Soil Survey of

WHITNEY LAKE PROVINCIAL PARK STUDY AREA

and Interpretation for Recreational Use

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Preface

This report is one of a series describing detailed and semi-detailed soil surveys being conducted in Alberta provincial parks and recreation areas. As well as the Whitney Lakes Provincial Park study area, a soil survey was conducted in the Carson-Pegasus Lakes region north of Whitecourt, during the summer of 1980. The total area surveyed was approximately 3290 ha.

A guidebook has been prepared to accompany soil survey reports written for Alberta provincial parks and recreation areas (Greenlee, 1981). The guidebook includes general discussions of the following: soil formation; the Canadian soil classification system; soil characteristics and other factors that affect the use of soils for recreational and related purposes; Luvisolic, Organic, and Solonetzic soils; soil erosion; methodology; soil and landscape maps that accompany the soil survey reports; an explanation of soil interpretations and guidelines for developing them; chemical and physical properties of soils; and the landform classification system used by Canadian soil pedologists. Also included is a glossary. This report presents specific results and interpretations for the Whitney Lakes Provincial Park study area.

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Summary

The mapped areas comprise about 2150 ha, and is 21 km east of the town of Elk Point. The study area encompasses Whitney, Borden, and Ross Lakes, as well as lands adjacent to the western and northern shores of Laurier Lake. The study area is in a region described as a rolling plain, for the most part morainic in origin, although most of the study area is covered by very coarse-textured glaciofluvial sediments. Moderately fine-textured till is found across most of the extreme northern portion, as well as south, southwest, and southeast of Ross Lake. The Whitney Lakes Park region has a cold snowy forest climate with humid winters, characterized by frozen ground and a snow cover lasting several months. Summers are cool, with the average temperature of the warmest month between 10°C and 22°C. The study area is in the aspen grove section of the boreal forest region.

Fourteen map units were recognized in the study area. The key profile types are Orthic Eutric Brunisols, Eluviated Eutric Brunisols, Orthic Melanic Brunisols, Orthic Black Chernozems, Orthic Dark Gray Chernozems, Orthic Gray Luvisols, Dark Gray Luvisols, Gleyed Gray Luvisols, Rego Gleysols, Rego Humic Gleysols, Fibrisols, Meisols, Terric Mesisols, and Humisols. These profiles are distributed over the landscape in relation to landform, parent material and drainage. Map units consist of single soil series, groupings of series (complexes), or catenas; the soil map shows their distribution.

Soil erodibility ratings (K values) and predicted water erosion hazards have been worked out for selected map units. Soil interpretations of each map unit are made for primitive camping areas, fully serviced campgrounds, picnic areas, lawns and landscaping, paths, trails, road location, source of roadfill, and source of sand or gravel. The soils most suitable for recreational development in the mapped area, when found on suitable topography, are those of map unit 8. Map unit 6 and 7 soils have severe limitations when found on suitable topography. Soils of map units 1, 4, 5, and 9 are well suited for road construction when found on suitable topography, and constitute good sources of sand or gravel. The soil map and tables 6 to 14 inclusive (soil limitation and suitability tables) indicate areas suitable for particular uses.

A soil survey properly interpreted can be one of the most useful tools management has to design a recreational area. All soil differences found in the field cannot, however, be shown on the soil map; for design and construction of specific recreational facilities, an on-site investigation is usually required.

Introduction

Size and Location

The mapped area comprises about 2150 ha, and is about 21 km east of the town of Elk Point (figure 1). The study area includes Whitney, Borden, and Ross Lakes, as well as lands adjacent to the western and northern shores of Laurier Lake. Most of the area is in Tp 56, R 4, W 4 Mer, and includes part of NE¼ Sec 8, part of N½ Sec 9, Sec 11, part of S½ Sec 14, S½ Sec 15, Sec 16, most of SE¼, part of SW¼, most of NW¼, NE¼ Sec 17, part of SE¼, part of NW¼, most of NE¼ Sec 19, Secs 20 and 21, part of E½ Sec 27, W½ Sec 27, Secs 28, 29, 32, 33, W½ Sec 34, and part of E½ Sec 34. Also included is part of S½ Sec 3, Tp 57, R 4, W 4 Mer.

Physiography and Surficial Deposits

The study area is in a region described as a rolling plain, for the most part morainic in origin. The regional slope is to the east (Currie and Zacharko, 1976). Green (1972) classified the bedrock as the Upper Cretaceous Lea Park formation, which is marine in origin. The average elevation throughout most of the study area is around 580 m. The highest is about 660 m in the extreme northwestern corner; the lowest is slightly less than 570 m along the shores of Whitney, Laurier, and Borden Lakes. The difference is about 90 m. Elevations are slightly above 600 m in the northeastern corner of the study area. The study area is drained by a small creek, which leaves Borden Lake on the west side and flows into the North Saskatchewan River about 2 km south.

Very coarse-textured glaciofluvial sediments, mostly sand, cover most of the study area. Fairly extensive deposits of fine gravels are found west and north of Borden Lake, as well as adjacent to the southwestern corner of Ross Lake. A few patches of medium- to coarse-textured glaciofluvial sediments are found between Borden and Laurier Lakes. Some small patches of medium- to coarse-textured glaciolacustrine sediments also occur in the same vicinity, adjacent to lake shores. Moderately fine-textured till is found across most of the extreme northern portion of the mapped area; as well as south, southwest, and southeast of Ross Lake. Depressional locations throughout the study area contain organic soil deposits; many are quite extensive. Most of these deposits are adjacent to lake shores, and many are found parallel to drainage courses which outlet into lakes.

Climate

The climate of the mapped area is humid continental in Koeppen's climatic classification (Trewartha, 1954). — A cold snowy forest climate with humid winters, characterized by frozen ground and a snow cover of several months duration. Summers are cool, with an average temperature of the warmest month between 10°C and 22°C. The average temperature of the coldest month is below -3°C.

Weather records for 1971 through 1980 from Elk Point at an elevation of 590 m were used to compile the following information (Environment Canada, 1971-80). The mean annual temperature is 0.9°C. July is the warmest month of the year with a mean temperature of 16.1°C; and January is the coldest month with a mean temperature of -18.5 °C. The mean annual precipitation is 47.5 mm; 75 percent falls as rain. The average frost-free period is 84 days.

Vegetation

Rowe (1972) classified the mapped area as a boreal forest region. It lies within the aspen grove section near the southern boundary of the mixedwood section, and the vegetation exhibits some characteristics of both.

In the aspen grove section, only trembling aspen is abundant in the natural stands. Balsam poplar is frequently found on moist lowlands, and occasionally is prominent on uplands after fire. White birch has a sporadic distribution, but is usually found only on rough broken land. Prairie and meadow patches were interspersed with the aspen bluffs in the original vegetation. The vegetation covering the greatest area in the mix-

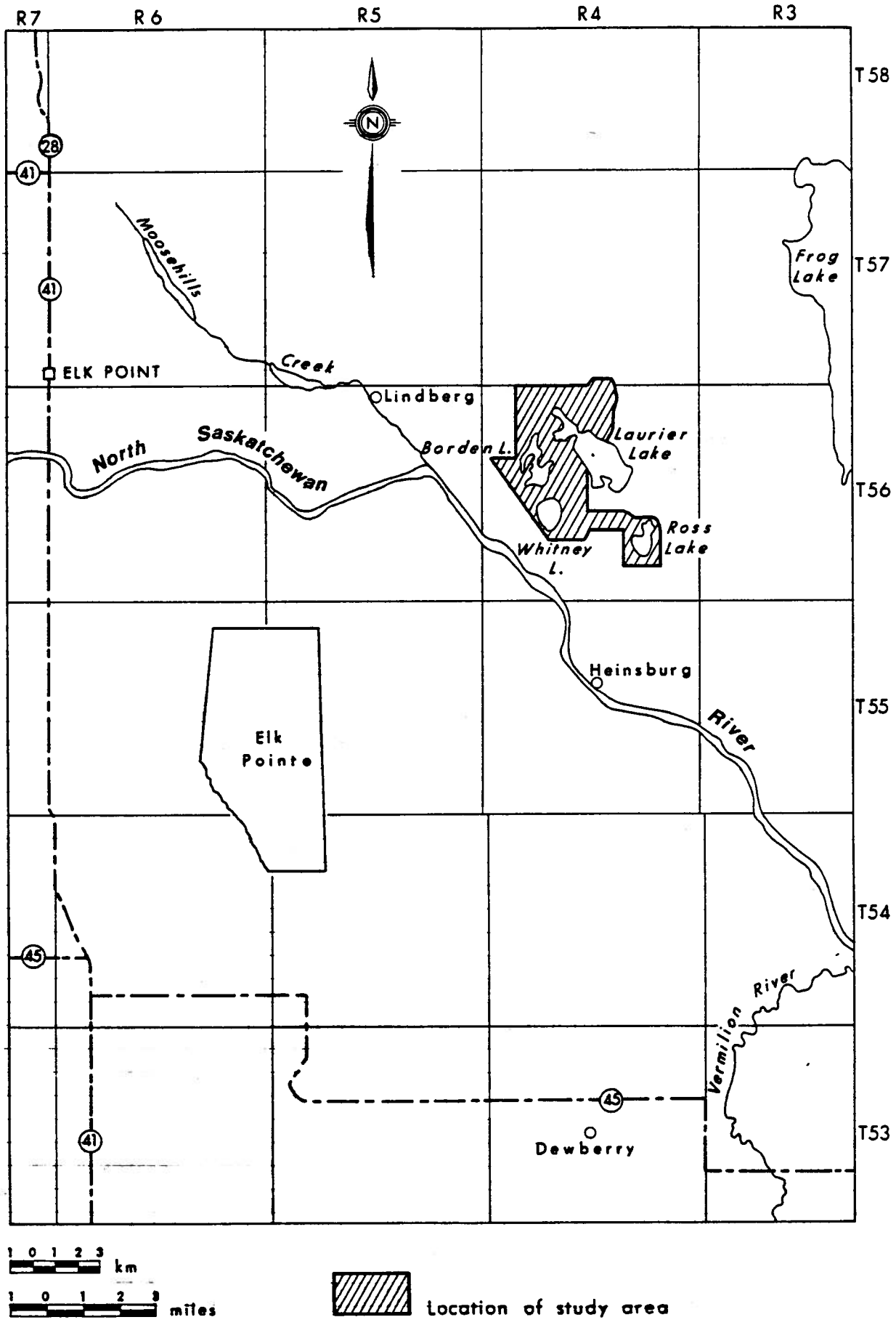

Figure 1. Map showing location of study area

edwood section is also the trembling aspen. The characteristic forest association of well-drained uplands, however, is a mixture in varying proportions of trembling aspen, balsam poplar, white birch, white spruce, and balsam fir. The last two species are especially prominent in old stands. Jack pine is dominant in sandy areas, while black spruce and tamarack muskeg develop in lower positions and upper water catchment areas.

In the study area, aspen is the most common cover type, and numerous clearings of grassland occur in the southern and western portions. Occasional white birch and white spruce are also found, and some balsam poplar is found in lowlands. Black spruce is dominant in bogs, with some tamarack in fens. Jack pine is dominant between Whitney and Ross Lakes.

The vegetation is not extensively discussed in this report, because the Outdoor Recreation Planning Branch of Alberta Recreation and Parks conducts biological studies of provincial parks and recreation areas. Some common plant species growing on different soils are indicated as part of the map unit descriptions (Moss, 1959; Cormack, 1967; Cunningham, 1975): aspen (*Populus tremuloides,* jack pine *(Pinus banksiana),* balsam poplar *(Populus balsamifera),* white spruce (*Picea glauca),* white birch *(Betula papyrifera),* black spruce *(Picea mariana),* tamarack (*Larix laricina),* saskatoon-berry *(Amelanchier alnifolia),* choke cherry *(Prunus virginiana),* beaked hazelnut *(Corylus cornuta),* wild rose *(Rosa* spp) wolf willow *(Elaeagnus commutata,* buckbrush *(Symphoricarpos* spp), wild red raspberry *(Rubus strigosus),* low-bush cranberry *(Viburnum edule),* dogwood *(Cornus stolonifera),* Canadian buffalo-berry *(Shepherdia canadensis),* willow *(Salix* spp) alder *(Alnus* spp), currant (*Ribes* spp) swamp birch *(Betula pumila* var *glandulifera),* wild strawberry *(Fragaria* spp), bunchberry *(Cornus canadensis),* twinflower *(Linnaea borealis* var *americana),* twining honeysuckle *(Lonicera dioica* var *glaucescens),* meadow rue *(Thalictrum* spp), common bearberry *(Arctostaphylos uva-ursi),* blueberry *(Vaccinium* spp), pasture sagewort *(Artemisia frigida),* three-flowered avens *(Geum triflorum),* pussy-toes *(Antennaria* spp), prairie crocus *(Anemone patens* var *wolfgangiana),* golden bean *Thermopsis rhombifolia),* reindeer-moss *(Cladonia* spp), grass (various species) Labrador tea *(Ledum groenlandicum),* bog cranberry (*Oxycoccus quadripetalus),* small bog cranberry *(Oxycoccus microcarpus),* bog rosemary (*Andromeda polifolia),* cotton grass *(Eriophorum* spp), sphagnum moss *(Sphagnum* spp), feathermoss, slough grass (*Beckmannia syzigachne),* sedge (*Carex* spp), horsetail (*Equisetum* spp.), common nettle *(Urtica gracilis),* wild mint *(Mentha arvensis* var *vilosa),* dwarf raspberry *(Rubus acaulis),* common cattail *(Typha latifolia),* and marsh marigold *(Caltha palustris).*

Soils

Fourteen map units were recognized in the mapped area. Four belong to each of the Luvisolic and Organic orders, three to the Brunisolic order, two to the Chernozemic order, and one to the Gleysolic order in the Canadian soil classification system (Canada Soil Survey Committee, 1978). The system is outlined in Greenlee (1981). Pertinent features of the map units are outlined in table 1.

Soils of the Brunisolic order are rapidly to imperfectly drained mineral soils with sufficient profile development to exclude them from the Regosolic order, but that lack the degrees or kinds of horizon development specified for soils of other orders. Their common characteristic of identification is the development in situ of the prominent brownish Bm horizon with sufficient alteration by hydrolysis, oxidation or solution to produce significant changes in color, structure and composition different from those of an A or C horizon. The processes of leaching and weathering are relatively weakly developed in Brunisolic soils. They tend to reflect the chemical characteristics, particularly the base status and acidity, of parent materials from which they have been derived.

Very rapidly drained Brunisolic soils, developed on sand, are widespread throughout most of the study area. These very coarse-textured materials almost totally lack fines; consequently very little soil profile development has evolved, other than the leaching of lime.

Table 1. Key to the soils

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
1	Orthic Dystric Brunisol — 80%; Eluviated Dystric Brunisol — 20%	very coarse textured glaciofluvial sediments (sand)	sand	c, d, e, f (>2 to 30%)	0	very rapidly drained	1) Pockets of Ah sometimes found. 2) Texture of loamy sand in upper 25-50 cm is sometimes found. Slight to severe limitations, good source of roadfill and sand, unsuitable source of gravel — sandy surface textures, excessive slopes, erosion hazard on steep slopes.
2	Gleyed Gray Luvisol — 80%; Rego Gleysol and Rego Humic Gleysol — 20%	Luvisols — very coarse-textured glaciolacustrine sediments (sand) Gleysols — moderately coarse- to moderately fine-textured glaciolacustrine sediments	Luvisols: loamy sand Gleysols: loam	b, c (>0.5 to 5%)	0	Luvisols — imperfectly drained Gleysols — poorly drained	1) Pockets of loam, silt loam, sandy clay loam common in BCg of Gleyed Gray Luvisols. 2) Ccag sometimes found in Gleyed Gray Luvisols. 3) Water table sometimes within 1 m of surface in Gleyed Gray Luvisols. Luvisols have moderate limitations, fair source of roadfill and sand, unsuitable source of gravel — seasonally high groundwater tables, sandy surface textures, flooding hazard (overflow). Gleysols have severe limitations, poor source of roadfill, sand and gravel — seasonally high groundwater tables or surface ponding.
3	Orthic Gray Luvisol	moderately coarse to very coarse-textured glaciofluvial sediments (sand)	sand	b, d, e, f (>0.5 to 30%)	0	well to rapidly drained	1) Very sporadic pockets of Ahe occur. 2) Under cultivation, an Ap horizon occurs, loam to loamy sand. 3) Clay loam to silty clay loam common in Bt. 4) Pockets and bands of loam to silt loam in C. Moderate to severe limitations, fair source of roadfill and sand, unsuitable source of gravel — sandy surface textures, erosion hazard, excessive slopes.

Table 1. Key to the soils

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
4	Orthic Dystric Brunisol — 70%; Orthic Black Chernozem — 30%	very coarse-textured glaciofluvial sediments (sand)	sand	c, d, e, f (>2 to 30%)	0 to 1	very rapidly drained	1) The Brunisols occur under forest, and the Chernozems predominantly under grassland. 2) The distinguishing feature among the Orthic Black Chernozems, Orthic Sombric Brunisols, and Orthic Dystric Brunisols is the Ah thickness. 3) The L-H is lacking under grassland. Slight to severe limitations, good source of roadfill and sand, unsuitable source of gravel — sandy surface textures, excessive slopes.
5	Orthic Black Chernozem — 60%; Orthic Melanic and Eutric Brunisol — 40%	very coarse-textured glaciofluvial sediments (fine gravel and sand)	loamy sand	c, d, e, f, g (>2 to 60%)	0 to 2	very rapidly drained	1) The Chernozems occur under grassland, and the Brunisols under aspen clumps. 2) The distinguishing feature among the Orthic Black Chernozems, Orthic Melanic Brunisols, and Orthic Eutric Brunisols is the Ah thickness. 3) The esker along the northwestern shores of Borden and Laurier Lakes is mainly gravel. 4) A lime horizon is occasionally found. Slight to very severe limitations, good source of roadfill, sand, and gravel — sandy surface textures, excessive slopes, surface stoniness.
6	Rego Gleysol and Rego Humic Gleysol	moderately coarse- to moderately fine-textured glaciolacustrine sediments	loam	a, b (0 to 2%)	0	poorly drained	1) Pockets of peaty phase, and discontinuous pockets of Ah occur. 2) Occasionally Ckg2 or Ccag2 is sand. Severe limitations, poor source of roadfill, sand, or gravel —seasonally high groundwater table or surface ponding, flooding hazard (overflow).

Table 1. Key to the soils

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
7	Orthic and Dark Gray Luvisol — 70%; Orthic Dark Gray Chernozem — 30%	moderately coarse- to very coarse-textured glaciofluvial sediments (sand), overlying moderately coarse- to moderately fine-textured till — 80%; moderately coarse- to moderately fine-textured till — 20%	fine sandy loam to sandy loam	e, f (>9 to 30%)	1	well drained	The Orthic and Dark Gray Luvisols and the Orthic Dark Gray Chernozems developed on sand overlying till, are all unpredictably associated. The Orthic Gray Luvisols developed on till occur on knolls. The soils developed on sand overlying till have severe limitations, are poor sources of roadfill and sand, and unsuitable sources of gravel — erosion hazard, excessive slopes, susceptibility of the till to frost heave, moderate shrink-swell potential of the till. For limitations of the soils developed on till, see map unit 8.
8	Orthic and Dark Gray Luvisol — 70%; Orthic Dark Gray Chernozem — 30%	moderately coarse- to moderately fine-textured till	sandy loam to loam	c, d, e, f, g (>2 to 60%)	0 to 1	well drained	Textures of the BC and Cca horizons range from clay loam to loamy sand. Slight to very severe limitations, poor source of roadfill, very poor source of sand or gravel — erosion hazard, excessive slopes, susceptibility to frost heave, moderate shrink-swell potential.
9	Eluviated Eutric Brunisol — 70%; Orthic Gray Luvisol —30%	very coarse-textured glaciofluvial sediments (sand and gravel)	sand to loamy sand	d, e, f (>5 to 30%)	0 to 2	very rapidly drained	The Ah horizons are discontinuous. Slight to severe limitations, good source of roadfill, sand, and gravel — sandy surface textures, surface stoniness, excessive slopes.
10	Orthic Dark Gray Chernozem — 80%; Orthic Melanic and Eutric Brunisol — 20%	very coarse- to moderately coarse-textured glaciofluvial sediments (sand)	loamy fine sand	d, e (>5 to 15%)	0	very rapidly drained	1) The distinguishing feature among the Orthic Dark Gray Chernozems, Orthic Melanic Brunisols and Orthic Eutric Brunisols is the Ah Thickness. 2) These soils are not quite as coarse-textured as the other soils developed on glaciofluvial sediments. Moderate limitations, fair source of roadfill and sand, unsuitable source of gravel— sandy surface textures, excessive slopes, erosion hazard.

Table 1. Key to the soils

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
F	Fibrisol	predominantly fibric peat overlying predominantly mesic peat	fibric peat	a (0 to 0.5%)	0	very poorly drained	Very severe limitations, unsuitable as a source of roadfill, sand, or gravel — organic soil, extreme wetness, high shrink-swell potential.
M	Mesisol	predominantly fibric peat overlying predominantly mesic peat	fibric peat	a (0 to 0.5%)	0	very poorly drained	Very severe limitations, unsuitable as a source of roadfill, sand, or gravel — organic soil, extreme wetness, high shrink-swell potential.
TM	Terric Mesisol	predominantly mesic peat overlying undifferentiated mineral material	mesic peat	a (0 to 0.5%)	0	very poorly drained	1) Near the edges of TM areas, where the Om is less than 40 cm thick, the soils can be classified as peaty phases of Gleysols. 2) Characteristics of terric layers are usually similar to those of adjacent mineral soil parent materials. Very severe limitations, unsuitable as a source of roadfill, sand or gravel — organic soil, extreme wetness, high shrink-swell potential.
H	Humisol	predominantly humic peat	humic peat	a (0 to 0.5%)	0	very poorly drained	Very severe limitations, unsuitable as a source of roadfill, sand, or gravel — organic soil, extreme wetness, high shrink-swell potential.

Soils of the Luvisolic Order are well to imperfectly drained mineral soils characterized by an Ae horizon near the surface, and generally from 7.5 to 30 cm thick. It is a leached gray-colored horizon, very low in organic matter (humus) content and in plant nutrients. Luvisolic soils in their natural state commonly have surface L-H and Ah horizons as well. The L-H horizon is from 2.5 to 12.5 cm or more in thickness; the Ah horizon, however, below is usually less than 5 cm thick, and is often absent altogether. When Luvisolic soils are cultivated, the L-H and Ah horizons quickly become mixed with the Ae, resulting in gray-colored fields. Also, the L-H and Ah horizons rapidly become broken down under conditions of heavy foot traffic in recreation areas, and often disappear completely from a combination of physical destruction and soil erosion. When thoroughly dried out, the Ae horizon is often baked and hard, so that plant seedlings may be unable to push up through the crust. Entry of moisture from rainfall may be hampered and runoff increased, thereby enhancing soil erosion. This problem is especially serious on steep slopes.

Well-drained Luvisolic soils developed on medium-textured till are found in the extreme northern portion of the mapped area, as well as around the southern half of Ross Lake.

Soils of the Chernozemic order are well to imperfectly drained mineral soils of good structure, with very high natural fertility and productive capacity. These soils are characterized by dark-colored surface virgin (Ah or Ahe) or cultivated (Ap) horizons, darkened by the accumulation of organic matter (humus) from the decomposition of grasses and forbs representative of grassland communities or of grassland-forest communities with associated shrubs and forbs. The A horizon is commonly referred to as "topsoil" and is from 10 to 25 cm thick. In some regions, it is much thicker. Chernozemic soils are further divided into four major divisions, the Brown, Dark Brown, Black and Dark Gray great groups. These groups are distinguished by measurable differences in color of the A horizons, which together with other associated features of depth, organic matter content, and structure reflect significant differences in the climates and vegetation under which they have developed. These features influence and distinguish their characteristics and relative use capabilities.

In general, Brown Chernozemic soils are found in southern and south-eastern Alberta, and have A horizons that are lower in organic matter content, lighter in color and thinner that those of the other Chernozemic great groups. Black Chernozemic soils are found in central and east-central Alberta, and have A horizons that are higher in organic matter content, darker in color and thicker than those of the other great groups. Dark Brown Chernozemic soils are found in south-central and east-central Alberta, and have A horizons with characteristics intermediate between those of the Browns and the Blacks. Dark Gray Chernozemic soils have A horizons with variable colors, thicknesses and modifications of structural pattern indicative of degradation of the typical Chernozemic A horizon. Under virgin conditions, the Dark Grays usually have leaf mats (L-H horizons) overlying the mineral soil, and degradation of the A horizons frequently causes a banded or "salt and pepper" effect. The organic matter content varies with the degree of degradation, from high accumulations in slightly degraded soils, comparable to that of Blacks; to significantly lower amounts in the more strongly degraded types. These latter types are intergrades to Dark Gray Luvisolic soils of the Luvisolic order. Dark Gray Chernozemics are found primarily in transitional areas of grassland and forest in north-central Alberta and in the Peace River region.

Numerous patches of very rapidly drained Black Chernozemic soils developed on sand are found in association with Brunisolic soils throughout most of the study area. In general, the Chernozemic soils are found in open areas under grass; the Brunisolic soils are under forest. An exception is the area of very rapidly drained Dark Gray Chernozemic soils developed on sand and found under forest, adjacent to the eastern and southern shores of Ross Lake. Patches of well-drained Dark Gray Chernozemic soils are found under forest in association with the Luvisolic soils developed on medium-textured till.

Soils of the Organic order include all soils developed largely from organic deposits, contain-

ing more than 30 percent organic matter by weight, and meeting minimum specifications of depth and thickness within a defined control section. Most organic soils are either water saturated or nearly so for much of the year unless artificially drained. The organic deposits are derived primarily from the decomposition of hydrophytic or mesohydrophytic vegetation. The further classification and naming of the great groups into Fibrisols, Mesisols and Humisols depends on the occurrence and identification of three major diagnostic layers: Fibric, Mesic and Humic. Fibric layers are the least decomposed of all the organic soil materials and have large amounts of well-preserved fibers, which are readily identifiable as to botanical origin. The organic matter of humic layers is in a highly decomposed state, and often has a smooth greasy feel when moist. This organic matter has the least amount of recognizable plant fiber, is usually darker in color than fibric or mesic materials, and is relatively stable, changing little in physical or chemical composition with time. The organic matter of mesic layers is in an intermediate stage of decomposition between that of fibric and humic layers, and is partially altered both chemically and physically.

Management problems in areas of cultivated Organic soils involve controlled drainage, adequate fertilization, and tillage practices necessary to maintain a firm bed for seed germination and root development. Overdrainage and dessication of peat are detrimental to crop production and to the maintenance of the organic layers in a desirable physical condition. Under cultivation, many Organic soils show deficiencies in macro and micro mineral nutrients, and most require the application of phosphorus and potassium to obtain maximum productivity. Special problems also exist in using Organic soils for construction — their low bearing strength, high shrink-swell potential and susceptibility to frost heaving.

Patches of Organic soils, some fairly extensive, are found at several locations throughout the study area. Most sites are adjacent to lakes or smaller water bodies, or drainage courses leading into lakes.

Soils of the Gleysolic order are poorly drained mineral soils whose profiles reflect the influence of waterlogging for significant periods. Water saturation causes reducing conditions because of a lack of aeration. These conditions result in gleyed horizons having dull gray to olive, greenish or bluish-gray moist colors, frequently accompanied by prominent, usually rust-colored, mottles resulting from localized oxidation and reduction of hydrated iron oxides.

Only three patches of Gleysolic soils (map unit 6), large enough to be outlined at the scale of mapping employed, were found in the study area. Gleysolic soils, in small depressions of insufficient size to be outlined as separate entities, are found as minor inclusions in Map Unit 2.

Very minor differences exist among some map units. The differences are usually significant with regard to a particular recreational or engineering use, and thus justify separation of different map units. The map units are described in chronological order, and horizon thicknesses represent averages. Thicknesses of comparative horizons in identical soil profiles often vary as much as 10 to 40 percent from the norm at different points in the landscape.

The dominant plant species are listed, using common names. These are very general lists, and not attempts at complete or exhaustive species lists.

Map Unit 1

Classification: Orthic Dystric Brunisol — 80%; Eluviated Dystric Brunisol — 20%; (These two subgroups are intimately and unpredictably associated.)
Parent Material: very coarse-textured glaciofluvial sediments (sand)
Landform: hummocky glaciofluvial ($F^{G}h$); undulating glaciofluvial ($F^{G}u$).
Slope: undulating to strongly rolling (>2 to 30%)
Surface Stoniness: stone free (0)

Drainage: very rapidly drained
Vegetation: predominantly aspen, often open forest with small trees and numerous grassy clearings; often scattered white birch, white spruce, or jack pine; understory consists of hazelnut, saskatoon-berry, wild rose, choke cherry, pin cherry, wild strawberry, common bearberry, twinflower, bunchberry, grass, some bog cranberry; areas of jack pine, common bearberry, bog cranberry, reindeer-moss, saskatoon-berry, choke cherry, pin cherry, blueberry

Profile Description: Eluviated Dystric Brunisol

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	5	plentiful, very fine to coarse, horizontal and oblique roots			5.3	24.2
Aej	8	sand	amorphous	soft, dry	4.9	1.26
Bm	17	sand	amorphous	soft, dry	4.8	nd[2]
BC_1	35	sand	amorphous	loose, moist	4.9	nd
BC_2	40+	sand	amorphous	loose, moist	5.4	nd

[1]OM — organic matter, [2]nd — not determined

Comments: (1) Pockets of Ah horizon up to 5 cm thick are sometimes found. The texture is usually sand.
(2) Ae horizons do not occur in the Orthic Dystric Brunisol profiles.
(3) A texture of loamy sand is sometimes found in the upper 25 to 50 cm of map unit 1 soil profiles.
Limitations: Slight to severe—slight on suitable topography for road location; moderate on suitable topography for camping and picnic areas; severe for lawns and landscaping, paths and trails; good source of roadfill on suitable topography; good source of sand; unsuitable as a source of gravel because of unsuitable textures; specific limitations include sandy surface textures, rapid permeability (droughtiness), thin Ah horizons, excessive slopes, erosion hazard on steep slopes.

Map Unit 2

Classification: Gleyed Gray Luvisol — 80%; Rego Gleysol and Rego Humic Gleysol — 20%
Parent Material: Luvisols — very coarse-textured glaciolacustrine sediments (sand); Gleysols — moderately coarse- to moderately fine-textured glaciolacustrine sediments
Landform: level glaciolacustrine (L^{Gl}); undulating glaciolacustrine (L^{Gu})
Slope: gently undulating to undulating (>0.5 to 5%)
Surface Stoniness: stone free (0)
Drainage: Luvisols — imperfectly drained; Gleysols — poorly drained
Vegetation: Luvisols — aspen, saskatoon-berry, hazelnut, wild rose, twinflower, wild strawberry, meadow rue; occasional patches of balsam poplar, willow, and dogwood. Gleysols — balsam poplar, willow, aspen, dogwood, saskatoon-berry, hazelnut, wild rose, twinflower, grass; occasional white spruce, and Canadian buffalo-berry.

Profile Description: Gleyed Gray Luvisol

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	6	plentiful, very fine to coarse, horizontal and oblique roots			5.6	45.2
Ahe	4	loamy sand (field texture)	amorphous	very friable, moist	5.6	6.3
Ae	8	loamy sand	platy	very friable, moist	5.9	1.39
Aeg	34	loamy sand	platy	loose, moist	5.9	nd[2]
Btg	30	sandy loam	subangular blocky	firm, moist	6.4	nd
BCg	24 +	sand	amorphous	loose, moist	6.2	nd

[1]OM — organic matter, [2]nd — not determined

Profile Description: Rego Gleysol and Rego Humic Gleysol

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Om	7-15	predominantly mesic peat		
Ah	0-25	loam	granular	very friable, moist
CKg 1 or Ccag 1	25-40	loam to sandy loam	amorphous	very friable, moist
CKg 2 or Ccag 2	at 25-40	variable — loam, sandy clay loam, or clay loam (layers 20-55 cm thick)	amorphous	friable to very firm, moist

Comments: (1) The two Gleysolic soil great groups are intimately and unpredictably associated.
(2) The BCg horizons of the Gleyed Gray Luvisols often have pockets of loam, silt loam, and sandy clay loam textured sediments; having amorphous structure, very friable moist consistence; ranging from 2 to 25 cm in thickness, and 10 to 35 cm apart.
(3) A Ccag horizon is sometimes found within 60 cm of the surface in the Gleyed Gray Luvisols.
(4) A water table is sometimes found within 1 m of the surface in the Gleyed Gray Luvisols.

(5) The texture of the CKg 2 or Ccag 2 horizon of the Gleysols is sand in some instances.
Limitations: Luvisols — moderate for all uses. Fair source of roadfill and sand, unsuitable as a source of gravel because of unsuitable textures. Specific limitations include seasonally high groundwater tables, sandy surface textures, flooding hazard (overflow), thin Ah horizons. Gleysols — Severe for all uses because of seasonally high groundwater tables or surface ponding; poor source of roadfill for the same reason; poor source of sand or gravel for the same reason, as well as unsuitable textures.

Map Unit 3

Classification: Orthic Gray Luvisol
Parent Material: moderately coarse- to very coarse-textured glaciofluvial sediments (sand)
Landform: hummocky glaciofluvial (F^{Gh}); level glaciofluvial (F^{Gl})
Slope: gently undulating to strongly rolling (>0.5 to 30%)
Surface Stoniness: stone free (0)
Drainage: well to rapidly drained
Vegetation: aspen, hazelnut, saskatoon-berry, wild rose; occasionally some white spruce and white birch; patches of choke cherry and pin cherry; often some low-bush cranberry, twinflower, bunchberry, and grass.
Profile Description: Orthic Gray Luvisol

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	8	plentiful, very fine to coarse, horizontal and oblique roots			5.8	46.2
Ae 1	6	loamy sand	platy	very friable, moist	4.9	2.4
Ae 2	24	sandy loam	platy	very friable, moist	5.7	nd[2]
Ae 3	10	gravelly loamy sand	amorphous	loose, moist	6.0	nd
Bt 1	1	gravelly clay loam (field texture)	subangular blocky	friable, moist	nd	nd
AB 1	14	fine sandy loam	amorphous	very friable, moist	6.1	nd
AB 2	15	very gravelly loamy sand to sand	amorphous	loose, moist	6.1	nd
Bt 2	12	loam	subangular blocky	firm, moist	6.9	nd

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
Cca	3	silt loam (field texture)	platy	firm, moist	7.8	nd
C	15+	very fine loamy sand to very fine sand	amorphous	loose, moist	7.6	nd

[1]OM — organic matter, [2]nd — not determined

Comments: (1) Pockets of a surface Ahe horizon occur very sporadically below the L-H. It ranges from 0 to 5 cm thick and has a texture of fine sandy loam.
(2) When these soils are cultivated, a surface Ap horizon, about 12 cm thick, is found. The texture ranges from loam to loamy sand.
(3) Textures of clay loam to silty clay loam are often found in the Bt horizons.
(4) Numerous pockets and bands of loam to silt loam textured sediments occur in the C horizons. They range from 2 to 5 cm thick, and 7 to 10 cm apart.
Limitations: Slight to severe — slight on suitable topography for camping areas, and picnic areas; moderate on suitable topography for lawns and landscaping, paths, trails, and road location; fair source of roadfill on suitable topography; fair source of sand, and unsuitable as a source of gravel due to unsuitable textures. Specific limitations include sandy surface textures, erosion hazard, excessive slopes, and thin Ah horizons.

Map Unit 4

Classification: Orthic Dystric Brunisol — 70%; Orthic Black Chernozem — 30%
Parent Material: very coarse-textured glaciofluvial sediments (sand)
Landform: hummocky glaciofluvial ($F^{G}h$); undulating glaciofluvial ($F^{G}u$)
Slope: undulating to strongly rolling (>2 to 30%)
Surface Stoniness: stone free to slightly stony (0 to 1)
Drainage: very rapidly drained
Vegetation: forest, interspersed with grassland. Forest — mostly aspen, some jack pine; some saskatoon-berry, choke cherry, and pin cherry; common bearberry, patches of reindeer-moss. Grassland — native grass; scattered wild rose, three-flowered avens, pasture sagewort, prairie crocus, other forbs
Profile Description: Orthic Sombric Brunisol

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	4	plentiful, very fine to coarse, horizontal roots			5.1	28.0
Ah	8	sand	amorphous	loose, dry	5.0	1.31
Bm	22	sand	amorphous	loose, moist	5.3	0.25
BC 1	30	sand	amorphous	loose, moist	5.2	nd[2]

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
BC 2	40+	sand	amorphous	loose, moist	5.0	nd

[1]OM — organic matter, [2]nd — not determined

Comments: (1) The Brunisols occur under forest, and the Chernozems are found predominantly under grass.
(2) The only difference among the Orthic Black Chernozems, the Orthic Sombric Brunisols, and the Orthic Dystric Brunisols is the thickness of the Ah horizons, which are thickest in the Chernozems and thinnest in the Dystric Brunisols.
(3) The surface L-H horizon is lacking in grassland areas.
Limitations: Slight to severe — slight on suitable topography for road location; moderate on suitable topography for camping and picnic areas; severe for lawns and landscaping, paths, and trails; good source of roadfill on suitable topography; good source of sand; unsuitable as a source of gravel due to unsuitable texture. Specific limitations include sandy surface textures, rapid permeability (droughtiness), thin Ah horizons, and excessive slopes.

Map Unit 5

Classification: Orthic Black Chernozem — 60%; Orthic Melanic and Eutric Brunisol — 40%
Parent Material: very coarse-textured glaciofluvial sediments (fine gravel and sand)
Landform: hummocky glaciofluvial ($F^{G}h$); inclined glaciofluvial ($F^{G}i$); undulating glaciofluvial ($F^{G}u$)
Slope: undulating to hilly (>2 to 60%)
Surface Stoniness: stone free to moderately stony (0 to 2)
Drainage: very rapidly drained
Vegetation: grassland, with aspen clumps. Grassland — native grass; some pasture sagewort, prairie crocus, three-flowered avens, pussy-toes, golden bean; patches of wolf willow; some buckbrush, and saskatoon-berry. Forest — aspen, saskatoon-berry, wild rose; some hazelnut, choke cherry, pin cherry; common bearberry, twining honeysuckle, wild strawberry, other forbs; some grass
Profile Description: Orthic Black Chernozem

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
Ah	12	loamy sand	granular	loose, moist	5.5	4.4
Bm	18	loamy sand	prismatic	very friable, moist	5.5	1.16
BC 1	40	sand	amorphous	loose, moist	5.2	nd[2]
BC 2	30+	sand	amorphous	loose, moist	5.1	nd

[1]OM — organic matter, [2]nd — not determined

Comments: (1) In general, the Chernozems occur under grass, and the Brunisols are found under aspen clumps. The two Brunisolic soil great groups are intimately and unpredictably associated.
(2) The only difference among the Orthic Black Chernozems, the Orthic Melanic Brunisols, and the Orthic Eutric Brunisols is the thickness of the Ah horizons, which are thickest in the Chernozems and thinnest in the Eutric Brunisols.
(3) Fine gravel commonly occurs in these soil sola.
(4) The esker along the northwestern shores of Borden and Laurier Lakes appears to be predominantly sandy gravel and fine gravel.
(5) Lime is occasionally found at 50 to 85 cm below the surface.
Limitations: Slight to very severe — slight on suitable topography for road location; moderate on suitable topography for camping areas, picnic areas, paths, and trails; severe for lawns and landscaping; good source of roadfill on suitable topography; good source of sand and gravel. Specific limitations include sandy surface texture, excessive slopes, surface stoniness.

Map Unit 6

Classification: Rego Gleysol and Rego Humic Gleysol
Parent Material: moderately coarse- to moderately fine-textured glaciolacustrine sediments
Landform: level glaciolacustrine (L^{Gl})
Slope: nearly level to gently undulating (0 to 2%)
Surface Stoniness: stone free (0)
Drainage: poorly drained
Vegetation: balsam poplar, willow, aspen, dogwood, saskatoon-berry, hazelnut, wild rose, twinflower, grass; occasional white spruce and Canadian buffalo-berry
Profile Description: Rego Gleysol and Rego Humic Gleysol

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Om	7-15	predominantly mesic peat		
Ah	0-25	loam	granular	very friable, moist
CKg 1 or Ccag 1	25-40	loam to sandy loam	amorphous	very friable, moist
CKg 2 or Ccag 2	at 25-40	variable — loam, sandy clay loam, or clay loam (layers 20-55 cm thick)	amorphous	friable to very firm, moist

Comments: (1) Occasional pockets of peaty phases occur where the Om horizon is 15 cm thick. The Ah horizon also occurs as discontinuous pockets. Humic Gleysols have at least 10 cm of Ah.
(2) Occasionally, the texture of the CKg 2 or Ccag 2 horizon is sand.
Limitations: Severe for all uses; poor source of roadfill; poor source of sand or gravel due to wetness, and unsuitable textures. Specific limitations include seasonally high groundwater table or surface ponding, flooding hazard (overflow), thin Ah horizon.

Map Unit 7

Classification: Orthic and Dark Gray Luvisol — 70%; Orthic Dark Gray Chernozem — 30%
Parent Material: moderately coarse- to very coarse—textured glaciofluvial sediments (sand), overlying moderately coarse- to moderately fine-textured till — 80%; moderately coarse- to moderately fine-textured till — 20%
Landform: glaciofluvial veneer, overlying hummocky morainal ($F^{G}v/Mh$)
Slope: moderately to strongly rolling (>9 to 30%)
Surface Stoniness: slightly stony (1)
Drainage: well drained
Vegetation: aspen, hazelnut, saskatoon-berry, wild rose; some choke cherry, pin cherry, and dogwood
Profile Description: Dark Gray Luvisol, developed on sand overlying till

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	3	plentiful, very fine to coarse, horizontal and oblique roots			6.3	27.8
Ahe	20	fine sandy loam	platy	slightly hard, dry	5.9	2.04
Ae	15	fine sandy loam	amorphous	soft, dry	5.9	0.77
AB	20	fine sandy loam	prismatic	firm, moist	5.7	nd[2]
IIBt	35	loam	subangular blocky	very firm, moist	5.5	nd
IICca	10+	loam	amorphous	hard, dry	7.8	nd

[1]OM — organic matter, [2]nd — not determined

Profile Description: Orthic Dark Gray Chernozem, developed on sand overlying till

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	2-5	leaf litter		
Ah	10-13	sandy loam	granular	soft, dry
Bm	40	loamy sand to sand	amorphous	slightly hard to loose, dry

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
IIBC	35	loam	subangular blocky	hard, dry; friable moist
IICca	at 85-100	sandy clay loam	amorphous	friable to firm, moist

Profile Description: Orthic Gray Luvisol, developed on till

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	5	plentiful, very fine to coarse, horizontal roots			5.7	46.8
Ae	10	sandy loam	platy	hard, dry	4.9	1.14
Bt	40	sandy clay loam	subangular blocky	hard, dry	5.1	nd[2]
BC	25	sandy loam	amorphous	very hard, dry	6.2	nd
Cca	25+	sandy loam	amorphous	hard, dry	7.9	nd

[1]OM — organic matter, [2]nd — not determined

Comments: (1) The Orthic and Dark Gray Luvisols, developed on sand overlying till, both have the same features and profile description, except that the Ahe horizon is absent in the Orthic soils.
(2) The Orthic and Dark Gray Luvisols and the Orthic Dark Gray Chernozems, developed on sand overlying till, are all intimately and unpredictably associated. The Orthic Gray Luvisols developed on till occur on the crests of some knolls, which are often moderately to very stony on the surface (stony 2 to 3).
Limitations: (for the soils developed on sand overlying till) Severe for all uses; poor source of roadfill; poor source of sand because of thin deposits and unsuitable textures; unsuitable as a source of gravel because of unsuitable textures. Specific limitations include erosion hazard, excessive slopes, susceptibility of the till to frost heave, moderate shrink-swell potential of the till. For limitations of the soils developed on till, see map unit 8.

Map Unit 8

Classification: Orthic and Dark Gray Luvisol — 70%; Orthic Dark Gray Chernozem — 30% (These soils are intimately and unpredictably associated.)
Parent Material: moderately coarse- to moderately fine-textured till
Landform: hummocky morainal (Mh), inclined morainal (Mi), undulating morainal (Mu)

Slope: undulating to hilly (>2 to 60%)
Surface Stoniness: stone free to slightly stony (0 to 1)
Drainage: well drained
Vegetation: mostly forested with some grassland, generally on south-facing slopes. Forest—aspen, hazelnut, saskatoon-berry, wild rose; some choke cherry, pin cherry, dogwood, low-bush cranberry, wild red raspberry. Grassland — native grass, pasture sagewort; patches of saskatoon-berry, and buckbrush
Profile Description: Orthic Gray Luvisol

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	5	plentiful, very fine to coarse, horizontal roots			5.7	46.8
Ae	10	sandy loam	platy	hard, dry	4.9	1.14
Bt	40	sandy clay loam	subangular blocky	hard, dry	5.1	nd[2]
BC	25	sandy loam	amorphous	very hard, dry	6.2	nd
Cca	25+	sandy loam	amorphous	hard, dry	7.9	nd

[1]OM — organic matter, [2]nd — not determined

Profile Description: Dark Gray Luvisol

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	5	plentiful, very fine to coarse, horizontal and oblique roots.			6.8	42.4
Ahe	40	sandy loam	platy	slightly hard, dry; very friable, moist	5.5	2.21
Bt	25	gravelly loam	prismatic, breaking to subangular blocky	very hard, dry	5.1	nd[2]
BC	25	loam	prismatic	hard, dry	6.1	nd
Cca	10+	loam	amorphous	hard, dry	7.8	nd

[1]OM — organic matter, [2]nd — not determined

Profile Description: Orthic Dark Gray Chernozem

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	2-7	leaf litter (absent under grass)		
Ah	15-20	loam	granular	very friable, moist; slightly hard, dry.
AB (or Ahe and Ae)	2-15	loam to fine sandy loam	amorphous or platy	slightly hard, dry; very friable, moist
Bt	25-50	clay loam	subangular blocky	firm to very firm, moist; hard, dry.
or Bm	25-50	clay loam	prismatic	firm to very firm, moist; hard, dry
BC	0-50	clay loam	amorphous	firm, moist; slightly hard to hard, dry
Cca	at 50-100	clay loam	amorphous	firm, moist; slightly hard to hard, dry

Comments: (1) The BC and Cca horizons of map unit 8 soils vary greatly in texture. Where the general texture is clay loam, small pockets of loam-, sandy loam-, or loamy sand-textured materials are commonly found. Also, silty clay-textured materials are occasionally found.
(2) On dry south-facing slopes, where grass is the dominant vegetation, lime usually occurs within 35 cm of the surface, and often the Ah horizons are only 2 to 7 cm thick. These soils can be classified as Orthic Melanic Brunisols.
Limitations: Slight to very severe-slight on suitable topography for camping areas, picnic areas, paths, and trails; moderate on suitable topography for lawns landscaping; severe to very severe for road location; poor source of roadfill; very poor source of sand or gravel because of unsuitable textures. Specific limitations include erosion hazard, excessive slopes, susceptibility to frost heave, and moderate shrink-swell potential.

Map Unit 9

Classification: Eluviated Eutric Brunisol — 70%; Orthic Gray Luvisol — 30% (These two soils are intimately and unpredictably associated.)
Parent Material: very coarse-textured glaciofluvial sediments (very gravelly sand, sandy gravel, fine gravel)

Landform: hummocky glaciofluvial (F^{Gh})
Slope: gently to strongly rolling (>5 to 30%)
Surface Stoniness: stone free to moderately stony (0 to 2)
Vegetation: aspen, common bearberry, grass, saskatoon-berry, wild rose
Profile Description: Eluviated Eutric Brunisol

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	2-3	leaf litter		
Ah or Ahe	0-5	sand to loamy sand	amorphous	loose, dry or moist
Aej	2-15	sand to loamy sand	amorphous	loose, dry or moist
Bm	30-50	sand to loamy sand	amorphous	loose, dry or moist
BC	at 35-65	sandy gravel to gravel	amorphous	loose, dry or moist

Profile Description: Orthic Gray Luvisol

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	3	plentiful, very fine to coarse, horizontal roots			6.4	31.8
Ah	4	loamy sand	amorphous	very friable, moist	5.5	6.29
Ae	20	loamy sand	amorphous	very friable, moist; soft, dry	5.6	1.61
AB	6	gravelly sandy loam	amorphous	slightly hard, dry	6.3	nd[2]
Bt	15	very gravelly sandy loam	subangular blocky	firm, moist	6.4	nd
BC1	35	very gravelly sand	amorphous	loose, dry	6.4	nd
BC2	20+	very gravelly sand	amorphous	loose, moist	6.1	nd

[1]Om — organic matter, [2]nd — not determined

Comments: The Ah horizons are discontinuous.
Limitations: Slight to severe-slight on suitable topography for road location; moderate on suitable topography for camping areas, picnic areas, paths, and trails; severe for lawns and landscaping; good source of roadfill on suitable topography; good source of sand and gravel. Specific limitations include sandy surface texture, surface stoniness, excessive slopes.

Map Unit 10

Classification: Orthic Dark Gray Chernozem — 80%; Orthic Melanic and Eutric Brunisol — 20% (These soils are all intimately and unpredictably associated.)
Parent Material: very coarse- to moderately coarse-textured glaciofluvial sediments (sand)
Landform: hummocky glaciofluvial ($F^{G}h$)
Slope: gently to moderately rolling (>5 to 15%)
Surface Stoniness: stone free (0)
Drainage: very rapidly drained
Vegetation: aspen, saskatoon-berry, hazelnut, choke cherry, wild rose, grass, forbs
Profile Description: Orthic Dark Gray Chernozem

Horizon	Thickness (cm)	Lab Texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	6	plentiful, fine to coarse, horizontal roots.			6.6	41.5
Ah	20	loamy fine sand	granular	very friable, moist	6.0	5.61
Bm	22	fine sand	amorphous	loose, moist	6.3	0.70
BC1	28	fine sand	amorphous	loose, moist	6.1	nd[2]
BC2	30+	loamy fine sand	amorphous	loose, moist	6.2	nd

[1]OM — organic matter, [2]nd — not determined

Comments: (1) The only difference among the Orthic Dark Gray Chernozems, the Orthic Melanic Brunisols, and the Orthic Eutric Brunisols is the thickness of the Ah horizon; which is thickest in the Chernozems and thinnest in the Eutric Brunisols. Ah horizons in map unit 10 soils range from 0 to 30 cm thick, and often have sandy loam textures.
(2) These soils are generally not quite as coarse-textured as soils of the other map units developed on glaciofluvial sediments. Textures of Ah horizons are commonly sandy loam, and of Bm horizons sandy loam to loamy sand. BC horizons often have alternating layers of loam- to fine sandy loam- and loamy sand-textured sediments, ranging from 15 to 30 cm thick.
Limitations: Severe for lawns and landscaping; moderate for all other uses; fair source of sand, and unsuitable as a source of gravel due to unsuitable textures. Specific limitations include sandy surface textures, excessive slopes, erosion hazard, and rapid permeability (droughtiness).

F (Organic Soil)

Classification: Fibrisol
Parent Material: predominantly fibric peat, overlying predominantly mesic peat
Landform: horizontal bog (Bh)
Slope: nearly level (0 to 0.5%)
Surface Stoniness: stone free (0)
Drainage: very poorly drained
Vegetation: black spruce, sphagnum moss, Labrador tea, bog cranberry, small bog cranberry, bog rosemary, cotton grass, some tamarack and some sedge
Profile Description: Fibrisol

Horizon	Thickness (cm)	Field Description
Of	120	predominantly fibric peat
Om	40 +	predominantly mesic peat

Limitations: Very severe for all uses; unsuitable as a source of roadfill, sand or gravel. Specific limitations include organic soil, extreme wetness, a high shrink-swell potential, and lack of an Ah horizon.

M (Organic Soil)

Classification: Mesisol
Parent Material: predominantly fibric peat, overlying predominantly mesic peat
Landform: horizontal fen (Nh)
Slope: nearly level (0 to 0.5%)
Surface Stoniness: stone free (0)
Drainage: very poorly drained
Vegetation: sedge, feathermoss, bog rosemary, swamp birch, marsh marigold; some small tamarack
Profile Description: Mesisol

Horizon	Thickness (cm)	Field Description
Of	75	predominantly fibric peat
Om	85 +	predominantly mesic peat

Limitations: Very severe for all uses; unsuitable as a source of sand or gravel. Specific limitations include organic soil, extreme wetness, a high shrink-swell potential, and lack of an Ah horizon.

TM (Organic Soil)

Classification: Terric Mesisol
Parent Material: predominantly mesic peat, overlying undifferentiated mineral material
Landform: horizontal fen (Nh)
Slope: nearly level (0 to 0.5%)
Surface Stoniness: stone free (0)
Drainage: very poorly drained
Vegetation: sedge; patches of open water, with common cattail and willow around fringes
Profile Description: Terric Mesisol

Horizon	Thickness (cm)	Field Description
Om	70	predominantly mesic peat
Cg	at 70	undifferentiated mineral material

Comments: (1) Near the edges of these soil areas, where the thickness of the surface Om horizon is less than 40 cm, the soils can be classified as peaty phases of Gleysols.
(2) Textures and other characteristics of terric layers in the TM soils and parent materials of adjacent mineral soils are usually similar.
Limitations: Very severe for all uses; unsuitable as a source of roadfill, sand or gravel. Specific limitations include organic soil, extreme wetness, a high shrink-swell potential, and lack of an Ah horizon.

H (Organic Soil)

Classification: Humisol
Parent Material: predominantly humic peat
Landform: horizontal fen (Nh)
Slope: nearly level (0 to 0.5%)
Surface Stoniness: stony free (0)
Drainage: very poorly drained
Vegetation: white spruce, tamarack, white birch, alder, willow, sedge, feathermoss, marsh marigold, common nettle, currant, horsetail, dwarf raspberry; patches of Labrador tea
Profile Description: Humisol

Horizon	Thickness (cm)	Field Description
Oh	150+	predominantly humic peat

Limitations: Very severe for all uses; unsuitable as a source of roadfill, sand or gravel. Specific limitations include organic soil, extreme wetness, a high shrink-swell potential, and lack of an Ah horizon.

Special Features

The soils in Alberta have been classified into broad general zones (figure 2) as established by Alberta Soil Survey during the normal course of soil surveys, and correlated with temperature and precipitation records. Annual precipitation amounts change gradually from one soil zone to another, and are not abrupt changes at the point where a zone boundary has been located. A zone boundary is, therefore, a broad transitional belt, which can be many kilometres across. Topsoil colors reflect this gradual change. In the center of the Brown Soil Zone (annual precipitation about 30 to 33 cm), for example, topsoil colors are brown. Similarly, in the center of the Dark Brown Soil Zone (annual precipitation about 38 cm), topsoil colors are dark brown. Between these two zones, topsoil colors are brown to dark brown, and the annual precipitation is about 35 cm. The boundary between the two soil zones has been placed approximately at that midpoint.

Zonal soils are soils with well-developed soil characteristics that reflect the zonal or normal influences of climate and living organisms, mainly vegetation, as active factors of soil genesis. Examples are Brown, Dark Brown, or Black soils of the Brown, Dark Brown, or Black Soil Zones respectively. Intrazonal soils are soils with morphology that reflects the influence of some local factor of relief, parent material or age, rather than of climate and vegetation. An example is Solonetzic soils, which develop as a result of salinization either from a saline parent material or from saturation by external saline waters. Solonetzic soils are found across many soil zones (figure 2). Azonal soils are without distinct genetic horizons, and are represented by Regosolic soils in Canada.

The study area is situated in the Dark Gray and Dark Gray Luvisolic Soil Zone, which is transitional. This particular area is especially transitional because the northern boundary coincides roughly with the boundary of the Luvisolic Soil Zone, and the southern boundary is only a few kilometres north of the Black Soil Zone. Black Chernozemic, Dark Gray Chernozemic, Dark Gray Luvisolic, and Orthic Gray Luvisolic soils are all found in the study area. They may all be considered zonally normal soils. A preponderance of Brunisolic soils are also found, and may be considered intrazonal. They have developed on very coarse-textured glaciofluvial materials, almost totally devoid of fines, and soil profile development has been minimal. The soils of the study area can be considered normal, both locally and regionally, since similar soils are common nearby, as well as further away within the general region (Wyatt *et al.,* 1944; Kocaoglu, 1975).

Two special features of soils in the study area are their very coarse textures, and very low moisture holding capacitites. First, they are very rapidly drained, and droughty. Second, they have loose consistence and thin L-H horizons, so they tend to deteriorate rapidly under human foot traffic. The Brunisols are especially fragile because they have thin or no Ah horizons. Thus surface horizons are very low in soil organic matter, an important soil-binding agent.

Miscellaneous Symbols

SLF This symbol indicates the location of a sanitary landfill site.

SR This symbol indicates areas where the soil solum has been removed by construction activities, exposing the C horizon at the surface. The areas are usually high sloping road ditch banks, or shallow burrow pits along the edge of a road. Soil characteristics similar to C horizons of adjacent soils can be expected.

 This symbol indicates small water-filled depressions. Vegetation includes wild mint, slough grass, other hydrophytic vegetation, and willow around the fringes.

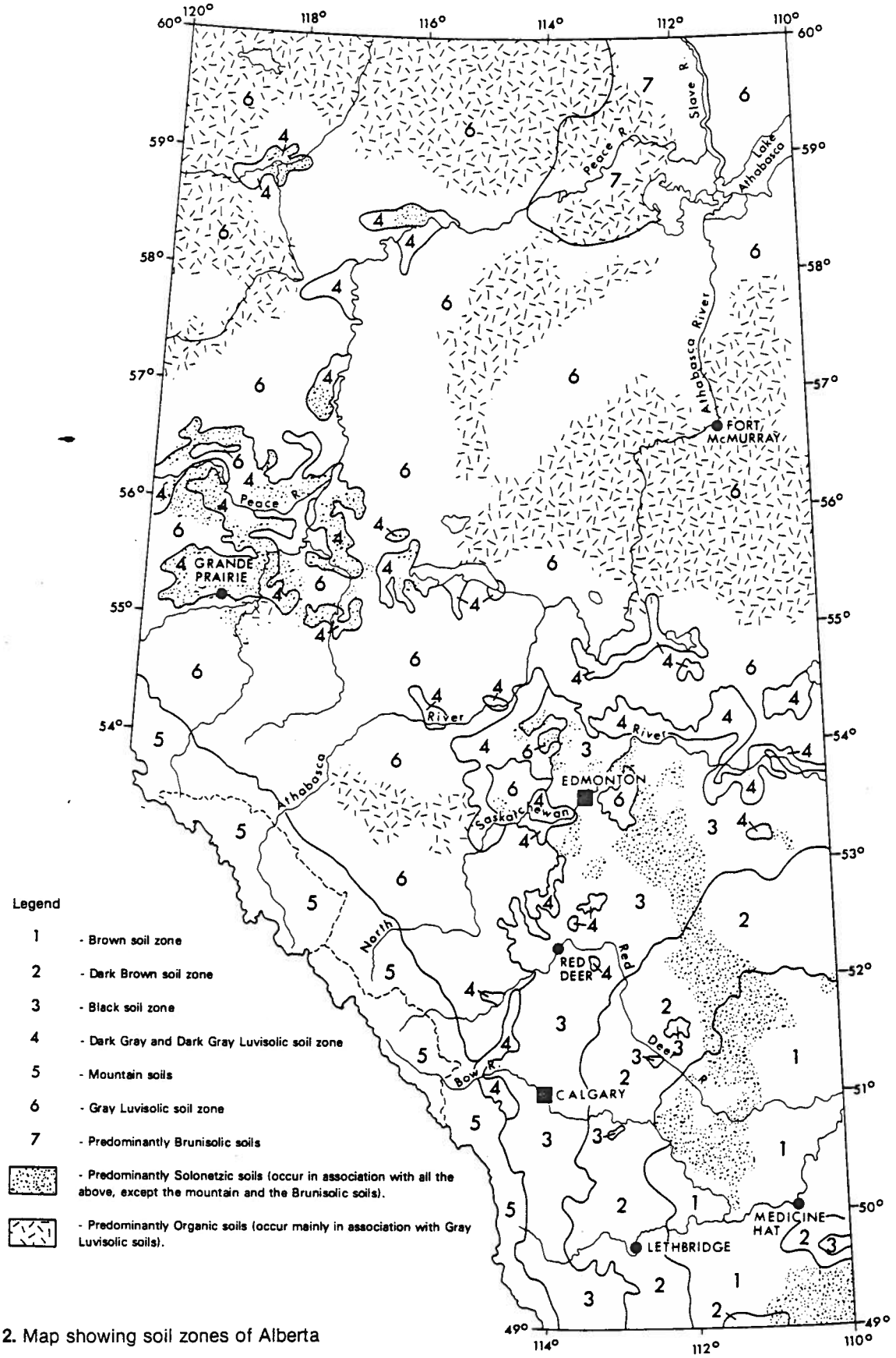

Figure 2. Map showing soil zones of Alberta

Soil Interpretations

Greenlee (1981) explains soil interpretations and definitions of the soil limitation and suitability ratings. Tables 2 and 3 contain results of soil chemical and physical analyses.

Tables 4 and 5 present soil erodibility ratings (K values) and predicted water erosion hazards of selected map units. As well as surface horizons, values have been worked out for soil parent materials, because they may be exposed during construction activities.

The soils most suited to recreational development in the mapped area, when found on suitable topography, are those of map unit 8. Unfortunately, these are of very limited extent, and occur only in the extreme northern portion. Map unit 6 soils have severe limitations due to wetness and a flooding hazard (overflow); and map unit 7 soils have severe limitations due to an erosion hazard. These two map units are of very limited extent in the mapped area as well. The soils of most other map units have moderate to severe limitations for recreation, when found on suitable topography, due mainly to sandy surface textures. An exception is map unit 2 soils, which have seasonally high groundwater tables, but the surface textures are not quite as coarse as those of most other soils in the area. Map unit 2 soils are of limited extent also, but a few patches occur between Laurier and Borden Lakes. Map unit 10 soils are somewhat better suited to recreational development than the other sandy soils, because of slightly finer textures. These soils are found only around Ross Lake. Considering the very coarse-textured soils of map units 1, 4, 5 and 9, those of map units 4 and 5 are probably the better suited to recreation because of the Chernozemic soils. These have thicker Ah horizons, and therefore higher organic matter contents in surface horizons, than Brunisolic and Luvisolic soils. Available plant nutrient levels and productive capacities are also higher in the Chernozemic soils.

Soils of several map units in the study area, including those of map units 1, 4, 5 and 9, are well suited for road construction when found on suitable topography. Collectively these four map units cover most of the study area. Soils of map unit 2 have moderate limitations due to seasonally high groundwater tables; and soils of map units 3 and 10 have moderate limitations due to erosion hazards. Map unit 6 soils have severe limitations due to seasonally high groundwater tables or surface ponding, and a possible flooding hazard (overflow). Soils of map units 7 and 8 have severe limitations because of a susceptibility of frost heave, moderate shrink-swell potentials, and erosion hazards.

Soils of map units 1, 4 and 5 constitute good sources of sand; and soils of map unit 9 constitute a good source of gravel. Soils of map units 2, 3 and 10 are only fair sources of sand because of unsuitable textures; map unit 2 soils also have seasonally high groundwater tables. Map units 6 and 7 soils are poor sources of sand, and map unit 8 soils are a very poor source, all because of unsuitable textures. Map unit 6 soils also have seasonally high groundwater tables or surface ponding, and the sand deposits of map unit 7 soils are thin.

The organic soil map units (F, M, TM and H) have severe limitations for all uses, and are unsuitable as sources of sand and gravel, due to extreme wetness and the inherent properties of organic soils (see Greenlee, 1981).

Specific limitations and suitabilities of the various soils for selected uses are shown in tables 6 to 14. The ratings were determined on the basis of morphological, physical, and chemical properties of the soils, as well as steepness of slope. The principal limiting properties are indicated, and are generally listed in decreasing order of importance.

Limitations due to slope are not further subdivided once the slope becomes steep enough to cause a very severe limitation for a specified use. The steeper the slope, the more severe the limitation, and this fact should be kept in mind while using the soil interpretation tables. In tables 6 to 12 the soil limitations for various uses have been designated as none to slight, moderate, severe and very severe. In tables 13 and 14, the suitability of soils as sources of roadfill and as sources of sand and gravel, have been designated as good, fair, poor and very poor.

Table 2. Chemical and physical analyses of selected map units

Map Unit	Horizon	Depth cm	pH $CaCl_2$	pH H_2O	Exchangeable cations [1]meq/100 g soil				[2]CEC meq/100 g
					Na^+	K^+	Ca^{++}	Mg^{++}	
1	L-H	5-0	5.3	5.2	[3]nd	nd	nd	nd	nd
	Aej	0-8	4.9	5.4	0.01	0.09	1.7	0.21	2.6
	Bm	8-25	4.8	5.2	0.02	0.13	0.91	0.10	2.0
	BC1	25-60	4.9	5.6	0.01	0.08	0.69	0	0.9
	BC2	60-100	5.4	6.0	0.01	0.12	1.7	0.31	1.6
2	L-H	6-0	5.6	5.8	nd	nd	nd	nd	nd
	Ahe	0-4	5.6	5.8	nd	nd	nd	nd	nd
	Ae	4-12	5.9	6.2	0.01	0.25	5.3	0.92	5.5
	Aeg	12-46	5.9	6.5	0.01	0.22	3.3	0.92	3.6
	Btg	46-76	6.4	6.8	0.02	0.40	7.1	4.2	10.1
	BCg	76-100	6.2	6.9	0.01	0.08	1.7	0.8	1.9
3	L-H	8-0	5.8	6.0	nd	nd	nd	nd	nd
	Ae1	0-6	4.9	5.2	0.01	0.29	4.4	0.31	6.2
	Ae2	6-30	5.7	6.2	0.02	0.27	3.0	0.26	3.7
	Ae3	30-40	6.0	6.5	0.01	0.16	2.2	0.31	2.5
	Bt1	40-41				not sampled			
	AB1	41-55	6.1	6.4	0.02	0.32	6.3	1.8	7.4
	AB2	55-70	6.1	6.6	0.01	0.16	3.8	1.0	4.4
	Bt2	70-82	6.9	7.2	0.04	0.63	11.4	3.1	11.2
	Cca	82-85	7.8	7.9	nd	nd	nd	nd	nd
	C	85-100	7.6	8.0	nd	nd	nd	nd	nd
4	L-H	4-0	5.1	5.2	nd	nd	nd	nd	nd
	Ah	0-8	5.0	5.4	0.05	0.08	2.7	0.26	3.1
	Bm	8-30	5.3	6.0	0.01	0.07	1.5	0.26	1.8
	BC1	30-60	5.2	5.9	0.01	0.04	1.0	0.10	1.1
	BC2	60-100	5.0	5.7	0	0.04	0.91	0.15	1.0

[3]OC %	$CaCO_3$ equiv %	Mech. Analysis % from frac < 2 mm diam. sand	silt	clay	[4]VFS %	5% CF	Texture Lab det	Texture Field est
15.7	nd	-	-	-	-	0	-	-
0.74	nd	89	11	0	6	0	S	LS
nd	nd	87	11	2	6	0	S	LS
nd	nd	93	6	1	5	0	S	S
nd	0	96	3	1	4	0	S	S
26.6	nd	-	-	-	-	0	-	-
3.7	nd	nd	nd	nd	nd	0	nd	LS
0.82	nd	74	25	1	14	0	LS	LS
nd	nd	77	20	3	11	0	LS	LS
nd	nd	59	23	18	10	0	SL	CL
nd	0	96	1	3	0	10	S	S
27.2	nd	-	-	-	-	0	-	-
1.4	nd	72	28	0	20	0	LS	LS
nd	nd	71	25	4	18	0	SL	SL
nd	nd	83	17	0	13	40	LS	[gv]LS[7]
		not sampled				40	nd	[gv]CL
nd	nd	76	15	9	35	0	FSL	SL
nd	nd	86	12	2	14	60	LS-S	[vgv]LS[7]
nd	nd	40	36	24	18	0	L	CL
nd	18.7	nd	nd	nd	nd	0	nd	SiL
nd	0.67	86	12	2	57	0	VFLS-VFS	LFS
16.5	nd	-	-	-	-	0	-	-
0.77	nd	93	6	1	3	0	S	S
0.15	nd	89	10	1	4	0	S	S
nd	nd	93	7	0	5	5	S	S
nd	0	97	3	0	3	5	S	S

[1]meq - milliequivalents, [2]CEC - cation exchange capacity, [3]OC - organic carbon, [4]VFS - very fine sand, [5]CF-coarse fragments (>2 mm diam) (field estimate), [6]nd - not determined , [7]gv - gravelly, vgv - very gravelly

Table 2. Chemical and physical analyses of selected map units *continued*

Map Unit	Horizon	Depth cm	pH $CaCl_2$	pH H_2O	Exchangeable cations [1]meq/100 g soil Na^+	K^+	Ca^{++}	Mg^{++}	[2]CEC meq/100 g
5	Ah	0-12	5.5	5.8	0.02	0.17	10.0	1.2	11.4
	Bm	12-30	5.5	6.0	0.01	0.05	3.0	0.41	4.4
	BC1	30-70	5.2	6.0	0.01	0.03	1.0	0.15	1.7
	BC2	70-100	5.1	6.1	0.01	0.02	0.56	0.05	1.1
7	L-H	3-0	6.3	6.5	nd	nd	nd	nd	nd
	Ahe	0-20	5.9	6.2	0.03	0.38	6.5	1.6	6.8
	Ae	20-35	5.9	6.3	0.01	0.28	3.5	1.1	4.0
	AB	35-55	5.7	6.1	0.03	0.27	5.1	2.2	6.2
	IIBt	55-90	5.5	6.0	0.06	0.31	7.8	3.3	10.1
	IICca	90-100	7.8	8.0	nd	nd	nd	nd	nd
8	L-H	5-0	5.7	5.9	nd	nd	nd	nd	nd
	Ae	0-10	4.9	5.3	0.05	0.14	3.0	0.87	3.7
	Bt	10-50	5.1	5.3	0.05	0.24	9.2	4.7	10.8
	BC	50-75	6.2	6.4	0.04	0.20	8.1	4.0	9.4
	Cca	75-100	7.9	8.1	nd	nd	nd	nd	nd
8	L-H	5-0	6.8	7.0	nd	nd	nd	nd	nd
	Ahe	0-40	5.5	5.7	0.03	0.19	8.4	2.9	10.1
	Bt	40-65	5.1	5.5	0.05	0.23	7.7	3.1	9.5
	BC	65-90	6.1	6.7	0.05	0.20	7.8	2.9	8.0
	Cca	90-100	7.8	8.0	nd	nd	nd	nd	nd
9	L-H	3-0	6.4	6.5	nd	nd	nd	nd	nd
	Ah	0-4	5.5	5.8	0.01	0.29	14.3	1.4	14.5
	Ae	4-24	5.6	6.0	0.01	0.13	4.7	0.36	4.5
	AB	24-30	6.3	6.7	0.02	0.25	5.5	0.72	5.1
	Bt	30-45	6.4	6.7	0.02	0.52	8.3	1.8	8.3
	BC1	45-80	6.4	7.3	0.03	0.09	1.7	0.41	1.5
	BC2	80-100	6.1	7.2	0	0.07	1.1	0.26	0.9

[3]OC %	$CaCO_3$ equiv %	Mech. Analysis % from frac<2 mm diam. sand	silt	clay	[4]VFS %	5% CF	Texture Lab det	Field est
2.6	nd	85	12	3	2	0	LS	LS
0.68	nd	78	17	5	3	0	LS	LS
[6]nd	0.06	96	4	0	1	0	S	S
nd	0.10	98	2	0	1	0	S	S
16.4	nd	-	-	-	-	0	-	-
1.2	nd	69	30	1	22	0	FSL	FSL
0.45	nd	72	20	8	26	0	FSL	LFS
nd	nd	71	16	13	30	0	FSL	L
nd	nd	48	29	23	11	15	L	CL
nd	6.8	51	32	17	10	15	L	SCL
27.5	nd	-	-	-	-	5	-	-
0.67	nd	61	34	5	12	5	SL	SL
nd	nd	52	26	22	10	15	SCL	CL
nd	nd	53	30	17	11	15	SL	CL
nd	7.7	53	31	16	11	15	SL	CL
24.8	nd	-	-	-	-	0	-	-
1.30	nd	60	26	14	15	15	SL	L
nd	nd	51	30	19	12	25	L	[7]gvSCL
nd	0	51	31	18	11	15	L	SCL
nd	8.8	44	39	17	12	15	L	L
18.7	nd	-	-	-	-	0	-	-
3.7	nd	80	16	4	3	5	LS	SL
0.95	nd	76	19	5	5	5	LS	LS
nd	nd	66	24	10	7	40	SL	gvL
nd	nd	77	8	15	5	80	SL	vgvCL
nd	nd	96	2	2	1	100	S	VFG[8]
nd	0	96	4	0	1	100	S	VFG

[1]meq — milliequivalents, [2]CEC — cation exchange capacity, [3]OC — organic carbon, [4]VFS — very fine sand, [5]CF — coarse fragments (>2 mm diam) (field estimate), [6]nd — not determined, [7]gv — gravelly, vgv — very gravelly, [8]VFG — very fine gravel

Table 2. Chemical and physical analyses of selected map units

Map Unit	Horizon	Depth cm	pH $CaCl_2$	pH H_2O	Exchangeable cations [1]meq/100 g soil Na^+	K^+	Ca^{++}	Mg^{++}	[2]CEC meq/100 g
10	L-H	6-0	6.6	6.8	nd	nd	nd	nd	nd
	Ah	0-20	6.0	6.2	0.03	0.52	10.5	2.5	17.0
	Bm	20-42	6.3	6.2	0.02	0.22	2.5	0.82	4.1
	BC1	42-70	6.1	6.6	0.01	0.14	1.5	0.72	2.3
	BC2	70-100	6.2	6.6	0.01	0.29	3.5	2.0	5.8

Table 3. Physical analyses of selected map units[1]

Map Unit	Depth cm	Field Moisture %	Mechanical Analysis: Percentage Passing Sieve 1 inch	3/4 inch	5/8 inch	#4 (4.7 mm)	#10 (2.0 mm)	#40 (0.42 mm)	#200 (0.074 mm)	Percentage Smaller Than 0.05 mm	0.005 mm	0.002 mm	0.001 mm
7	90-120	6	100	98	98	95	93	83	48	47	30	24	22
8	90-120	7	89	89	89	88	86	76	45	44	30	24	22
8	90-120	8	100	100	100	99	98	92	63	61	34	27	25

[3]OC %	$CaCO_3$ equiv %	Mech. Analysis % from frac<2 mm diam. sand	silt	clay	[4]VFS %	5% CF	Texture Lab det	Field est
24.4	nd	-	-	-	-	0	-	-
3.3	nd	80	15	5	23	0	LFS	LFS
0.41	nd	87	10	3	20	0	FS	LS
[6]nd	nd	90	8	2	18	0	FS	LS
nd	0.04	83	9	8	29	0	LFS	LS

[1]meq — milliequivalents, [2]CEC — cation exchange capacity, [3]OC — organic carbon, [4]VFS — very fine sand, [5]CF — coarse fragments (>2 mm diam) (field estimate), [6]nd — not determined

Liquid Limit	Plasticity Index	[2]Optimum Moisture %	[2]Maximum Dry Density lb/ft^3	Classification AASHO	Unified	USDA
23	10	11	122.5	A-4(3)	CL	SCL
23	9	11	121.0	A-4(2)	CL	SCL
26	12	12	120.0	A-6(7)	CL	L-CL

[1] Map units developed on similar parent material: 7 and 8
[2] These values are obtained from charts worked out by the Highways Testing Laboratory, Alberta Transportation.

Table 4. Soil erodibility ratings (K values) of selected map units

Map Unit	Horizon	K value[1]
1	Aej	0.14
	BC1	0.11
2	Ae	0.33
	BCg	0.02
3	Ae1	0.41
	Ae2	0.48
	C	0.64
4	Ah	0.07
	BC2	0.06
5	[2]Ah	0.03
	BC2	0.05
7	Ahe	0.50
	IICca	0.40
8	Ae	0.45
	Cca	o.39
8	Ahe	0.34
	Cca	0.50
9	Ah	0.09
	Ae	0.17
	BC2	0.06
10	Ah	0.20
	BC1	0.28
	BC2	0.41

[1]The K values were determined from data provided in this report using the soil erodibility nomograph presented in figure 5 of Greenlee (1981).

[2]Where the percent organic matter was more than 4, it was taken as 4 for the purposes of the nomograph.

Table 5. Predicted water erosion hazards of selected map units

Map Unit			Horizon	Erosion Risk[1]
1/co	1/do	1/eo	Aej	L
			BC1	L
	1/fo		Aej	L-M
			BC1	L
2/bo	2/co		Ae	L
			BCg	L
	3/b0		Ae1	L
			Ae2	L
			C	M
	3/do		Ae1	M
			Ae2	M-H
			C	M-H
	3/eo		Ae1	M-H
			Ae2	H
			C	H
	3/f0		Ae1	H
			Ae2	H
			C	H
4/co	4/do		Ah	L
4/eo	4/fo		BC2	L
5/co	5/do	5/eo	Ah	L
5/fo	5/g2		BC2	L
	7/e1		Ahe	H
			IICca	M-H
	7/f1		Ahe	H
			IICca	H
8/co	8/c1		Ae	L-M
			Cca	L-M
	8/d1		Ae	M-H
			Cca	M
	8/e1		Ae	H
			Cca	M-H
8/f1	8/g1		Ae	H
			Cca	H
8/co	8/c1		Ahe	L-M
			Cca	M
	8/d1		Ahe	M
			Cca	M-H
	8/e1		Ahe	M
			Cca	H
	8/f1		Ahe	M-H
			Cca	H

Table 5. Predicted water erosion hazards of selected map units

Map Unit	Horizon	Erosion Risk[1]
8/g1	Ahe	H
	Cca	H
9/do 9/d2 9/eo	Ah	L
	Ae	L
	BC2	L
9/fo 9/f2	Ah	L
	Ae	L-M
	BC2	L
10/do	Ah	L
	BC1	L-M
	BC2	M
10/eo	Ah	L
	BC1	M
	BC2	M-H

[1]L = erosion risk, M = Moderate erosion risk, H = High erosion risk. These ratings were derived by applying the K-values from Table 4 to the graph presented in figure 6 of Greenlee (1981).

Table 6. Soil limitations for primitive camping areas

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do 1/eo	M — Sandy
1/fo	M — Slope, Sandy, Er
[3] 2/bo 2/co	M — Wet, Flood
3/bo	SL
3/do 3/eo	M — Er
3/fo	S — Er, Slope
4/co 4/do 4/eo	M — Sandy
4/fo 4/fl	M — Slope, Sandy
5/co 5/do 5/eo	M — Sandy
5/fo	M — Slope, Sandy
5/g2	S — Slope, Sandy, Stony

Table 6. Soil limitations for primitive camping areas

Map Symbol[1]	Degree of Limitation[2]
6/ao 6/bo	S — Wet, Flood
[4] 7/e1	S — Er
7/f1	S — Er, Slope
8/co 8/c1	SL
8/d1 8/e1	M — Er
8/f1	S — Er, Slope
8/g1	S — Slope, Er
9/co 9/do 9/eo	M — Sandy
9/d2	M — Sandy, Stony
9/fo 9/f1	M — Slope, Sandy
9/f2	M — Slope, Sandy, Stony
10/do 10/eo	M — Sandy
F/ao M/ao TM/ao H/ao	VS — Org, Wet

[1] For explanation see soil map
[2] SL — None to slight, M — Moderate, S — Severe, VS — Very severe
[3] These limitations are for the Luvisols. The Gleysols have severe limitations because of wetness.
[4] These limitations are for the soils developed on sand overlying till. For limitations of the soils developed on till, see map unit 8.

Abbreviations

Er - Erosion hazard
Flood - Flooding hazard (overflow)
Org - Organic soil
Sandy - Sandy surface texture
Slope - Excessive slope
Stony - Surface stoniness
Wet - Seasonally high groundwater table or surface ponding

Table 7. Soil limitations for fully serviced campgrounds

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do	M — Sandy
1/eo	M — Slope, Sandy, Er
1/fo	S — Slope, Sandy, Er
[3]2/bo 2/co	M — Wet, Flood
3/bo	SL
3/do	M — Er
3/eo	M — Er, Slope
3/fo	S — Slope, Er
4/co 4/do	M — Sandy
4/eo	M — Slope, Sandy
4/fo 4/fl	S — Slope, Sandy
5/co 5/do	M — Sandy
5/eo	M — Slope, Sandy
5/fo	S — Slope, Sandy
5/g2	VS — Slope, Sandy, Stony
6/ao 6/bo	S — Wet, Flood
[4]7/el	S — ER, Slope
7/fl	S — Slope, Er
8/co 8/cl	SL
8/dl	M — Er
8/el	M — Er, Slope
8/fl	S — Slope, Er
8/gl	VS — Slope, Er

Table 7. Soil limitations for fully serviced campgrounds

Map Symbol[1]	Degree of Limitation[2]
9/co 9/do	M — Sandy
9/d2	M — Sandy, Stony
9/eo	M — Slope, Sandy
9/fo 9/fl	S — Slope, Sandy
9/f2	S — Slope, Sandy, Stony
10/do	M — Sandy
10/eo	M — Slope, Sandy
F/ao M/ao TM/ao H/ao	VS — Org, Wet

[1] For explanation, see soil map
[2] SL — None to slight, M — Moderate, S — Severe, VS — Very severe
[3] These limitations are for the Luvisols. The Gleysols have severe limitations due to wetness.
[4] These limitations are for the soils developed on sand overlying till. For limitations of the soils developed on till, see map unit 8.

Abbreviations

Er - Erosion hazard
Flood - Flooding hazard (overflow)
Org - Organic soil
Sandy - Sandy Surface Texture
Slope - Excessive slope
Stony - Surface Stoniness
Wet - Seasonally high groundwater table or surface ponding

Table 8. Soil limitations for picnic areas

Map Symbol[1]	Degree of Limitation[2]
1 co, 1 do	M — Sandy
1 eo	M — Slope, Sandy, Er
1 fo	S — Slope, Sandy, Er
[3]2 bo, 2 co	M — Wet
3 bo	SL
3 do	M — Er
3 eo	M — Er, Slope
3 fo	S — Slope, Er
4 co, 4 do	M — Sandy
4 eo	M — Slope, Sandy
4 fo, 4 f1	S — Slope, Sandy
5 co, 5 do	M — Sandy
5 eo	M — Slope, Sandy
5 fo	S — Slope, Sandy
5 g2	VS — Slope, Sandy
6 ao, 6 bo	S — Wet
[4]7 e1	S — Er, Slope
7 f1	S — Slope, Er
8 co, 8 c1	SL
8 d1	M — Er
8 e1	M — Er, Slope
8 f1	S — Slope, Er
8 g1	VS — Slope, Er

Table 8. Soil limitations for picnic areas

Map Symbol[1]	Degree of Limitation[2]
9 co, 9 do, 9 d2	M — Sandy
9 eo	M — Slope, Sandy
9 fo, 9 f1, 9 f2	S — Slope, Sandy
10 do	M — Sandy
10 eo	M — Slope, Sandy
F ao, M ao, TM ao, H ao	VS — Org, Wet

[1] For explanation, see soil map
[2] SL — None to slight, M — Moderate, S — Severe, VS — Very severe
[3] These limitations are for the Luvisols. The Gleysols have severe limitations due to wetness.
[4] These limitations are for the soils developed on sand overlying till. For limitations of the soils developed on till, see map unit 8.

Abbreviations

Er - Erosion hazard
Org - Organic soil
Sandy - Sandy Surface Texture
Slope - Excessive slope
Wet - Seasonally high groundwater table or surface ponding

Table 9. Soil limitations for lawns and landscaping

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do 1/eo	S — Sandy, R Perm, Thin Ah
1/fo	S — Slope, Sandy, R Perm
[3]2/bo 2/co	M — Wet, Thin Ah
3/bo	M — Thin Ah
3/do	M — Er, Thin Ah
3/eo	S — Er, Slope, Thin Ah
3/fo	S — Slope, Er, Thin Ah
4/co 4/do 4/eo	S — Sandy, R Perm, Thin Ah
4/fo 4/f1	S — Slope, Sandy, R Perm
5/co 5/do	S — R Perm, Sandy
5/eo	S — R Perm, Sandy, Slope
5/fo	S — Slope, R Perm, Sandy
5/g2	VS — Slope, R Perm, Sandy
6/ao 6/bo	S — Wet, Thin Ah
[4]7/e1	S — Er, Slope
7/f1	S — Slope, Er
8/co 8/c1	M — Thin Ah
8/d1	M — Er, Thin Ah
8/e1	S — Er, Slope, Thin Ah
8/f1	S — Slope, Er, Thin Ah
8/g1	VS — Slope, Er, Thin Ah

Table 9. Soil limitations for lawns and landscaping

Map Symbol[1]	Degree of Limitation[2]
9/co 9/do 9/d2	S — R Perm, Sandy, Thin Ah
9/eo	S — R Perm, Sandy, Slope
9/fo 9/f1 9/f2	S — Slope, R Perm, Sandy
10/do	S — R Perm, Sandy
10/eo	S — R Perm, Sandy, Slope
F/ao M/ao	VS — Wet, Org, Thin Ah
TM/ao H/ao	

[1] For explanation, see soil map
[2] SL — None to slight, M — Moderate, S — Severe, VS — Very severe
[3] These limitations are for the Luvisols. The Gleysols have severe limitations due to wetness.
[4] These limitations are for the soils developed on sand overlying till. For limitations of the soils developed on till, see map unit 8.

Abbreviations

Er - Erosion hazard
Org - Organic soil
R Perm - Rapid Permeability (droughtiness)
Sandy - Sandy Surface Texture
Slope - Excessive slope
Thin Ah - Thin or no Ah horizon
Wet - Seasonally high groundwater table or surface ponding

Table 10. Soil limitations for paths

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do	S — Sandy
1/eo	S — Sandy, Slope,Er
1/fo	S — Slope, Sandy, Er
[3]2/bo 2/co	M — Sandy, Wet
3/bo	M — Sandy
3/do	M — Sandy, Er
3/eo	S — Sandy, Slope, Er
3/fo	S — Slope, Er, Sandy
4/co 4/do	S — Sandy
4/eo	S — Sandy, Slope
4/fo 4/f1	S — Slope, Sandy
5/co 5/do	M — Sandy
5/eo	M — Slope, Sandy
5/fo	S — Slope, Sandy
5/g2	VS — Slope, Sandy, Stony
6/ao 6/bo	S — Wet
[4]7/e1	S — Er, Slope
7/f1	S — Slope, Er
8/co 8/c1	SL
8/d1	M — Er
8/e1	M — Er, Slope
8/f1	S — Slope, Er
8/g1	VS — Slope, Er

Table 10. Soil limitations for paths

Map Symbol[1]	Degree of Limitation[2]
9/co 9/do	M — Sandy
9/d2	M — Sandy, Stony
9/eo	M — Slope, Sandy
9/fo 9/f1	S — Slope, Sandy
9/f2	S — Slope, Sandy, Stony
10/do	M — Sandy
10/eo	M — Slope, Sandy
F/ao M/ao	VS — Org, Wet
TM/ao H/ao	

[1] For explanation, see soil map

[2] SL — None to slight, M — Moderate, S — Severe, VS — Very severe

[3] These limitations are for the Luvisols. The Gleysols have severe limitations due to wetness.

[4] These limitations are for the soils developed on sand overlying till. For limitations of the soils developed on till, see map unit 8.

Abbreviations

Er	- Erosion hazard
Org	- Organic soil
Sandy	- Sandy Surface Texture
Slope	- Excessive slope
Stony	- Surface Stoniness
Wet	- Seasonally high groundwater table or surface ponding

Table 11. Soil limitations for trails

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do 1/eo	S — Sandy
1/fo	S — Sandy, Slope, Er
[3]2/bo 2/co	M — Sandy, Wet
3/bo	M — Sandy
3/do 3/eo	M — Sandy, Er
3/fo	S — Sandy, Er, Slope
4/co 4/do 4/eo	S — Sandy
4/fo 4/f1	S — Sandy, Slope
5/co 5/do 5/eo	M — Sandy
5/fo	M — Slope, Sandy
5/g2	S — Slope, Sandy
6/ao 6/bo	S — Wet
[4]7/e1	S — Er
7/f1	S — Er, Slope
8/co 8/c1	SL
8/d1 8/e1	M — Er
8/f1	S — Er, Slope
8/g1	S — Slope, Er
9/co 9/do 9/eo	M — Sandy
9/d2	M — Sandy, Stony
9/fo 9/f1 9/f2	M — Slope, Sandy

Table 11. Soil limitations for trails

Map Symbol[1]	Degree of Limitation[2]
10/do 10/eo	M — Sandy
F/ao M/ao TM/ao H/ao	VS — Org, Wet

[1] For explanation, see soil map
[2] SL — None to slight, M — Moderate, S — Severe, VS — Very severe
[3] These limitations are for the Luvisols. The Gleysols have severe limitations due to wetness.
[4] These limitations are for the soils developed on sand overlying till. For limitations of the soils developed on till, see map unit 8.

Abbreviations

Er - Erosion hazard
Org - Organic soil
Sandy - Sandy Surface Texture
Slope - Excessive slope
Stony - Surface stoniness
Wet - Seasonally high groundwater table or surface ponding

Table 12. Soil limitations for road location

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do	SL
1/eo	M — Slope
1/fo	S — Slope
[3]2/bo 2/co	M — Wet, Flood
3/bo 3/do	M — Er
3/eo	S — Er, Slope
3/fo	S — Slope, Er
4/co 4/do	SL
4/eo	M — Slope
4/fo 4/f1	S — Slope
5/co 5/do	SL
5/eo	M — Slope
5/fo	S — Slope
5/g2	VS — Slope
6/ao 6/bo	S — Wet, Flood
7/e1	S — Frost, Er, M Sh-Sw
7/f1	S — Slope, Er, Frost
8/co 8/c1	S — Frost, M Sh-Sw
8/d1	S — Frost, M Sh-Sw, Er
8/e1	S — Frost, Er, M Sh-Sw
8/f1	S — Slope, Er, Frost
8/g1	VS — Slope, Er, Frost

Table 12. Soil limitations for road location

Map Symbol[1]	Degree of Limitation[2]
9/co 9/do 9/d2	SL
9/eo	M — Slope
9/fo 9/f1 9/f2	S — Slope
10/do	M — Er
10/eo	M — Slope, Er
F/ao M/ao	Vs — Org, Wet, Sh-Sw
TM/ao H/ao	

[1] For explanation, see soil map

[2] SL — None to slight, M — Moderate, S — Severe, VS — Very severe

[3] These limitations are for the Luvisols. The Gleysols have severe limitations because of wetness.

Abbreviations

Er	- Erosion hazard
Flood	- Flooding hazard (overflow)
Frost	- Susceptibility to frost heave
M Sh-Sw	- Moderate shrink-swell potential
Org	- Organic soil
Sh-Sw	- High shrink-swell potential
Slope	- Excessive slope
Wet	- Seasonally high groundwater table or surface ponding

Table 13. Soil suitability for source of roadfill

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do 1/eo	G
1/fo	F — Slope
[3]2/bo 2/co	F — Wet
3/bo 3/do	F — Er
3/eo	P — Er
3/fo	P — Er, Slope
4/co 4/do 4/eo	G
4/fo 4/f1	F — Slope
5/co 5/do 5/eo	G
5/fo	F — Slope
5/g2	P — Slope
6/ao 6/bo	P — Wet
7/e1	P — Frost, Er, M Sh-Sw
7/f1	P — Er, Frost, Slope
8/co 8/c1	P — Frost, M Sh-Sw
8/d1 8/e1	P — Frost, Er, M Sh-Sw
8/f1	P — Er, Frost, Slope
8/g1	P — Slope, Er, Frost
9/co 9/do	G
9/d2 9/eo	
9/fo 9/f1 9/f2	F — Slope
10/do 10/eo	F — Er
F/ao M/ao	Vs — Org, Wet, Sh-Sw
TM/ao H/ao	

[1] For explanation, see soil map
[2] G — Good, F — Fair, P — Poor, VP — Very poor
[3] These suitabilities are for the Luvisols. The Gleysols are poor sources because of wetness.

Abbreviations

Er - Erosion hazard
Frost - Susceptibility to frost heave
M Sh-Sw - Moderate shrink-swell potential
Org - Organic soil
Sh-Sw - High shrink-swell potential
Slope - Excessive slope
Wet - Seasonally high groundwater table or surface ponding

Table 14. Soil suitability for source of sand or gravel

Map Symbol[1]	Degree of Limitation[2]
1/co 1/do 1/eo 1/fo	G
[3]2/bo 2/co	F — Wet
3/bo 3/do 3/eo 3/fo	F — Text
4/co 4/do 4/eo 4/fo 4/f1	G
5/co 5/do 5/eo 5/fo 5/g2	G
6/ao 6/bo	P — Wet, Text
[4]7/e1 7/f1	P — Thin, Text
8/co 8/c1 8/d1 8/e1 8/f1 8/g1	VP — Text
9/co 9/do 9/d2 9/eo 9/fo 9/f1 9/f2	G
10/do 10/eo	F — Text
F/ao M/ao TM/ao H/ao	VP — Org, Wet, Text

[1] For explanation, see soil map
[2] G — Good, F — Fair, P — Poor, VP — Very poor
[3] These suitabilities are for the Luvisols. The Gleysols are poor sources due to wetness, and unsuitable textures.
[4] These suitabilities are for the soils developed on sand overlying till. For suitabilities of the soils developed on till, see map unit 8.

Abbreviations

Org - Organic soil
Text - Unsuitable texture
Thin - Thin deposit of sand or gravel
Wet - Seasonally high groundwater table or surface ponding

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SOIL LIMITATIONS FOR RECREATION IN WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 **NE**

LEGEND:

SL	- none to slight soil limitations
M	- moderate soil limitations
S	- severe soil limitations
VS	- very severe soil limitations
~	- soil limitation line
—·—	- boundary of mapped area
←	- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
Mapped and Compiled by:
G.M. Greenlee, P. Ag.
Soils Department
1981

Alberta
RESEARCH COUNCIL

SOIL LIMITATIONS FOR RECREATION IN WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 **NW**

LEGEND:

SL	- none to slight soil limitations
M	- moderate soil limitations
S	- severe soil limitations
VS	- very severe soil limitations
⌒	- soil limitation line
—·—	- boundary of mapped area
←	- slope direction

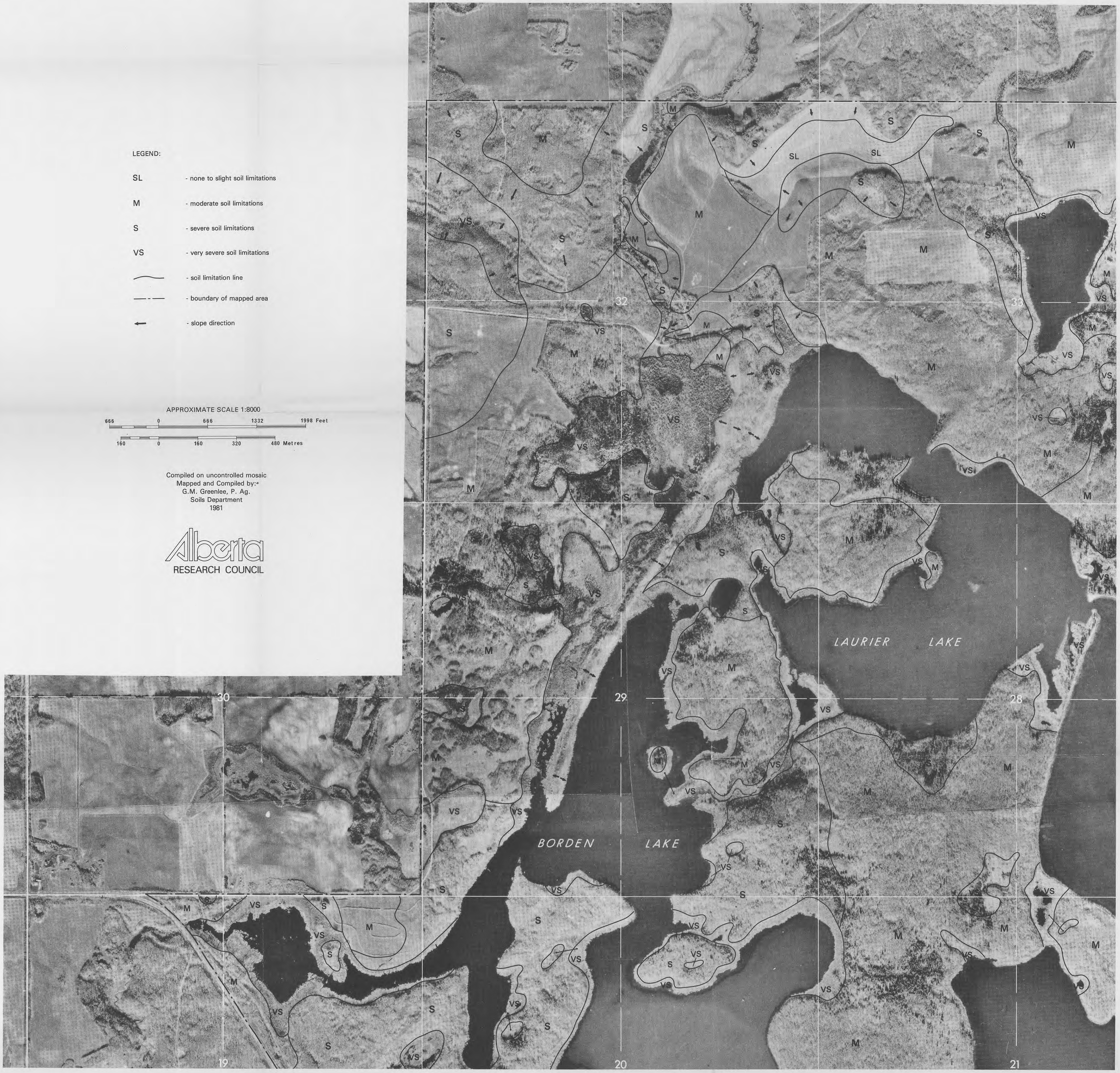
APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
Mapped and Compiled by:*
G.M. Greenlee, P. Ag.
Soils Department
1981

Alberta
RESEARCH COUNCIL



SOIL LIMITATIONS FOR RECREATION IN WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 **SW**

LEGEND:

SL	- none to slight soil limitations
M	- moderate soil limitations
S	- severe soil limitations
VS	- very severe soil limitations
⌒	- soil limitation line
—·—	- boundary of mapped area
←	- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
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1981

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SOIL LIMITATIONS FOR RECREATION IN WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 **SE**

LEGEND:

SL	- none to slight soil limitations
M	- moderate soil limitations
S	- severe soil limitations
VS	- very severe soil limitations
~	- soil limitation line
—·—	- boundary of mapped area
←	- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
Mapped and Compiled by:
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Soils Department
1981

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SOIL MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 NW

SOIL CLASSIFICATION

MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Brunisolic	Orthic Eutric Brunisol-80% Eluviated Eutric Brunisol-20%	very coarse-textured glaciofluvial sediments (sand)
2	Luvisolic-80%	Gleyed Gray Luvisol	very coarse-textured glaciofluvial sediments (sand)
	Gleysolic-20%	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
3	Luvisolic	Orthic Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments (sand)
4	Brunisolic-70%	Orthic Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand)
	Chernozemic-30%	Orthic Black Chernozem	
5	Chernozemic-60%	Orthic Black Chernozem	very coarse-textured glaciofluvial sediments (fine gravel and sand)
	Brunisolic-40%	Orthic Melanic Brunisol and Orthic Eutric Brunisol	
6	Gleysolic	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
7	Luvisolic-70%	Orhtic and Dark Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments, overlying moderately coarse-to moderately fine-textured till-80% moderately coarse-to moderately fine-textured till-20%
	Chernozemic-30%	Orthic Dark Gray Chernozem	
8	Luvisolic-70%	Orthic and Dark Gray Luvisol	moderately coarse-to moderately fine-textured till
	Chernozemic-30%	Orthic Dark Gray Chernozem	
9	Brunisolic-70%	Eluviated Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand and gravel)
	Luvisolic-30%	Orthic Gray Luvisol	
10	Chernozemic-80%	Orthic Dark Gray Chernozem	very coarse-to moderately coarse-textured glaciofluvial sediments (sand)
	Brunisolic-20%	Orthic Melanic and Eutric Brunisol	
F	Organic	Fibrisol	predominantly fibric peat, overlying predominantly mesic peat
M	Organic	Mesisol	predominantly fibric peat, overlying predominantly mesic peat
TM	Organic	Terric Mesisol	predominantly mesic peat, overlying undifferentiated mineral material
H	Organic	Humisol	predominantly humic peat

LEGEND:

Map Symbol:

4 ← map unit
e 0 ← surface stoniness rating
topographic class

SLF - sanitary landfill site

SR - surface removed

- small water-filled depression

- soil line

- boundary of mapped area

- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
Mapped and Compiled by:
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1981

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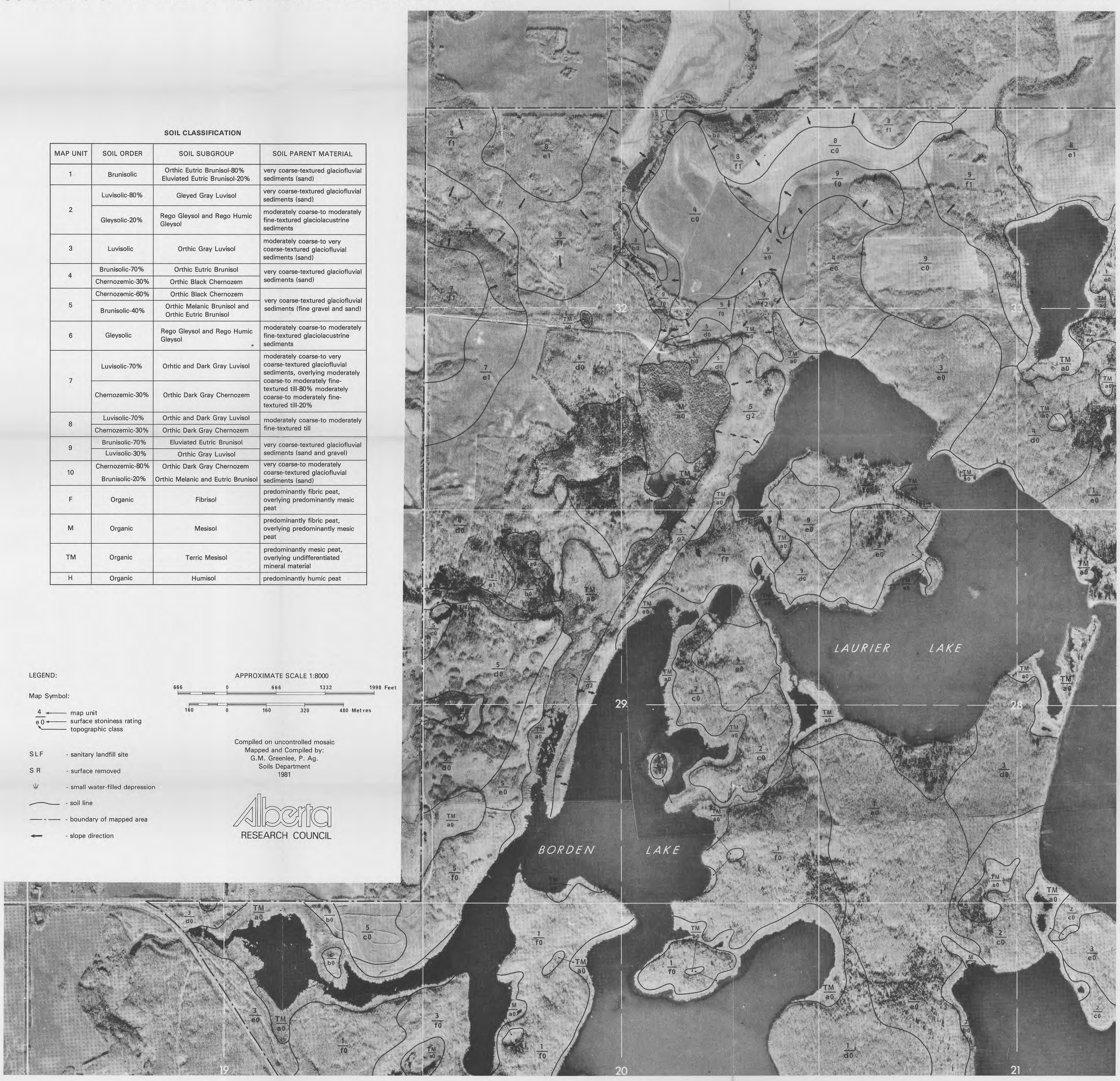

SOIL MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp. 56 R.4 W.4 NE

SOIL CLASSIFICATION

MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Brunisolic	Orthic Eutric Brunisol-80% Eluviated Eutric Brunisol-20%	very coarse-textured glaciofluvial sediments (sand)
2	Luvisolic-80%	Gleyed Gray Luvisol	very coarse-textured glaciofluvial sediments (sand)
	Gleysolic-20%	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
3	Luvisolic	Orthic Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments (sand)
4	Brunisolic-70%	Orthic Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand)
	Chernozemic-30%	Orthic Black Chernozem	
5	Chernozemic-60%	Orthic Black Chernozem	very coarse-textured glaciofluvial sediments (fine gravel and sand)
	Brunisolic-40%	Orthic Melanic Brunisol and Orthic Eutric Brunisol	
6	Gleysolic	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
7	Luvisolic-70%	Orhtic and Dark Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments, overlying moderately coarse-to moderately fine-textured till-80% moderately coarse-to moderately fine-textured till-20%
	Chernozemic-30%	Orthic Dark Gray Chernozem	
8	Luvisolic-70%	Orthic and Dark Gray Luvisol	moderately coarse-to moderately fine-textured till
	Chernozemic-30%	Orthic Dark Gray Chernozem	
9	Brunisolic-70%	Eluviated Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand and gravel)
	Luvisolic-30%	Orthic Gray Luvisol	
10	Chernozemic-80% Brunisolic-20%	Orthic Dark Gray Chernozem Orthic Melanic and Eutric Brunisol	very coarse-to moderately coarse-textured glaciofluvial sediments (sand)
F	Organic	Fibrisol	predominantly fibric peat, overlying predominantly mesic peat
M	Organic	Mesisol	predominantly fibric peat, overlying predominantly mesic peat
TM	Organic	Terric Mesisol	predominantly mesic peat, overlying undifferentiated mineral material
H	Organic	Humisol	predominantly humic peat

LEGEND:

Map Symbol:

4/e0 — 4 = map unit; e = surface stoniness rating; 0 = topographic class

SLF - sanitary landfill site

SR - surface removed

- small water-filled depression

- soil line

- boundary of mapped area

- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
Mapped and Compiled by:
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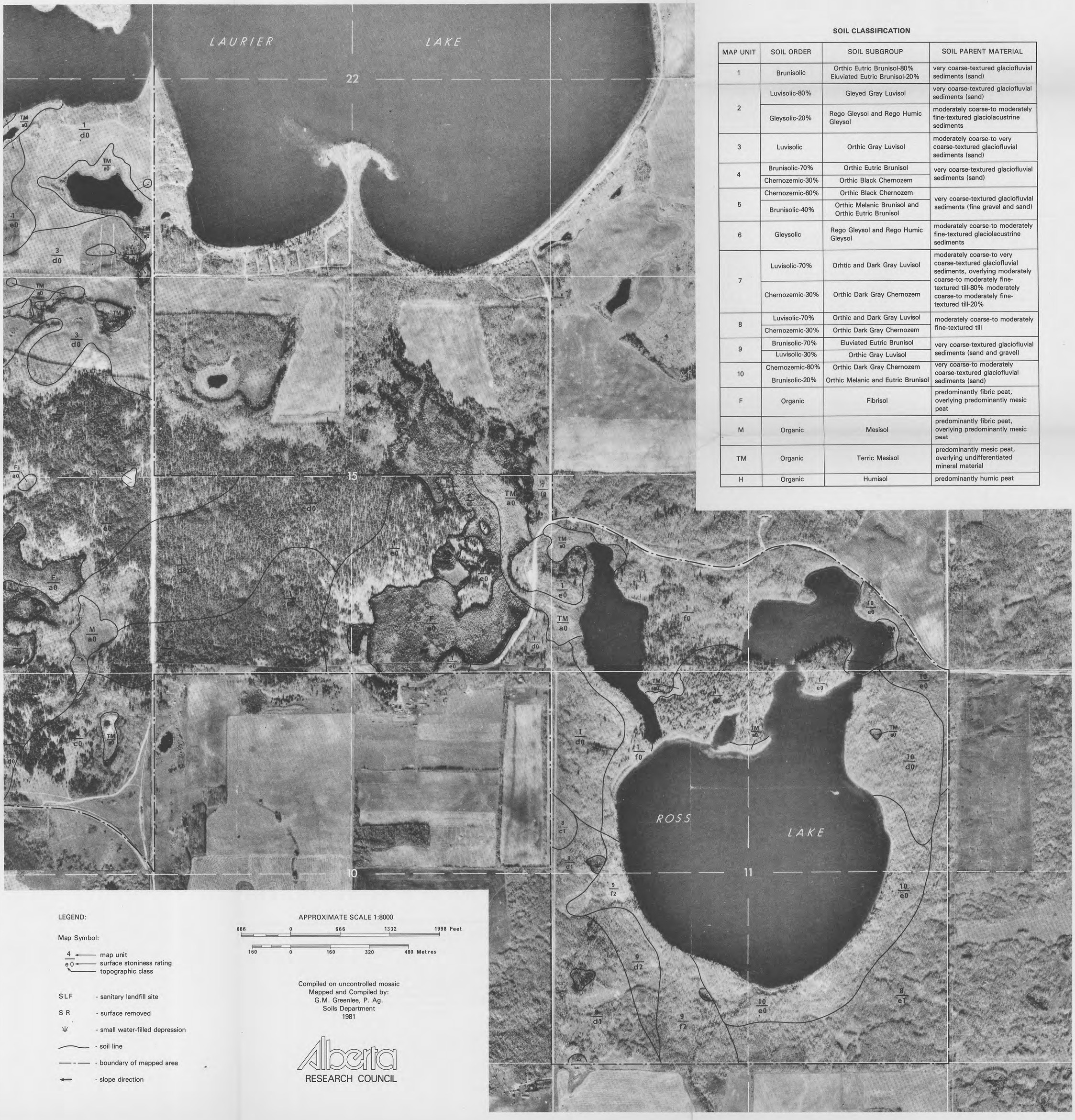
SOIL MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp. 56 R.4 W.4 SE



SOIL CLASSIFICATION

MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Brunisolic	Orthic Eutric Brunisol-80% Eluviated Eutric Brunisol-20%	very coarse-textured glaciofluvial sediments (sand)
2	Luvisolic-80%	Gleyed Gray Luvisol	very coarse-textured glaciofluvial sediments (sand)
	Gleysolic-20%	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
3	Luvisolic	Orthic Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments (sand)
4	Brunisolic-70%	Orthic Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand)
	Chernozemic-30%	Orthic Black Chernozem	
5	Chernozemic-60%	Orthic Black Chernozem	very coarse-textured glaciofluvial sediments (fine gravel and sand)
	Brunisolic-40%	Orthic Melanic Brunisol and Orthic Eutric Brunisol	
6	Gleysolic	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
7	Luvisolic-70%	Orhtic and Dark Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments, overlying moderately coarse-to moderately fine-textured till-80% moderately coarse-to moderately fine-textured till-20%
	Chernozemic-30%	Orthic Dark Gray Chernozem	
8	Luvisolic-70%	Orthic and Dark Gray Luvisol	moderately coarse-to moderately fine-textured till
	Chernozemic-30%	Orthic Dark Gray Chernozem	
9	Brunisolic-70%	Eluviated Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand and gravel)
	Luvisolic-30%	Orthic Gray Luvisol	
10	Chernozemic-80% Brunisolic-20%	Orthic Dark Gray Chernozem Orthic Melanic and Eutric Brunisol	very coarse-to moderately coarse-textured glaciofluvial sediments (sand)
F	Organic	Fibrisol	predominantly fibric peat, overlying predominantly mesic peat
M	Organic	Mesisol	predominantly fibric peat, overlying predominantly mesic peat
TM	Organic	Terric Mesisol	predominantly mesic peat, overlying undifferentiated mineral material
H	Organic	Humisol	predominantly humic peat

LEGEND:

Map Symbol:

4 ← map unit
e 0 ← surface stoniness rating
topographic class

SLF - sanitary landfill site

S R - surface removed

- small water-filled depression

- soil line

- boundary of mapped area

- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
Mapped and Compiled by:
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Soils Department
1981

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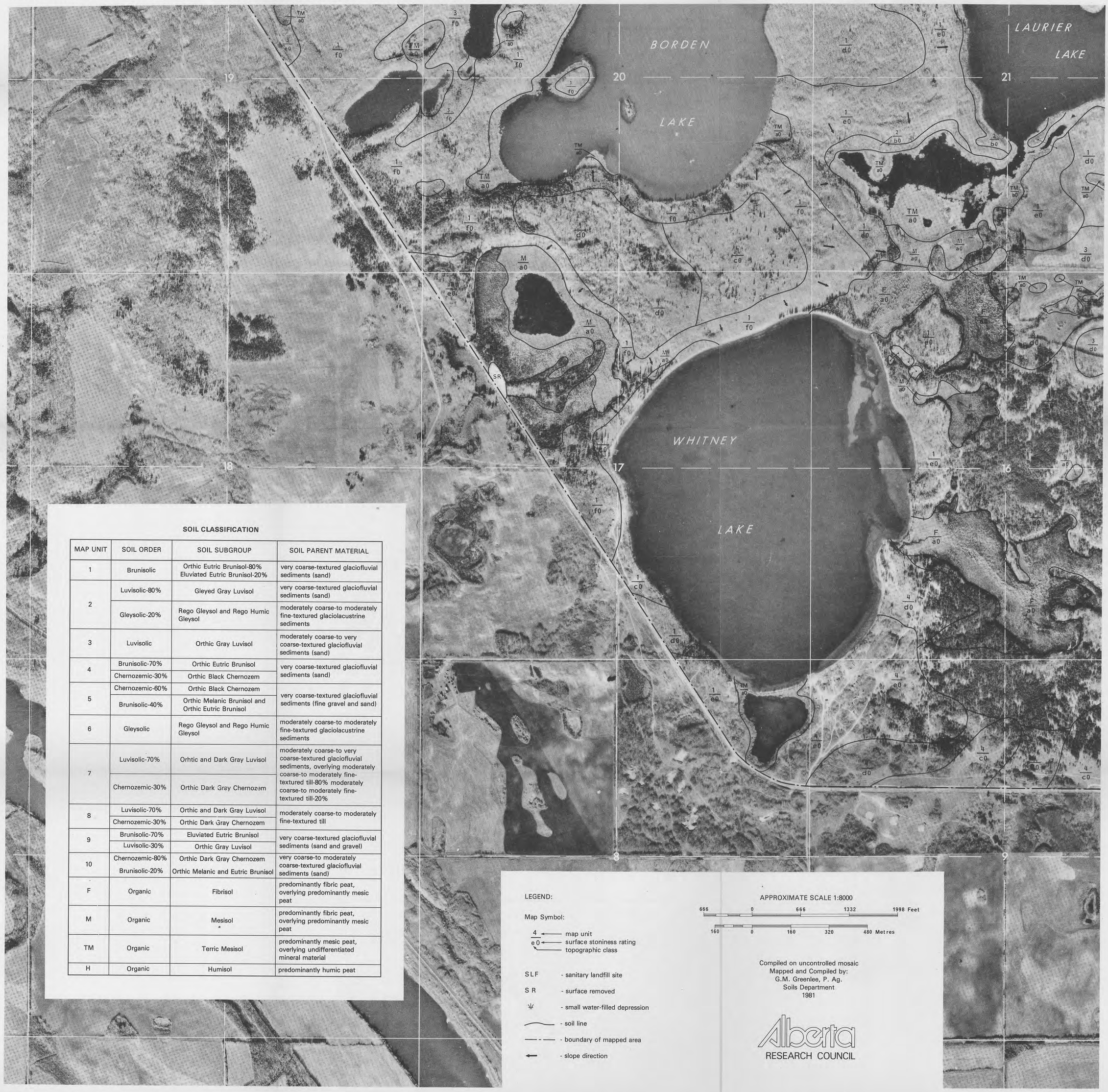
SOIL MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 SW



SOIL CLASSIFICATION

MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Brunisolic	Orthic Eutric Brunisol-80% Eluviated Eutric Brunisol-20%	very coarse-textured glaciofluvial sediments (sand)
2	Luvisolic-80%	Gleyed Gray Luvisol	very coarse-textured glaciofluvial sediments (sand)
	Gleysolic-20%	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
3	Luvisolic	Orthic Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments (sand)
4	Brunisolic-70%	Orthic Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand)
	Chernozemic-30%	Orthic Black Chernozem	
5	Chernozemic-60%	Orthic Black Chernozem	very coarse-textured glaciofluvial sediments (fine gravel and sand)
	Brunisolic-40%	Orthic Melanic Brunisol and Orthic Eutric Brunisol	
6	Gleysolic	Rego Gleysol and Rego Humic Gleysol	moderately coarse-to moderately fine-textured glaciolacustrine sediments
7	Luvisolic-70%	Orhtic and Dark Gray Luvisol	moderately coarse-to very coarse-textured glaciofluvial sediments, overlying moderately coarse-to moderately fine-textured till-80% moderately coarse-to moderately fine-textured till-20%
	Chernozemic-30%	Orthic Dark Gray Chernozem	
8	Luvisolic-70%	Orthic and Dark Gray Luvisol	moderately coarse-to moderately fine-textured till
	Chernozemic-30%	Orthic Dark Gray Chernozem	
9	Brunisolic-70%	Eluviated Eutric Brunisol	very coarse-textured glaciofluvial sediments (sand and gravel)
	Luvisolic-30%	Orthic Gray Luvisol	
10	Chernozemic-80% Brunisolic-20%	Orthic Dark Gray Chernozem Orthic Melanic and Eutric Brunisol	very coarse-to moderately coarse-textured glaciofluvial sediments (sand)
F	Organic	Fibrisol	predominantly fibric peat, overlying predominantly mesic peat
M	Organic	Mesisol	predominantly fibric peat, overlying predominantly mesic peat
TM	Organic	Terric Mesisol	predominantly mesic peat, overlying undifferentiated mineral material
H	Organic	Humisol	predominantly humic peat

LEGEND:

Map Symbol:

4 ← map unit
e0 ← surface stoniness rating
topographic class

SLF - sanitary landfill site

SR - surface removed

- small water-filled depression

- soil line

- boundary of mapped area

- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
Mapped and Compiled by:
G.M. Greenlee, P. Ag.
Soils Department
1981

Alberta
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LANDFORM MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp. 56 R.4 W.4 **SE**

LEGEND:

B - Bog
- Bh - horizontal bog

F - Fluvial
- $F^{G}h$ - hummocky glaciofluvial
- $F^{G}i$ - inclined glaciofluival
- $F^{G}l$ - level glaciofluvial
- $F^{G}u$ - undulating glaciofluvial
- $F^{G}v$/Mh - glaciofluvial veneer overlying hummocky morainal

L - Lacustrine
- $L^{G}l$ - level glaciolacustrine
- $L^{G}u$ - undulating glaciolacustrine

M - Morainal
- Mh - hummocky morainal
- Mi - inclined morainal
- Mu - undulating morainal

N - Fen
- Nh - horizontal fen

SLF - sanitary landfill site
SR - surface removed
⩒ - small water-filled depression

\- landform line
\- boundary of mapped area
\- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

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LANDFORM MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 SW

BORDEN LAKE

LAURIER LAKE

WHITNEY LAKE

19 20 21 18 17 16 8 9

LEGEND:

B - Bog
- Bh - horizontal bog

F - Fluvial
- $F^{G}h$ - hummocky glaciofluvial
- $F^{G}i$ - inclined glaciofluival
- $F^{G}l$ - level glaciofluvial
- $F^{G}u$ - undulating glaciofluvial
- $F^{G}v/Mh$ - glaciofluvial veneer overlying hummocky morainal

L - Lacustrine
- $L^{G}l$ - level glaciolacustrine
- $L^{G}u$ - undulating glaciolacustrine

M - Morainal
- Mh - hummocky morainal
- Mi - inclined morainal
- Mu - undulating morainal

N - Fen
- Nh - horizontal fen

SLF - sanitary landfill site

SR - surface removed

- small water-filled depression

- landform line

- boundary of mapped area

- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

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LANDFORM MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp.56 R.4 W.4 **NW**

LEGEND:

B - Bog

Bh - horizontal bog

F - Fluvial

$F^{G}h$ - hummocky glaciofluvial

$F^{G}i$ - inclined glaciofluival

$F^{G}l$ - level glaciofluvial

$F^{G}u$ - undulating glaciofluvial

$F^{G}v/Mh$ - glaciofluvial veneer overlying hummocky morainal

L - Lacustrine

$L^{G}l$ - level glaciolacustrine

$L^{G}u$ - undulating glaciolacustrine

M - Morainal

Mh - hummocky morainal

Mi - inclined morainal

Mu - undulating morainal

N - Fen

Nh - horizontal fen

SLF - sanitary landfill site

SR - surface removed

- small water-filled depression

- landform line

- boundary of mapped area

- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

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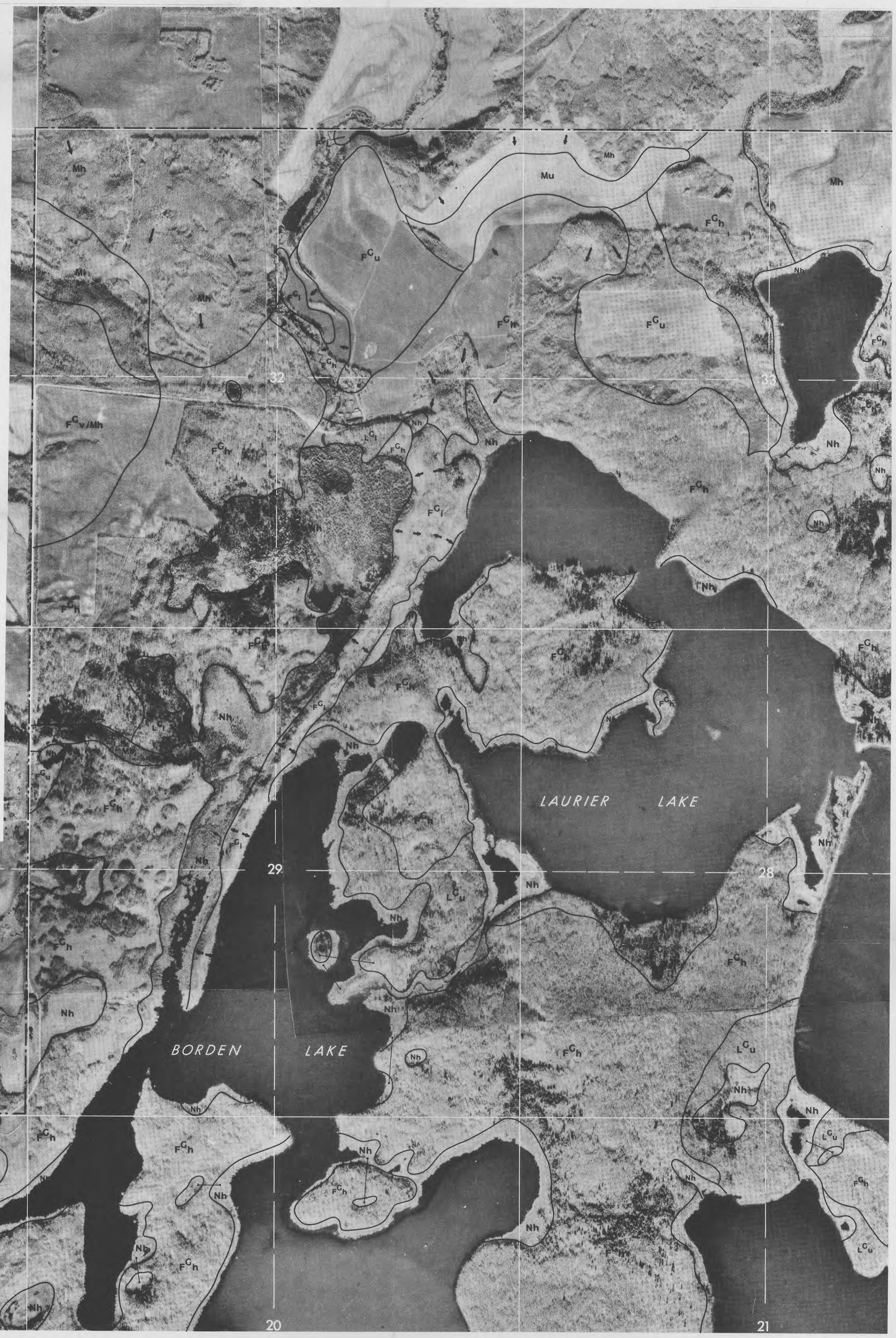

LANDFORM MAPS OF WHITNEY LAKES PROVINCIAL PARK STUDY AREA

Tp. 56 R.4 W.4 NE

LEGEND:

B - Bog

Bh - horizontal bog

F - Fluvial

F^Gh - hummocky glaciofluvial

F^Gi - inclined glaciofluival

F^Gl - level glaciofluvial

F^Gu - undulating glaciofluvial

F^Gv/Mh - glaciofluvial veneer overlying hummocky morainal

L - Lacustrine

L^Gl - level glaciolacustrine

L^Gu - undulating glaciolacustrine

M - Morainal

Mh - hummocky morainal

Mi - inclined morainal

Mu - undulating morainal

N - Fen

Nh - horizontal fen

SLF - sanitary landfill site

SR - surface removed

- small water-filled depression

- landform line

- boundary of mapped area

- slope direction

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

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