05	.26	7.8	6.3	1.8	1.62	19.9	4.8
II C G1	21- 32	8.59	.75	.11	.32	13.9	3.7	0.4		37.2	9.1
C G1	32- 42	3.64	.24	.07	.19	4.3	3.7	0.0		15.8	3.1
II C G2	42- 51	7.46	.73	.12	.25	10.0	3.0	0.1		38.2	8.5
C G2	51- 56	2.74	.26	.09	.19	3.9	3.7	0.1			
II C G3	56- 63	3.25	.42	.10	.19	5.0	3.7	0.1			
C G3	63- 71	2.14	.36	.08	.14	3.5	3.0	8.7			
II C G4	71- 76						3.7	0.3			
C G4	76- 79						3.7	0.0			
II C G5	79- 87						4.2	0.7			
C G5	87- 97						3.0	0.4			
II C G6	97-127										

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		PART. SIZE ANALY.(% PASSING) #25	#45	#60	#170	#200	PARTICLE SIZE(%) TOTAL SAND	50-2 U SILT	2U CLAY TOTAL
A P	0- 21								
II C G1	21- 32								
C G1	32- 42								
II C G2	42- 51								
C G2	51- 56								
II C G3	56- 63								
C G3	63- 71								
II C G4	71- 76								
C G4	76- 79								
II C G5	79- 87								
C G5	87- 97								
II C G6	97-127	99.90	99.60	99.20	92.00	89.60	22	74	4

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SOIL: SCULLARD | RESOURCE ANALYSIS BRANCH MINISTRY OF ENVIRONMENT VICTORIA, B.C.
PROJECT: 92J - NTS: 92J 7 | SUMMARY DATE: JULY 03,1979 PAGE: 01

SCULLARD SERIES

DATE OF SURVEY: 6 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 23 00
LONGITUDE(W): 122 52 00
PRECISION (SEC): 30
ELEVATION (M): 213
AIR PHOTOGRAPH: BC7549-115

CLASSIFICATION

REGO GLEYSOL(1976)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: UPPER SLOPE
LENGTH (M): 403
MICROTOPOGRAPHY: LEVEL

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SILTY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

MIDDLE STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SANDY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

SEEPAGE: ABSENT
FLOOD HAZARD: RARE
MOISTURE CLASS: SUB-AQUIC

DRAINAGE: POORLY DRAINED
RUNOFF: SLOW
STONINESS: NON-STONY
PERVIOUSNESS: MODERATE

ADDITIONAL NOTES

1 BAR MOISTURE FOR AP.CG=34.3.2CG=20.6.

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	TEXTURE	STRUCTURE 1	STRUCTURE 2
A P	0- 17	16- 19	GRADUAL SMOOTH	2.5Y4.0/2.0 MATRIX MOIST	SILTY CLAY LOAM	MASSIVE	WEAK MEDIUM TO COARSE SUBANGULAR BLOCKY
C G	17- 47	23- 36	CLEAR WAVY	2.5Y5.0/2.0 MATRIX MOIST	SILTY CLAY LOAM	MASSIVE	WEAK TO MODERATE COARSE SUBANGULAR BLOCKY PSEUDO
II C G1	47- 60	7- 23	CLEAR WAVY	2.5Y4.0/2.0 MATRIX MOIST	LOAM	MASSIVE	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
II C G2	60- 84	16- 30	GRADUAL WAVY	2.5Y4.0/2.0 MATRIX MOIST	FINE SANDY LOAM	MASSIVE	WEAK TO MODERATE MEDIUM TO COARSE SUBANGULAR BLOCKY PSEUDO
II C G3	84-114				SILT LOAM	MASSIVE	WEAK MEDIUM TO COARSE SUBANGULAR BLOCKY PSEUDO

HORIZON	THICKNESS DEPTH(CM)	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
A P	0- 17	STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR		MOIST
C G	17- 47	STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW FINE PROMINENT 2.5Y5.0/6.0	MOIST
II C G1	47- 60	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM PROMINENT 5.0YR4.0/6.0	MOIST
II C G2	60- 84	SLIGHTLY STICKY VERY FRIABLE PLASTIC	PLENTIFUL FINE VERTICAL IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM PROMINENT 5.0YR4.0/6.0	MOIST
II C G3	84-114	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL FINE VERTICAL IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW COARSE PROMINENT 10.0YR3.0/4.0	MOIST

SOIL: SCULLARD

PROJECT: 92J -   NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979   PAGE: 02

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	PH 1 METHOD	PH 1 VALUE	PH 2 SAMPLE STATE	PH 2 METHOD	PH 2 VALUE	ORGANIC CARBON %	NITROGEN %
A P	0- 17	761518	2	2	5.5	2	4	4.8	1.61	.13
C G	17- 47	761519	2	1	5.5	2	4	4.8	1.01	.09
II C G1	47- 60	761520	2	1	5.5	2	4	4.6	.64	.06
II C G2	60- 84	761521	2	1	5.4	2	4	4.6		
II C G3	84-114	761522	2	1	5.2	2	4	4.5		

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	BULK DENSITY	MOISTURE STATUS 1/3 BAR.	15 BAR.
A P	0- 17	3.85	.78	.09	.85	10.7	54.5	3.4	1.10	44.7	12.0
C G	17- 47	2.85	.50	.14	.50	9.6	44.9	1.0		44.7	12.0
II C G1	47- 60	1.35	.34	.15	.18	6.3	6.0	.6		33.0	8.9
II C G2	60- 84						10.1	1.4			
II C G3	84-114						13.1	1.6	1.07		

HORIZON-DEPTH(CM.)		PART. SIZE ANALY.(% PASSING) #10	#25	#45	#60	#170	#200	PARTICLE SIZE(%) TOTAL SAND	50-2 U SILT	2U CLAY TOTAL
A P	0- 17									
C G	17- 47									
II C G1	47- 60									
II C G2	60- 84									
II C G3	84-114	98.90	98.70	98.10	97.40	89.90	85.60	29	65	6

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

VALLEAU SERIES

DATE OF SURVEY: 6 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 22 00
LONGITUDE(W): 122 51 00
PRECISION (SEC): 30
ELEVATION (M): 213
AIR PHOTOGRAPH: BC7549-115

CLASSIFICATION

REGO GLEYSOL(1978)

STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: TOE
LENGTH (M): 403
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(ORGANIC & MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SILTY
COMM. CLASTIC 1: FINES
ORGANIC: FIBRIC
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

SEEPAGE: PRESENT
FLOOD HAZARD: RARE
MOISTURE CLASS: PERHUMID

DRAINAGE: POORLY DRAINED
RUNOFF: PONDED
STONINESS: NON-STONY
PERVIOUSNESS: SLOW

ADDITIONAL NOTES

CLASSIFICATION PHASE IS CUMULIC
1 BAR MOISTURE STATUS FOR AP=21.0,CG1=21.3,CG2=49.1,OFB1=102.7
1/3 BAR MOISTURE STATUS FOR OFB2=118.4

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	COLOUR 2	TEXTURE	STRUCTURE 1
A P	0- 15	13- 19	CLEAR SMOOTH	2.5Y5.0/2.0 MATRIX MOIST		LOAM	MASSIVE
C G1	15- 35	17- 23	CLEAR WAVY	5.0Y6.0/2.0 MATRIX MOIST		SILTY CLAY LOAM	MASSIVE
C G2	35- 45	7- 17	CLEAR WAVY	10.0YR3.0/2.0 MATRIX MOIST	2.5Y5.0/2.0 MATRIX MOIST	SILT LOAM	MASSIVE
O FB1	45- 61	13- 22	GRADUAL SMOOTH	7.5YR3.0/2.0 MATRIX MOIST		PEATY	MASSIVE
O FB2	61- 70	6- 10	CLEAR SMOOTH	10.0YR2.0/2.0 MATRIX MOIST		PEATY	MASSIVE
II C G	70-100			5.0GY4.0/1.0 NATURAL WET/REDUCED	5.0GY5.0/1.0 NATURAL WET/OXIDIZED	SILTY CLAY LOAM	MASSIVE LAMINATED(< 1 CM)

HORIZON	THICKNESS DEPTH(CM)	STRUCTURE 2	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
A P	0- 15	WEAK FINE TO MEDIUM SUBANGULAR BLOCKY	SLIGHTLY STICKY FIRM PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON FINE PROMINENT 10.0YR4.0/6.0	MOIST
C G1	15- 35	WEAK COARSE SUBANGULAR BLOCKY PSEUDO	STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	MANY MEDIUM PROMINENT 5.0YR4.0/4.0	MOIST
C G2	35- 45	WEAK MEDIUM TO COARSE PLATY PSEUDO	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW MEDIUM PROMINENT 5.0YR3.0/4.0	MOIST
O FB1	45- 61						MOIST
O FB2	61- 70						MOIST
II C G	70-100	WEAK MEDIUM TO COARSE PLATY PSEUDO	SLIGHTLY STICKY FRIABLE PLASTIC		ABUNDANT FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR		MOIST

SOIL: VALLEAU

PROJECT: 92J -   NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979   PAGE: 02

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	PH 1 METHOD	PH 1 VALUE	PH 2 SAMPLE STATE	PH 2 METHOD	PH 2 VALUE	ORGANIC CARBON %	NITROGEN %
A P	0- 15	761523	2	1	5.4	2	4	4.8	1.62	.11
C G1	15- 35	761524	2	1	5.2	2	4	4.8	2.01	.16
C G2	35- 45	761525	2	2	4.9	2	4	4.5	8.06	.51
O FB1	45- 61	761526	2	2	4.8	2	4	4.3	20.76	.98
O FB2	61- 70	761527	2	2	4.3	2	4	4.0	41.22	1.56
II C G	70-100	761528	2	2	4.9	2	4	4.6	3.33	

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	BULK DENSITY	MOISTURE STATUS 1/3 BAR.	15 BAR.
A P	0- 15	4.22	1.18	.08	.56	10.0	7.1	1.1	.93	36.3	7.6
C G1	15- 35	6.14	1.81	.13	.40	12.9	4.9	32.3	.93	39.8	8.8
C G2	35- 45	11.05	3.15	.17	.44	31.0	4.3	35.5		66.0	25.7
O FB1	45- 61	7.48	2.33	.13	.27	58.2	3.2				61.9
O FB2	61- 70						2.2				
II C G	70-100						15.3	54.9			

HORIZON-DEPTH(CM.)		ATTERBURG LIMITS PLASTIC LIMIT	LIQUID LIMIT	PART. SIZE ANALY.(% PASSING) #25	#45	#60	#170	#200	PARTICLE SIZE(%) 50-2 U SILT	2U CLAY TOTAL
A P	0- 15									
C G1	15- 35									
C G2	35- 45									
O FB1	45- 61									
O FB2	61- 70									
II C G	70-100	68.9	81.8	94.60	87.70	83.30	77.30	75.70	66	34

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SOIL: WILDFONG
PROJECT: 92J - NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979 PAGE: 01

WILDFONG SERIES

DATE OF SURVEY: 21 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 29 00
LONGITUDE(W): 122 58 00
PRECISION (SEC): 30
ELEVATION (M): 229
AIR PHOTOGRAPH: BC7548-193

CLASSIFICATION

GLEYED REGOSOL(1978)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: UPPER SLOPE
LENGTH (M): 403
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SANDY
SPEC. CLASTIC 2: SILTY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 113 CM.

SEEPAGE: ABSENT
FLOOD HAZARD: RARE
MOISTURE CLASS: HUMID

DRAINAGE: IMPERFECTLY DRAINED
RUNOFF: VERY SLOW
STONINESS: NON-STONY
PERVIOUSNESS: MODERATE

ADDITIONAL NOTES

1 BAR MOISTURE OF AP=15.4.CGJ=5.6.2CGJ=36.2.3CGJ1=8.1.3CGJ2=16.4.

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	TEXTURE	STRUCTURE 1	STRUCTURE 2
A P	0- 16	13- 20	ABRUPT WAVY	2.5Y4.0/2.0 MATRIX MOIST	FINE SANDY LOAM	VERY WEAK COARSE GRANULAR	WEAK FINE GRANULAR
C GJ	16- 24	0- 11	ABRUPT WAVY	5.0Y5.0/2.0 MATRIX MOIST	SANDY LOAM	MASSIVE	WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO
II C GJ	24- 32	5- 12	ABRUPT SMOOTH	5.0Y5.0/3.0 MATRIX MOIST	SILTY CLAY LOAM	MASSIVE	WEAK TO MODERATE MEDIUM SUBANGULAR BLOCKY PSEUDO
III C GJ1	32- 42	7- 12	ABRUPT SMOOTH	2.5Y4.0/4.0 MATRIX MOIST	FINE SANDY LOAM	MASSIVE	WEAK MEDIUM ANGULAR BLOCKY PSEUDO
III C GJ2	42- 63	18- 23	ABRUPT WAVY	2.5Y4.0/4.0 MATRIX MOIST	SILT LOAM	MASSIVE	WEAK MEDIUM ANGULAR BLOCKY PSEUDO
III C GJ3	63- 73	8- 11	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	SILT LOAM	MASSIVE	WEAK MEDIUM PLATY PSEUDO
III C GJ4	73-113			2.5Y4.0/2.0 MATRIX MOIST	SANDY LOAM	MASSIVE	WEAK COARSE PLATY PSEUDO

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
A P	0- 16	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED	PLENTIFUL FINE RANDOM IN PED DISCONTINUOUS DENDRITIC INTERSTITIAL		MOIST
C GJ	16- 24	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED	PLENTIFUL VERY FINE RANDOM IN PED DISCONTINUOUS DENDRITIC INTERSTITIAL	FEW FINE PROMINENT 10.0YR4.0/4.0	MOIST
II C GJ	24- 32	STICKY FIRM PLASTIC	PLENTIFUL MEDIUM HORIZONTAL IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW COARSE PROMINENT 10.0YR4.0/4.0	MOIST

III C GJ1	32- 42	SLIGHTLY STICKY VERY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL VERY FINE RANDOM IN PED DISCONTINUOUS DENDRITIC INTERSTITIAL	FEW MEDIUM DISTINCT 10.0YR4.0/4.0	MOIST
III C GJ2	42- 63	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC TUBULAR	FEW MEDIUM DISTINCT 10.0YR4.0/6.0	MOIST
III C GJ3	63- 73	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	FEW COARSE DISTINCT 10.0YR5.0/6.0	MOIST
III C GJ4	73-113	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL FINE OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON FINE DISTINCT 10.0YR4.0/6.0	MOIST

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	PH 1 METHOD	PH 1 VALUE	PH 2 SAMPLE STATE	PH 2 METHOD	PH 2 VALUE	ORGANIC CARBON %	NITROGEN %
A P	0- 16	761702	2	1	6.5	2	4	5.9	1.11	.06
C GJ	16- 24	761703	2	1	6.3	2	4	5.7	.30	.01
II C GJ	24- 32	761704	2	1	5.9	2	4	5.2	1.19	.08
III C GJ1	32- 42	761705	2	1	5.7	2	4	5.0	.37	.03
III C GJ2	42- 63	761706	2	1	5.5	2	4	4.8	.42	.03
III C GJ3	63- 73	761707	2	1	5.7	2	4	5.0		
III C GJ4	73-113	761708	2	1	5.7	2	4	5.0		

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	BULK DENSITY	MOISTURE STATUS 1/3 BAR.	15 BAR.
A P	0- 16	5.36	.98	.03	.24	8.0	11.1	1.2	1.05	20.3	5.4
C GJ	16- 24	2.27	.66	.03	.22	4.0	4.8	0.0		9.4	2.5
II C GJ	24- 32	6.42	2.59	.06	.55	17.0	3.1	0.0		42.2	14.3
III C GJ1	32- 42	1.98	.76	.04	.24	4.4	4.8	0.0		13.4	3.6
III C GJ2	42- 63	2.45	1.11	.09	.27	6.9	4.2	0.0		27.1	5.5
III C GJ3	63- 73						6.3	0.0			
III C GJ4	73-113						7.0	0.0	1.18		

HORIZON-DEPTH(CM.)		PART. SIZE ANALY.(% PASSING) #170	#200	PARTICLE SIZE(%) TOTAL SAND	50-2 U SILT	2U CLAY TOTAL
A P	0- 16					
C GJ	16- 24					
II C GJ	24- 32					
III C GJ1	32- 42					
III C GJ2	42- 63					
III C GJ3	63- 73					
III C GJ4	73-113	93.80	90.90	49	46	5

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

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SOIL: WOLVERINE RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
PROJECT: 92J - NTS: 92J 7 VICTORIA, B.C. SUMMARY DATE: JULY 03,1979 PAGE: 01

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WOLVERINE SERIES

DATE OF SURVEY: 18 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION		CLASSIFICATION		SLOPE	
LATITUDE(N):	50 25 00				
LONGITUDE(W):	122 54 00	GLEYED REGOSOL(1978)		%	1.0
PRECISION (SEC):	30			TYPE:	COMPLEX
ELEVATION (M):	213	STATUS:	MODAL SOIL	CLASS:	NEARLY LEVEL
AIR PHOTOGRAPH:	OC7549-275			ASPECT (DEG):	360
				PROFILE SITE:	UPPER SLOPE
				LENGTH (M):	457
				MICROTOPOGRAPHY:	LEVEL

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: SANDY
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SANDY
COMM. CLASTIC 1: FINES
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTOR 1: INACTIVE

ROOTING DEPTH: 52 CM.

SEEPAGE: ABSENT
FLOOD HAZARD: RARE
MOISTURE CLASS: HUMID

DRAINAGE: IMPERFECTLY DRAINED
RUNOFF: MEDIUM
STONINESS: NON-STONY
PERVIOUSNESS: MODERATE

ADDITIONAL NOTES

1 BAR MOISTURE FOR AP=4.8,C1=3.3,C2=2.2,CGJ1=6.4.

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PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	TEXTURE	STRUCTURE 1	STRUCTURE 2
A P	0- 11	10- 12	ABRUPT SMOOTH	2.5Y4.0/2.0 MATRIX MOIST	FINE SANDY LOAM	MASSIVE	WEAK MEDIUM ANGULAR BLOCKY
C 1	11- 23	8- 19	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	SANDY LOAM	MASSIVE	VERY WEAK MEDIUM PLATY PSEUDO
C 2	23- 46	20- 24	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	LOAMY SAND	MASSIVE LAMINATED(< 1 CM)	VERY WEAK FINE SUBANGULAR BLOCKY PSEUDO
C GJ1	46- 52	4- 8	ABRUPT SMOOTH	2.5Y4.0/2.0 MATRIX MOIST	FINE SANDY LOAM	MASSIVE	WEAK MEDIUM ANGULAR BLOCKY PSEUDO
C GJ2	52- 61	6- 12	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	SANDY LOAM	MASSIVE LAMINATED(< 1 CM)	VERY WEAK FINE PLATY PSEUDO
C GJ3	61- 83	18- 26	ABRUPT SMOOTH	2.5Y5.0/2.0 MATRIX MOIST	LOAMY SAND	MASSIVE	VERY WEAK MEDIUM PLATY PSEUDO
C GJ4	83-113			5.0Y5.0/2.0 MATRIX MOIST	SANDY LOAM	MASSIVE LAMINATED(< 1 CM)	WEAK MEDIUM SUBANGULAR BLOCKY PSEUDO

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
A P	0- 11	SLIGHTLY STICKY FRIABLE SLIGHTLY PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON FINE PROMINENT 10.0YR4.0/6.0	MOIST
C 1	11- 23	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC	FEW MEDIUM OBLIQUE IN PED	PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL		MOIST
C 2	23- 46	NON STICKY VERY FRIABLE SLIGHTLY PLASTIC	FEW MEDIUM OBLIQUE IN PED	PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL		MOIST

C GJ1	46- 52	SLIGHTLY STICKY FRIABLE PLASTIC	VERY FEW MEDIUM OBLIQUE IN PED	PLENTIFUL FINE HORIZONTAL IN PED CONTINUOUS DENDRITIC TUBULAR	COMMON MEDIUM PROMINENT 7.5YR4.0/4.0	MOIST
C GJ2	52- 61	NON STICKY FRIABLE SLIGHTLY PLASTIC		PLENTIFUL FINE HORIZONTAL IN PED CONTINUOUS DENDRITIC TUBULAR	FEW MEDIUM PROMINENT 10.0YR4.0/6.0	MOIST
C GJ3	61- 83			PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL	FEW COARSE DISTINCT 2.5Y5.0/4.0	MOIST
C GJ4	83-113			PLENTIFUL FINE RANDOM IN PED CONTINUOUS DENDRITIC INTERSTITIAL	FEW COARSE PROMINENT 2.5Y5.0/6.0	MOIST

PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	METHOD	VALUE	PH 2 SAMPLE STATE	METHOD	VALUE	ORGANIC CARBON %	NITROGEN %
A P	0- 11	761646	2	1	5.7	2	4	5.1	.37	.01
C 1	11- 23	761647	2	1	5.9	2	4	5.2	.14	.02
C 2	23- 46	761648	2	1	5.9	2	4	5.1	.12	.01
C GJ1	46- 52	761649	2	1	5.9	2	4	5.2	.18	.01
C GJ2	52- 61	761650	2	1	5.9	2	4	5.1	.09	.02
C GJ3	61- 83	761651	2	1	5.9	2	4	5.1		
C GJ4	83-113	761052	2	1	5.9	2	4	5.2		

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	BULK DENSITY	MOISTURE STATUS 1/3 BAR.	15 BAR.
A P	0- 11	2.52	.21	.04	.24	4.0	4.2	.6	1.19	12.1	2.3
C 1	11- 23	1.56	.08	.04	.16	2.4	4.2	.2		5.5	1.7
C 2	23- 46	1.07	.10	.03	.09	1.7	3.0	.0		3.0	1.7
C GJ1	46- 52	2.05	.12	.06	.16	3.4	4.8	.2		11.8	3.7
C GJ2	52- 61	1.36	.10	.04	.13	2.2	4.8	.1			
C GJ3	61- 83						3.7	.0			
C GJ4	83-113						3.7	.0	1.20		

HORIZON-DEPTH(CM.)		PART. SIZE ANALY.(% PASSING) #60	#170	#200	PARTICLE SIZE(%) TOTAL SAND	50-2 U SILT	2U CLAY TOTAL
A P	0- 11						
C 1	11- 23						
C 2	23- 46						
C GJ1	46- 52						
C GJ2	52- 61						
C GJ3	61- 83						
C GJ4	83-113	97.30	73.40	10.90	68	30	2

PH METHODS, CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF

SOIL: ZURCHER
PROJECT: 92J - NTS: 92J 7

RESOURCE ANALYSIS BRANCH
MINISTRY OF ENVIRONMENT
VICTORIA, B.C.

SUMMARY DATE: JULY 03,1979 PAGE: 01

ZURCHER SERIES

DATE OF SURVEY: 7 10 76 SURVEYOR: RB VIC. RES. ANAL. BRCH., M OF E
SAMPLING PURPOSE: SEMI-DETAILED SURVEY

PROJECT CODE: 92J

LOCATION

LATITUDE(N): 50 21 00
LONGITUDE(W): 122 51 00
PRECISION (SEC): 30
ELEVATION (M): 213
AIR PHOTOGRAPH: BC7549- 26

CLASSIFICATION

TERRIC FIBRISOL(1978)
STATUS: MODAL SOIL

SLOPE

%: 1.0
TYPE: COMPLEX
CLASS: NEARLY LEVEL
ASPECT (DEG): 360
PROFILE SITE: TOE
LENGTH (M): 403
MICROTOPOGRAPHY: SLIGHTLY MOUNDED

PARENT MATERIAL & LANDFORM

UPPER STRATIGRAPHIC UNIT

WEATHERING: WEAK CHEMICAL
PHYSICAL COMP.: STRATIFIED(ORGANIC & MINERAL)
CHEMICAL COMP.: MEDIUM ACID/NEUTRAL
SPEC. CLASTIC 1: SILTY
COMM. CLASTIC 1: FINES
ORGANIC: FIBRIC
GENETIC MAT.: FLUVIAL
SURFACE EXPRES.: LEVEL
DESCRIPTON 1: INACTIVE

ROOTING DEPTH: 70 CM.

SEEPAGE: PRESENT
FLOOD HAZARD: RARE
GROUNDWATER -DEPTH: 1.0 M
-KIND: APPARENT

DRAINAGE: VERY POORLY DRAINED
RUNOFF: SLOW
STONINESS: NON-STONY

ADDITIONAL NOTES

1 BAR MOISTURE FOR OF1=97.3,OF2=69.4,CG1=29.0

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	RANGE	HORIZON BOUNDARY	COLOUR 1	TEXTURE	STRUCTURE 1	STRUCTURE 2
O F1	48- 16	30- 33	GRADUAL SMOOTH	10.0YR2.0/2.0 MATRIX MOIST	PEATY		
O F2	16- 0	14- 18	GRADUAL SMOOTH	10.0YR2.0/2.0 MATRIX MOIST	PEATY	MASSIVE	WEAK COARSE PLATY
C G1	0- 22	17- 28	CLEAR SMOOTH	2.5Y3.0/2.0 MATRIX MOIST	SILT LOAM	MASSIVE	WEAK COARSE SUBANGULAR BLOCKY PSEUDO
C G2	22- 35	11- 16	CLEAR SMOOTH	10.0YR3.0/1.0 MATRIX MOIST	SILT LOAM PEATY	MASSIVE	WEAK MEDIUM TO COARSE PLATY PSEUDO
C G3	35- 52	15- 20	CLEAR SMOOTH	5.0Y5.0/2.0 NATURAL WET/REDUCED	SILTY CLAY LOAM	MASSIVE	WEAK MEDIUM TO COARSE SUBANGULAR BLOCKY PSEUDO
A H8	52- 57	4- 9	GRADUAL SMOOTH	2.5Y3.0/2.0 NATURAL WET/REDUCED	SILT LOAM PEATY	MASSIVE	WEAK MEDIUM TO COARSE PLATY LAMINATED(< 1 CM)
O F8	57- 66			10.0YR3.0/2.0 NATURAL WET/REDUCED	PEATY	MASSIVE	WEAK MEDIUM TO COARSE PLATY

PROFILE DESCRIPTION

HORIZON	THICKNESS DEPTH(CM)	CONSISTENCE	ROOTS 1	PORES 1	MOTTLES 1	MOISTURE AT SAMPLING
O F1	48- 16		PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC INTERSTITIAL		MOIST
O F2	16- 0		PLENTIFUL MEDIUM OBLIQUE IN PED	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC INTERSTITIAL		MOIST
C G1	0- 22	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL FINE OBLIQUE IN PED	PLENTIFUL MEDIUM VERTICAL IN PED CONTINUOUS DENDRITIC TUBULAR	FEW MEDIUM PROMINENT 10.0YR3.0/6.0	MOIST
C G2	22- 35	SLIGHTLY STICKY FRIABLE PLASTIC		PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC INTERSTITIAL		MOIST

C G3	35- 52	STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC TUBULAR	WET
A HB	52- 57	SLIGHTLY STICKY FRIABLE PLASTIC	PLENTIFUL MEDIUM OBLIQUE IN PED CONTINUOUS DENDRITIC INTERSTITIAL	WET
O FB	57- 66			WET

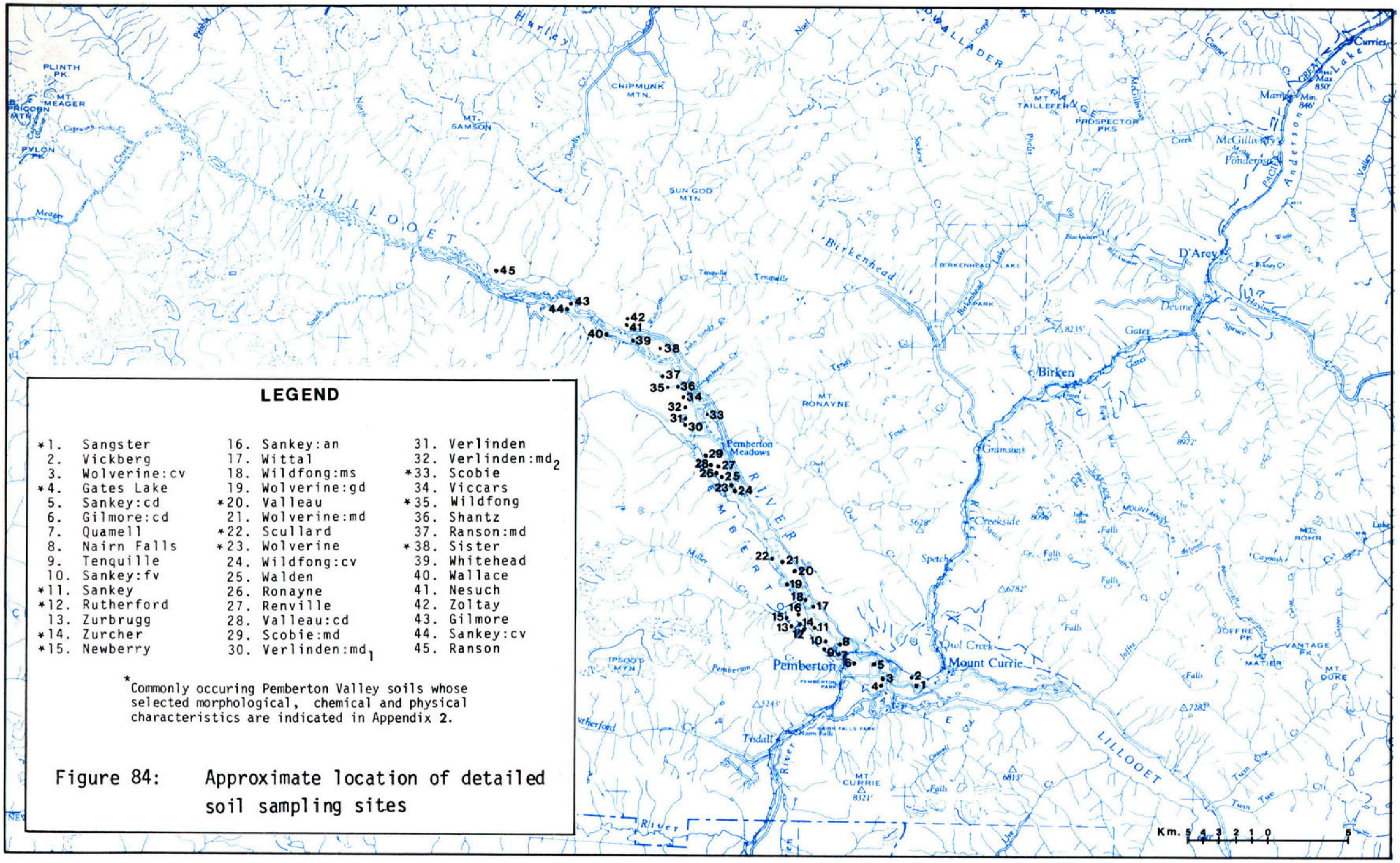
PHYSICAL & CHEMICAL DATA

HORIZON-DEPTH(CM.)		SAMPLE # LAB SAMPLE #	PH 1 SAMPLE STATE	PH 1 METHOD	PH 1 VALUE	PH 2 SAMPLE STATE	PH 2 METHOD	PH 2 VALUE	ORGANIC CARBON %	NITROGEN %
O F1	48- 16	761534	2	2	4.3	2	4	4.0	33.01	2.10
O F2	16- 0	761535	2	2	4.2	2	4	3.8	21.37	1.09
C G1	0- 22	761536	2	1	4.5	2	4	4.0	2.74	.14
C G2	22- 35	761537	2	2	4.5	2	4	4.1	9.87	.49
C G3	35- 52	761538	2	1	4.9	2	4	4.4	1.61	.07
A HB	52- 57	761539	2	2	4.8	2	4	4.4	16.07	.95
O FB	57- 66									

HORIZON-DEPTH(CM.)		EXCHANGEABLE CATIONS BUFF.(ME/100G) CA	MG	NA	K	C. E. C. DETERMINED	P1 PPM.	S PPM.	BULK DENSITY	MOISTURE STATUS 1/3 BAR.	15 BAR.
O F1	48- 16	21.19	3.46	.15	.39	104.4	1.1		.23		85.0
O F2	16- 0	7.17	1.71	.15	.31	65.0	2.1			88.2	37.8
C G1	0- 22	2.11	.54	.10	.15	11.8	5.2	23.3		39.1	11.6
C G2	22- 35	8.09	1.12	.22	.29	31.1	2.6	40.1			
C G3	35- 52	3.33	.35	.16	.30	9.5	3.7	39.9			
A HB	52- 57	11.73	1.43	.31	.52	59.7	1.6	88.4	.63		
D FB	57- 66										

PH METHODS. CODES:

1...H2O 1:1
2...H2O 1:5
3...H2O SATURATION
4...CACL2
5...KCL
6...NAF



LEGEND

*1. Sangster	16. Sankey:an	31. Verlinden
2. Vickberg	17. Wittal	32. Verlinden:md$_2$
3. Wolverine:cv	18. Wildfong:ms	*33. Scobie
*4. Gates Lake	19. Wolverine:gd	34. Viccars
5. Sankey:cd	*20. Valleau	*35. Wildfong
6. Gilmore:cd	21. Wolverine:md	36. Shantz
7. Quamell	*22. Scullard	37. Ranson:md
8. Nairn Falls	*23. Wolverine	*38. Sister
9. Tenquille	24. Wildfong:cv	39. Whitehead
10. Sankey:fv	25. Walden	40. Wallace
*11. Sankey	26. Ronayne	41. Nesuch
*12. Rutherford	27. Renville	42. Zoltay
13. Zurbrugg	28. Valleau:cd	43. Gilmore
*14. Zurcher	29. Scobie:md	44. Sankey:cv
*15. Newberry	30. Verlinden:md$_1$	45. Ranson

*Commonly occuring Pemberton Valley soils whose selected morphological, chemical and physical characteristics are indicated in Appendix 2.

Figure 84: Approximate location of detailed soil sampling sites

Appendix 3: Methods: Settlement Suitability Interpretations

A. RATING SYSTEM

The suitability rating system is based on the presumption that all units have a HIGH potential for use until a factor which limits this use is noted. The extent to which a rating for a particular unit is downgraded is dependent on the number and severity of the limiting factors within the suitability rating. Knowledge of the limiting factor(s) enables the user to readily relate to the types of limitations found with a map unit for a particular use.

Ratings are generally conservative to ensure that the unit is suited for an intended use and that the limiting factors are identified where the suitability of that unit is MEDIUM or LOW.

The reliability of the interpretations is determined by the reliability of the mapping and the applicability of the guidelines used in making the interpretations. An indication of the reliability of the mapping is shown in the "Accessibility map" in the text.

B. DEFINITION OF TERMS

H	HIGH POTENTIAL	- no limitations for the specific use interpretation.
$M^{\#}_{\#}$	MEDIUM POTENTIAL	- severe Limiting Factor #, 1 or none (superscripted). - some limitations for the specific use interpretations; these limitations need to be recognized, but can be overcome with good management and design. - moderate Limiting Factor #, 3 or less (subscripted).
$L^{\#}_{\#}$	LOW POTENTIAL	- severely Limiting Factor #, 2 or more alone (super scripted) - enough limitations to make use questionable. However, with careful planning and management, the limitations may be overcome, but economic feasibility may then become limiting. - moderate Limiting Factor #, 3 or more alone sub-scripted).

C. ASSUMPTIONS:

1. Dwellings

In the interpretations of soil suitability for dwellings, buildings of more than three stories and other buildings requiring a foundation load in excess of that of a three story dwelling have not been included. More detailed information than that supplied by this type of survey would be required for interpretations which would fit larger structures.

Properties which affect foundation support are bearing strength and settlement under load. These properties are determined by soil properties such as soil density, wetness, susceptibility to flooding, slope, plasticity, texture, and shrink-well potential. Properties influencing the amount and ease of excavation are wetness, slope, depth to bedrock, stoniness and rockiness.

The major differences between ratings for dwellings with basements and without basements are in the depth to water table, soil drainage, and the depth to bedrock or impermeable layer. In some cases, areas which have been rated LOW or MEDIUM for buildings with basements may be rated MEDIUM or HIGH for buildings without basements.

SOIL LIMITATION FOR DWELLINGS (WITH BASEMENTS)

Limiting Factor Number used in the HIGH MEDIUM LOW SYSTEM

	Item Affecting Use	Degree of Soil Limitation[a] None to Slight	Moderate	Severe
1	Apparent Water Table	Below a depth of 1.5 meters	Between 0.75 and 1.5 meters depth	Above a depth of 0.75 meters
2	Flooding	None	None	Rare, occasional or frequent
4	Soil Drainage Class[b]	Very rapidly, rapidly, well drained	Moderately well drained	Imperfectly drained, poorly drained, very poorly drained
5	Slope	0-8%	8-30%	More than 30%
6	Stoniness Class[b]	1	2 and 3	4 and 5
7	Rockiness Class[b,f]	0	1	2,3,4 & 5
8	Unified Soil Group	GW, GP, SW, SP, GM, GC, SM, SC, CL, with PI[d] less than 15	ML, CL, with PI[d] 15 or more	CH, MH, OL, OH
9	Potential Frost Action[e]	Low	Moderate	High
10	Depth to Bedrock[f]	More than 1.5 meters	1-1.5 meters	Less than 1 meter
14	Inferred[c] Shrink-Swell Potential	Low	Moderate	High
15	Evidence of Previous Slope or Surface Instability	None	None	Rare, occasional, frequent

[a]Some soils given limitation ratings of moderate or severe may be good sites from the standpoint of aesthetics but require more preparation or maintenance.

[b]For class definitions see CanSIS Manual for Describing Soils in the Field, 1975.

[c]See Guide for Interpreting Engineering Uses of Soils U.S.D.A. (1971) pages 14, 15 and 58.

[d]PI means plasticity index.

[e]Use this item only where frost penetrates to assumed depth of footings and where soil is moist during freezing weather. See Guide for Interpreting Engineering Uses of Soils, U.S.D.A.(1971) pages 48 and 49.

[f]When bedrock is soft enough so that it can be dug out with light power equipment, such as backhoes, the limitations have been reduced by one class.

SOIL LIMITATION RATINGS FOR DWELLINGS (WITHOUT BASEMENTS)

Limiting Factor Number used in the HIGH MEDIUM LOW SYSTEM

	Item Affecting Use	Degree of Soil Limitation[a] None to Slight	Moderate	Severe
1	Apparent Water Table	Below a depth of 0.75 meters	Below a depth of 0.5 meters	Above a depth of 0.5 meters
2	Flooding	None	None	Rare, occasional or frequent
4	Soil Drainage Class[b]	Very rapidly, rapidly well, moderately well drained	imperfectly drained	poorly drained, very poorly drained
5	Slope	0-8%	8 - 30%	More than 30%
6	Stoniness Class[b]	1	2 and 3	4 and 5
7	Rockiness Class[b]	0	1	2,3,4 and 5
8	Unified Soil Group	GW, GP, SW, SP, GM, GC, SM, SC, CL with PI[d] less than 15	ML, CL with PI[d] 15 or more	CH, MH, OL, OH
9	Potential Frost Action[e]	Low	Moderate	High
10	Depth to Bedrock[f]	More than 1 meter	0.5-1 meter	Less than 0.5 meter
14	Inferred[c] Shrink-Swell Potential	Low	Moderate	High
15	Evidence of Previous Slope and Surface Instability	None	None	Rare, occasional or frequent

[a] Some soils given limitation rating of moderate or severe may be good sites from the standpoint of aesthetics but require more preparation or maintenance.

[b] For class definitions see CanSIS Manual for Describing Soils in the Field, 1975.

[c] See Guide for Interpreting Engineering Uses of Soils USDA (1971) pages 14, 19 and 58

[d] PI means plasticity index.

[e] Use this item only where frost penetrates to assumed depth of footings and where soil is moist during freezing weather. See Guide for Interpreting Engineering Uses of Soils, U.S.D.A. (1971) pages 53 and 49.

[f] When bedrock is soft enough so that it can be dug out with light power equipment, such as backhoes, the limitations have been reduced by one class.

2. Septic Tank Absorption Fields

The ratings of suitability of soils for septic tank absorption fields are designed to predict the performance of an area for sewage disposal through a surface tile system. Effluent is considered to be reasonably uniformly distributed into the natural soil.

Rapid permeability is considered to be a severe limitation due to the potential in some places for groundwater contamination. Shallow depths to bedrock or impermeable layers may prevent effluent distribution and cause concentration or channelling of effluent allowing the effluent to travel long distances and possibly contaminate groundwater elsewhere.

Flooding and seasonally high water tables may interfere with the filter field operation. Slope and stoniness influence construction and successful operation of an absorption field.

SOIL LIMITATION RATINGS FOR SEPTIC TANK ABSORPTION FIELDS[b]

Limiting Factor Number used in the HIGH MEDIUM LOW SYSTEM

	Item Affecting Use	Degree of Soil Limitation: None to Slight	Moderate	Severe
1	Apparent Water Table Depth	More than 1.8 meters	1.2 to 1.8 meters	Less than 1.2 meters
2	Flooding	None	Rare	Occasional or frequent
3	Perviousness Class[a] (implies permeability and percolation)	Upper end of moderate	Lower end of moderate	Rapid, slow
4	Soil Drainage[a]	Well, moderately well	Imperfect	Very rapid, rapid, poorly, very poorly
5	Slope	0.8%	8-30%	More than 30%
6	Stoniness Class[c]	1	2 and 3	4 and 5
7	Rockiness Class[c]	0	1	2,3,4, and 5
10	Depth to Hard Rock,[b] Bedrock, or Other Impervious Materials	More than 1,8 meters	1.2-1.8 meters	Less than 1.2 meters
12	Ground Water Contaimination Hazard	Slight	Moderate	Severe

[a] Class limits are the same as those suggested by the CanSIS Manual for Describing Soil in the Field (1975) The limitation ratings should be related to the permeability of soil layers at and below the depth of the tile line to a depth of 1.2 meters.

[b] Based on the assumption that tile is a depth of 0.6 meters.

[c] For class definition see CanSIS Manual for Describing Soils in the Field, 1975.

3. Sand and Gravel Source

Determination of the suitability of a soil as a sand and/or gravel source is dependent primarily on the textural class or particle size distribution of the soil.

Depth to apparent water table and flood hazard are included to determine the year-round suitability of a deposit.

Mass movement hazard potential indicates any potential instability which could result should a deposit be used.

Unsuitable overburden and deposit thickness are included to indicate buried gravel and/or sand resource and the extent of these deposits.

SUITABILITY RATINGS FOR MATERIALS AS SOURCES OF SAND and/or GRAVEL

Limiting Factor Number used in the HIGH MEDIUM LOW SYSTEM

	Item Affecting Use	Degree of Deposit Limitation: None to Slight	Moderate	Severe
1	Depth to Apparent Water Table	Not present	Between 1 and 5 meters from the surface	Within 1 meter of the surface
2	Flood Hazard	None	Rare	Occasional or frequent
8	Textural Limitation (Unified Soil Group)	SW, SP, GW, GP	SW-SM, SP-SM, GP-GM, GW-GM	SM, SM,SW-SC, GM, GP-GC, GW-GC, all other groups
11	Unsuitable Overburden	Not located	Less than 1 meter	More than 1 meter
13	Deposit Thickness	Greater than 1 meter	Less than 1 meter	Not located

4. Shallow Excavations

Shallow excavations require excavating or trenching to a depth of 1.5 or 2 m. The limitation ratings for shallow excavations alone, though highly relevant, are insufficient for interpretations for ultimate uses, such as for dwellings with basements, sanitary landfills, cemetaries, and underground utility lines (sewers, pipelines, and cables). Additional soil features must be considered in evaluating soils for those uses. For example, additional interpretations concerning shrink-swell potential and corrosivity are needed for giving ratings for the ultimate use of soils for pipelines. Backfilling is required in most uses except basements or open ditches.

In soils used for shallow excavations, desireable characteristics are: good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops and large stones, and no flooding hazard.

SOIL LIMITATION RATINGS FOR SHALLOW EXCAVATIONS

Limiting Factor Number used in the HIGH, MEDIUM, LOW SYSTEM

	Item Affecting Use	Degree of Soil Limitation Slight	Moderate	Severe
1	Seasonal Water Table	Below a depth of 1.5 m	Between depth of 0.75 and 1.5	Above a depth of 0.75 m
2	Flooding	None	Rare	Occasionally or frequent
4	Soil Drainage Class	Excessively drained, somewhat excessively drained, and well drained	Moderately well drained	Somewhat poorly drained, poorly drained, and very poorly drained
5	Slope	0 - 8%	8 - 15%	More than 15%
6	Stoniness Class[f]	0 and 1	2	3, 4, and 5
7	Rockiness Class[f]	0	1	2, 3, 4, and 5
8	Texture of Soil to Depth to be Excavated[a,b,g]	fsl, sl, l, sil, sicl, scl	si[c], cl, sc; all gravelly types	c[d], sic[d], s, ls; organic soils; all very gravelly types
10	Depth to Bedrock[e]	More than 1.5 m	1 to 1.5 m	Less than 1 m

[a] Texture is used here as an index to workability and sidewall stability.

[b] If soil contains a thick fragipan, duripan, or other material difficult (but not impossible) to excavate with hand tools, increase the limitation rating by one step unless it is severe.

[c] If soil stands in vertical cuts, like loess, reduce rating to slight.

[d] If the soil is friable, reduce rating to moderate.

[e] If bedrock is soft enough so that it can be dug out with ordinary hand tools or light equipment, such as back hoes, reduce ratings of moderate and severe by one step.

[f] For class definitions see CanSIS Manual for Describing Soils in the Field, Ag. Can., 1975.

[g] See Guide for Interpreting Engineering Uses of Soils, U.S.D.A., 1971.

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