Soil Survey of

LESSER SLAVE LAKE PROVINCIAL PARK

and Interpretation for Recreational Use

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Alberta Institute of Pedology
Number M-81-2

Alberta Research Council
1983

ACKNOWLEDGMENTS

The Alberta Research Council provided the staff and about two-thirds of the funds, and the Parks Planning Branch of Alberta Recreation and Parks contributed about one-third of the funds needed to cover the total costs of the 1977-78 provincial parks soil survey program. Costs included field, office, laboratory and drafting; as well as equipment and supplies. Office space was provided by the University of Alberta until the end of August 1977, and by the Research Council beyond that date.

D. Miller typed and assisted in compiling and proofreading the report. Z. Widtman and J. Dlask drafted the soil maps, while J. Beres determined the physical properties of the soils. The soil chemical analyses were determined by A. Schwarzer and W. McKean.

Able field assistance was given by A. Rodvang.

Special acknowledgment is given to the Park Rangers and other park employees, who cooperated by allowing soil investigations to be conducted throughout the park, and who invariably offered assistance when needed.

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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. It is a follow-up to the earlier report on Lesser Slave Lake Park (Greenlee, 1973) describing the soil survey of the area not covered by that report. The area covered in 1972 was a corridor of land about 0.8 km wide along the lake shore, totalling approximately 2100 ha. The additional work was done in 1977 and covers the remainder of the park, comprising about 5400 ha.

A general 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: 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. A glossary is included. Specific results and interpretations for the areas covered by this study are presented in the ensuing report.

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SUMMARY

Lesser Slave Lake Park, including Dog Island in the eastern end of the lake west of the main park area, contains about 7500 ha. The southern boundary of the park is about 5 km north of the town of Slave Lake, while the northern boundary is about 24 km north. The northern portion of the park is on the western slopes of Marten Mountain, and most of this area is blanketed with medium-textured till. Near the lake, glaciofluvial veneers of sand and gravel, and some small localized veneers of glaciolacustrine sands, silts, and clays overlie the till. The southern portion of the park, in the Lesser Slave River valley, is characterized mainly by sand dunes near the lakeshore and medium- to fine-textured till further east. Dog Island is covered predominantly by sand and gravel deposits. The Lesser Slave Lake park region has a cold snowy forest climate with humid winters, characterized by frozen ground and snow cover lasting several months. Summers are cool, having an average temperature of the warmest month under 22°C. The park is situated in the mixed wood section of the boreal forest region.

Thirty-two map units are recognized in the mapped area, but only the 21 mapped in the present study are described in this report. The key profile types are Orthic Gray Luvisols, Gleyed Gray Luvisols, Gleyed Dark Gray Luvisols, Orthic Eutric Brunisols, Orthic Melanic Brunisols, Gleyed Eutric Brunisols, Gleyed Eluviated Eutric Brunisols, Orthic Regosols, Cumulic Regosols, Gleyed Cumulic Regosols, Orthic Gleysols, Orthic Luvic Gleysols, Orthic Humic Gleysols, Rego Gleysols, Mesisols, and Terric Mesisols. These 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. Their distribution is shown on the soil map.

Soil interpretations are made for each map unit indicating the possible use of the locations for primitive camping areas, fully serviced campgrounds, paths, trails, road location, source of roadfill, and source of sand or gravel.

Soils of map units 18, 19, and 21 are the most suitable for recreational development; and those of map units 2, 19, and 21 are the most suitable for road construction purposes. Numerous other soils have severe limitations, and several have only moderate limitations. Careful study of the soil map and tables 4 to 10 (soil limitation and suitability tables) will reveal areas suitable for particular uses.

A soil survey properly interpreted can be one of the most useful tools management has in making a proper design for a recreational area. However, all soil differences found in the field cannot be shown on the soil map. Design and construction of specific recreational facilities usually require on-site investigation.

INTRODUCTION

SIZE AND LOCATION

Lesser Slave Lake Park comprises about 7500 ha, including Dog Island, which is situated in the eastern end of the lake west of the main park area, about 3 km offshore. The major portion of the park is in township 74 and the southern half of township 75, range 6, west of the 5th meridian, along the northeastern shore of the lake (Figure 1). Three smaller portions are found in sections 18, 19, 29, 31, and 32 of Tp 73, R 5 along the eastern shore of the lake. The southern boundary of the park is about 5 km north of the town of Slave Lake, while the northern boundary is about 24 km north.

The 1972 soil survey covered a corridor of land about 0.8 km wide along the shore of the lake for the whole length of the park. Dog Island was also included, and the total area completed was about 2100 ha. The 1977 soil survey covered the remainder of the park, approximately 5400 ha.

PHYSIOGRAPHY AND SURFICIAL DEPOSITS

The northern portion of Lesser Slave Lake Park is on the western slopes of Marten Mountain, part of a well-dissected irregular upland extending northward from the Swan Hills (Vogwill, 1978). The bedrock of the upland has been classified as the Upper Cretaceous Wapiti Formation (Green, 1972). Marten Mountain rises some 460 m above Lesser Slave Lake and occasional outcrops of gravel, probably of Tertiary age, are visible on the peak. Most of the western slopes area of Marten Mountain is blanketed with medium-textured till of variable thickness. On the very lowest slopes near the lake, glaciofluvial deposits of sand and gravel, as well as some small localized deposits of glaciolacustrine sands, silts, and clays, are found. These most commonly occur as veneers, or occasionally as blankets, overlying the till. This northern portion of the park is drained by numerous small streams flowing into Lesser Slave Lake from Marten Mountain.

The southern portion of the park is in the Lesser Slave River valley, and is drained by the river, flowing eastward from the lake. This area is characterized mainly by sand dunes near the lakeshore, and medium- to fine-textured till further east. Dog Island is covered predominantly by sand and gravel deposits, although a small area of medium-textured till is found on the northwestern side. Deposits of beach gravel and beach sand occur along most of the lakeshore within the park.

Medium-textured fluvial deposits characterize the narrow floodplains of most streams and drainage courses, and occasional outcrops of soft shale are found in the central portion of the park, usually within 1 km of the lakeshore. Also, organic soil deposits occupy a small percentage of the surveyed area, chiefly in the southwestern portion of the park. Only small sporadic deposits of these are found on the slopes of Marten Mountain.

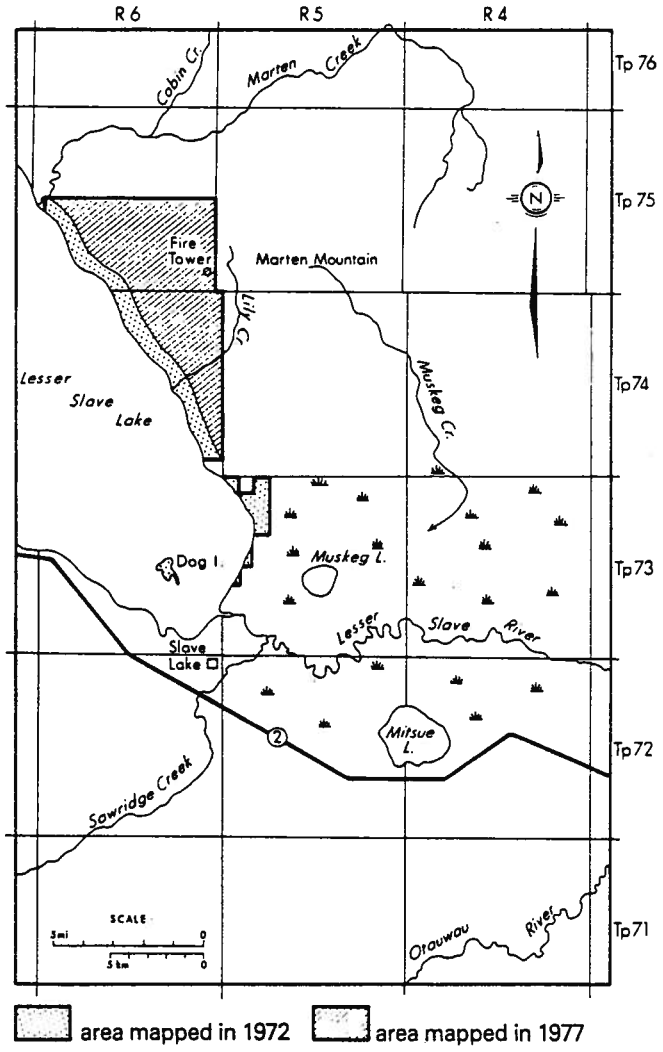

FIGURE 1. Map showing location of mapped areas.

CLIMATE

Lesser Slave Lake and surrounding areas are described in Koeppen's climatic classification as having a humid continental climate (Trewartha, 1954). This climate is a cold snowy forest one with humid winters, characterized by frozen ground and a snow cover of several months duration. Summers are cool, having an average temperature of the warmest month under 22°C. The average temperature of the coldest month is below −3°C, and that of the warmest month is above 10°C.

Weather records from the Slave Lake airport for 1971 through 1979 have been used to compile the following information (Environment Canada): The mean annual temperature is 0.7°C. July is the warmest month of the year with a mean temperature of 16.1°C; January is the coldest month with a mean temperature of −17.1°C. The mean annual precipitation is 530 mm and 68 percent of this falls as rain. The average frost free period is 109 days, which seems high for this region. The close proximity of Lesser Slave Lake may have some moderating influence on the local climate.

VEGETATION

The park is situated in the mixed wood section of the boreal forest region according to Rowe (1972). The characteristic forest association of well-drained uplands 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; however, the cover type of greatest areal extent is the trembling aspen. Black spruce and larch muskeg have developed in lower positions and the upper water catchment areas.

A comprehensive list of trees, shrubs, forbs, and grasses for well, imperfectly, and poorly drained sites is included in Greenlee (1973), and is not repeated here.

SOILS

Thirty-two map units are recognized in the mapped area. Ten belong to the Luvisolic Order, ten to the Regosolic Order, six to the Gleysolic Order, four to the Brunisolic Order, and two to the Organic Order in the Canadian System of Soil Classification (Canada Soil Survey Committee, 1978). This system is outlined in Greenlee (1981). Twenty-nine map units were recognized during the 1972 soil survey (Greenlee, 1973), and three additional ones during the 1977 survey, for a total of 32. However, only the 21 that were actually mapped during the 1977 survey are described in this report. Pertinent features of these are outlined in Table 1.

As is the case throughout most of the forested regions of Alberta, the most common soils found in Lesser Slave Lake Park are those classified in the Luvisolic Order. These are well- to imperfectly drained mineral soils characterized by an Ae horizon near the surface, which is generally between 7.5 and 30 cm thick. The Ae horizon is a leached gray color, very low in organic matter (humus) content and plant nutrients. Luvisolic soils in their natural state commonly have surface L-H and Ah horizons as well. The L-H horizon ranges from 2.5 to 12.5 cm or more in thickness. The Ah horizon 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 break down under 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 also be hampered and runoff increased, thereby enhancing soil erosion. This problem is especially serious on steep slopes.

Well-drained Luvisolic soils are the most prevalent at higher elevations of the park throughout the northeastern portion; imperfectly drained Luvisolic soils are dominant at lower elevations nearer the lakeshore over most of the remaining park area. Imperfectly drained Luvisolic soils also occur on lower slopes in the area of hummocky topography north of Marten Mountain.

Soils of the Regosolic Order are rapidly to imperfectly drained mineral soils with profile development too weakly expressed to meet the requirements for classification in any other order. They lack any expression of a B horizon and, therefore, reflect the

characteristics of the C horizons and the parent materials from which they are formed.

Small areas of rapidly drained Regosolic soils are found along most of the lakeshore and in the sand dune area in the southern portion of the park. These coarse-textured materials lack any inherent component of fines, and consequently soil-forming features are not evident. Small areas of well-to imperfectly drained Regosolic soils occur in floodplains of streams and drainage courses throughout the park. The fluvial deposits in these locations are of relatively recent deposition, and insufficient time has elapsed for any marked soil profile development, other than gleying.

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 is the development in situ of a 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. Because 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.

Rapidly to very well-drained Brunisolic soils are found in sporadic locations in the southern portion of the mapped area, developed in sand and gravel deposits. Further north, imperfectly drained Brunisolic soils have developed in sandy veneers overlying till, usually within 1 km of the lakeshore. These coarse-textured materials are generally devoid of a fines component, so the only soil profile developments have been the leaching of lime and the process of gleying. Also an area of well-drained Brunisolic soils, developed in fluvial deposits, is present in the extreme northwestern corner of the study area. The minimal soil profile development reflects the youthful age of these sediments.

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 due to 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. Gleysolic soils are found in low depressional areas throughout the park. Some larger ones are indicated on the soil map. Numerous others, which are of insufficient size to be oulined as separate entities, have been included as minor inclusions with other map units.

Soils of the Organic order include all soils that have developed largely from organic deposits, contain more than 30 percent organic matter by weight, and meet minimum specifications of depth and thickness within a defined control section. The majority of 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 diagnositc layers: Fibric, Mesic, and Humic. Fibric layers are the least composed of all the organic soil materials and have large amounts of well-preserved fibres, whose botanic origins are readily identifiable. The organic matter of humic layers is in a highly decomposed state, and often has a smooth greasy feel when moist. It has the least amount of recognizable plant fibre, and is usually darker in color than fibric or mesic materials. It is relatively stable and changes 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 the maintenance of 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. Organic

soils pose special problems for construction purposes because of their low bearing strength, high shrink-swell potential, and susceptibility to frost heaving.

Organic soils are found in low depressional areas throughout the park, at the lowest points of elevation in the landscape. Some areas are extensive enough to be outlined on the map at the scale used, and the largest are located in the southern portion of the study area. These extend for considerable distances east of the park boundary. Numerous small organic soil areas are included as minor components of other map units.

Soils of the Chernozemic order are well to imperfectly drained mineral soils of good structure, with very high natural fertility and productive capacity. They 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, commonly referred to as "topsoil," 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 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, and which continue to influence and distinguish their present characteristics and possible uses.

In general, Brown Chernozemic soils have A horizons that are lower in organic matter content, lighter in color, and thinner than those of the other Chernozemic great groups; and are found in southern and southeastern Alberta. Black Chernozemic soils have A horizons that are higher in organic matter content, darker in color, and thicker than those of the other great groups; and are found in central and east-central Alberta. Dark Brown Chernozemic soils have A horizons with characteristics intermediate between those of the Browns and the Blacks; and are found in south-central and east-central Alberta. 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.

Well-to imperfectly drained Dark Gray Chernozemics are found in a few unpredictable pockets, as a minor component of only one map unit in the central portion of the park within 1 km of the lakeshore.

Although some of the map units have only minor differences, they are usually significant with regard to a particular recreational or engineering use, and justify separation into different map units. The map units are described in chronological order. Horizon thicknesses quoted in the following map unit descriptions 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 observed growing on different soils are listed, using common names. These are very general lists and are not attempts at complete species lists.

TABLE 1.
Key to the Soils.

Map Unit	Classification	Parent Material	Surface Texture	Slope (class and gradient)	Surface Stoniness	Drainage	Comments and Limitations
2	Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol	sand	S	c, d, e (>2 to 15%)	0 to 1	moderately well drained	Slight to severe limitations, good to fair source of roadfill, good source of sand, unsuitable as a source of gravel — sandy surface texture, excessive slope, erosion hazard.
5	Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol — 70%; Gleyed Gray Luvisol and Gleyed Brunisolic Gray Luvisol — 30%	sand overlying moderately fine-textured till	SL to S	c, d, e (>2 to 15%)	0 to 5	imperfectly drained	(1) A layer of gravel is usual at the contact between the sandy overlay and underlying till. (2) The overlay of the stony phase is very stony and gravelly. (3) B horizons of the Gleyed Gray Luvisols are usually very sandy, and contain pockets with textures of clay loam, sandy clay loam, or clay. Moderate limitations, fair source of roadfill, poor source of sand or gravel-surface stoniness, sandy surface texture, erosion hazard, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave, excessive slope, thin deposit of sand or gravel.
6	Orthic Gray Luvisol — 70%; Gleyed Gray Luvisol — 10%; Orthic Gleysol — 10%; Terric Mesisol — 10%	medium-to moderately fine-textured till	SiL	c, d, e, f, (>2 to 30%)	0 to 4	well drained	(1) Surface textures can vary from sandy loam to loamy sand. (2) Occasional sand pockets occur in Bt horizon. (3) Gleysols and Terric Mesisols occur in small depressions, Gleyed Gray Luvisols transitional between poorly drained soils and Orthic Gray Luvisols. Slight to severe limitations, fair source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture), surface stoniness, slow permeability, excessive slope, erosion hazard, moderate shrink-well potential, susceptibility to frost heave.

TABLE 1.
Key to the Soils (cont'd)

Map Unit	Classification	Parent Material	Surface Texture	Slope (class and gradient)	Surface Stoniness	Drainage	Comments and Limitations
8	Gleyed Gray Luvisol — 80%; Gleyed Melanic Brunisol and Gleyed Eluviated Eutric Brunisol — 20%	Luvisol — fine-textured till containing a high portion of weathered shale. Brunisol — sand overlying the same till.	SL to S	c (>2 to 5%)	0 to 1	imperfectly drained	Slight to severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — seasonally high groundwater table, slow permeability, high shrink-swell potential, susceptibility to frost heave, shallow depth to bedrock.
11	Gleyed Gray Luvisol — 70%; Orthic Gleysol — 20%; Terric Mesisol — 10%	moderately fine-textured till	SiL	c, d, e, f (>2 to 30%)	1 to 3	imperfectly drained	(1) Ah and Ahe horizons often occur. (2) Occasional sand pockets occur in the Btg horizon. Moderate to severe limitations, fair source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — surface stoniness, organic surface layer more than 15 cm thick, slow permeability, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave, excessive slope, erosion hazard.
13	Orthic Gleysol and Orthic Luvic Gleysol	moderately fine-textured till	S or CL	a, b, c (0 to 5%)	0 to 5	poorly drained	Numerous sand pockets occur in profiles of Map Unit 13 soils. Severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — surface stoniness, seasonally high groundwater table or surface ponding, moderate shrink-swell potential, susceptibility to frost heave.
14	Orthic Humic Gleysol	fine-textured lacustrine sediments overlying coarse-textured lacustrine sediments (sand)	SiCL	b (>0.5 to 2%)	0	poorly drained	Severe limitations, poor source of roadfill and sand, unsuitable as a source of gravel (unsuitable texture) — seasonally high groundwater table or surface ponding, slippery or sticky when wet, slow permeability, high shrink-swell potential, susceptibility to frost heave.

Table 1.
Key to the Soils. (con't)

Map Unit	Classification	Parent Material	Surface Texture	Slope (class and gradient)	Surface Stoniness	Drainage	Comments and Limitations
15	Gleyed Gray Luvisol and Gleyed Dark Gray Luvisol	fine-textured lacustrine sediments	SiL to SiCL	b, c (>0.5 to 5%)	0	imperfectly drained	These soils are sometimes underlain by gravel or coarse sand. Moderate to severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — slow permeability, slippery, or sticky when wet, high clay content, seasonally high groundwater table, high shrink-swell potential, susceptibility to frost heave.
17	Gleyed Cumulic Regosol	medium-textured fluvial sediments, overlying coarse sand or gravel	SL	b, c (>0.5 to 5%)	0	imperfectly drained	(1) Usually one to three Ahb horizons occur in the soil profile. (2) The L-H horizon has been destroyed in heavy use areas (campgrounds). Slight to moderate limitations, fair source of roadfill, sand or gravel — seasonally high groundwater table or surface ponding.
18	Cumulic Regosol	medium-textured fluvial sediments	LFS to FSL	b, c (>0.5 to 5%)	0	moderately well drained	(1) An Ahb horizon commonly occurs between the C and Cg horizons. (2) Areas of Map Unit 18 soils are dissected by stream meander scars. Slight to severe limitations, poor source of roadfill, poor source of sand and unsuitable as a source of gravel (unsuitable texture) — susceptibility to frost heave, moderate shrink-swell potential, seasonally high groundwater table.
19	Orthic Gray Luvisol	medium-textured lacustrine sediments, overlying moderately fine-textured till	L	c, d (>2 to 9%)	0	well drained	(1) A thin Ah horizon often occurs. (2) The till is usually more than 100 cm below the surface. Slight limitations, good source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture).
21	Orthic Eutric Brunisol and Orthic Melanic Brunisol	medium- to very coarse-textured fluvial sediments	SL and SiL	c, d (>2 to 9%)	0	well drained	Numerous sand lenses occur in these soils. Slight limitations, good source of roadfill, fair source of sand, unsuitable as a source of gravel (unsuitable texture).

Table 1.
Key to the Soils. (con't)

Map Unit	Classification	Parent Material	Surface Texture	Slope (class and gradient)	Surface Stoniness	Drainage	Comments and Limitations
22	Gleyed Gray Luvisol — 40%; Orthic Dark Gray Chernozemic and Gleyed Rego Dark Gray Chernozemic — 30%; Orthic Gleysol — 20%; Terric Mesisol — 10%	moderately fine-textured till	L, SiL, SL	d (>5 to 9%)	1 to 4	imperfectly drained	The Chernozemic soils are occasionally developed in gravel. Moderate limitations, fair source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — surface stoniness, slippery or sticky when wet, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave.
23	Gleyed Gray Luvisol — 40%; Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol — 30%; Orthic Gleysol — 20%; Terric Mesisol — 10%	dominantly medium-textured till, with sand overlying the till in unpredictable pockets	SiL to S	c (>2 to 5%)	3	imperfectly drained	The Luvisols have developed in till, and the Brunisols in sand overlying the till. Moderate to severe limitations, fair source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — surface stoniness, organic surface layer more than 15 cm thick, slow permeability, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave.
24	Gleyed Gray Luvisol — 40%; Orthic Gray Luvisol — 30%; Orthic Gleysol — 20%; Terric Mesisol — 10%	medium- to moderately fine-textured till	SiL	d (>5 to 9%)	3	imperfectly to well drained	This map unit is characterized by hummocky topography. The Orthic Gray Luvisols occur on upper slopes and knolls; the Gleyed Gray Luvisols on mid and lower slopes; and the Gleysols and Mesisols in depressions. Moderate to severe limitations, fair source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — surface stoniness, organic surface layer more than 15 cm thick, slow permeability, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave.

Table 1.
Key to the Soils (cont'd)

Map Unit	Classification	Parent Material	Surface Texture	Slope (class and gradient)	Surface Stoniness	Drainage	Comments and Limitations
B.F.-G.	Orthic Regosol	fine beach gravel and coarse sand, overlying coarse gravel	fine gravel to CS	b, c, d (>0.5 to 9%)	1 to 4	rapidly drained	A narrow band of the B.G. Map Unit usually occurs adjacent to the lake shore, paralleling the B.F.-G. Map Unit. Severe limitations, poor source of roadfill, poor source of sand (variable textures), fair source of gravel — surface stoniness, sandy surface texture, flooding hazard (overflow), erosion hazard.
B.G.	Orthic Regosol	beach gravel	gravel	c, d, e (>2 to 15%)	5	rapidly drained	Severe limitations, poor source of roadfill, unsuitable as a source of sand (unsuitable texture), fair source of gravel — surface stoniness, flooding hazard (overflow), excessive slope.
B.G.-W.	Rego Gleysol	variable — sand, gravel, and stony moderately fine-textured till	variable-S, gravel, or CL	a, b, c (0 to 5%)	5	poorly drained	(1) Different textured layers in Cg horizons occur in various sequences. (2) Buried layers of highly decomposed peat (Ohb) are occasionally found. Severe limitations, poor source of roadfill and sand or gravel (variable textures) — surface stoniness, seasonally high groundwater table or surface ponding, flooding hazard (overflow).
R.B.	Orthic Regosol	undifferentiated riverbank, predominantly till	variable	g (>30 to 60%)	1 to 4	well drained	These soils occur on steep valley walls bordering streams. Severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — surface stoniness, excessive slope, erosion hazard.
M	undifferentiated Mesisol	predominantly intermediately decomposed peat	fibric peat (Of)	a (0 to 0.5%)	0	very poorly drained	Occasional thin layers of fibric and humic peat occur in the Om horizon. Severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — organic soil, seasonally high groundwater table or surface ponding, high shrink-swell potential, susceptibility to frost heave.

Table 1.
Key to the Soils (concluded)

Map Unit	Classification	Parent Material	Surface Texture	Slope (class and gradient)	Surface Stoniness	Drainage	Comments and Limitations
T.M.	Terric Mesisol	predominantly intermediately decomposed peat, overlying undifferentiated mineral material	mesic peat (Om)	a (0 to 0.5%)	0	very poorly drained	(1) The underlying mineral material is expected to be similar to parent material of adjacent mineral soils. (2) Peat thickness near edges of Terric Mesisol soil areas is often less than 40 cm, and the soils are then classified as peaty phases of Gleysols. Severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel (unsuitable texture) — organic soil, seasonally high groundwater table or surface ponding, high shrink-swell potential, susceptibility to frost heave.

MAP UNIT 2

Classification: Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol (These two subgroups are intimately and unpredictably associated.)
Parent Material: sand
Landform: undulating eolian (Eu)
Slope: undulating to moderately rolling (>2 to 15%)
Surface Stoniness: stone free to slightly stony (0 to 1)
Drainage: moderately well drained
Vegetation: aspen, balsam poplar, white birch, white spruce, balsam fir, willow; in some areas predominantly white spruce and jack pine
Profile Description:

Gleyed Eutric to Gleyed Eluviated Eutric Brunisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	0-5	soft and unstable, contains sand		
Ah	0-5	sand	single grain	loose, moist or dry

MAP UNIT 2 (continued)

Horizon	Thickness cm	Field Texture	Structure	Consistence
Ae	0-15	coarse sand	single grain	loose, moist or dry
Bm	0-5	coarse sand	single grain	loose, moist or dry
Bmgj	40	coarse sand	single grain	loose, moist or dry
Cgj	at 56	coarse sand	single grain	loose, moist or dry

Limitations: Slight to moderate for road location; severe for other uses. Good to fair source of roadfill; good source of sand, unsuitable as a source of gravel due to unsuitable texture. Specific limitations include sandy surface texture, excessive slope, erosion hazard.

MAP UNIT 5

Classification: Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol — 70%; Gleyed Gray Luvisol and Gleyed Brunisolic Gray Luvisol — 30%; (These four subgroups are intimately and unpredictably associated.)
Parent Material: sand, overlying moderately fine-textured till
Landform: glaciofluvial veneer overlying undulating morainal ($F^{G}v$/Mu), glaciofluvial veneer overlying hummocky morainal ($F^{G}v$/Mh)
Slope: undulating to moderately rolling (>2 to 15%)
Surface Stoniness: stone free to exceedingly stony (0 to 5)
Drainage: imperfectly drained
Vegetation: predominantly aspen and balsam poplar; scattered balsam fir and white spruce
Profile Description:

Gleyed Brunisolic Gray Luvisol

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M[1] %
L-H	16				5.8	71.8
Aeg	10	sandy loam	single grain	loose, moist	5.0	1.04
Bmg	8	sandy loam to sand	single grain	loose, moist	5.7	0.34
11Btg	30	clay	subangular blocky	firm, moist	5.2	1.26
11BC	at 58-100	clay loam	amorphous	very firm, moist	4.7	n.d.[2]

[1]O.M. — organic matter,
[2]n.d. — not determined

MAP UNIT 5 (continued)

Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	12	loose and unstable, contains numerous roots		
Ae	0-12	sand	single grain	loose, moist or dry
Bmg	50-100	coarse sand	single grain	loose, moist or dry
11Cg	at 45-100	clay loam	amorphous	firm to very firm, moist

Gleyed Gray Luvisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	7-15			
Aeg	5-10	loamy sand to coarse sand	single grain	loose, moist or dry
Btg	50-70	loamy sand to sandy clay loam	single grain, or amorphous breaking to weak blocky	loose to very friable, moist
11Cg	at 50-75	clay loam	amorphous	firm to very firm, moist

Comments: (1) A layer of gravel, 15 to 25 cm in thickness, often occurs in the soil profile at the contact between the sandy overlay and the underlying till.
(2) A stony phase is often found where the overlay is very stony, sandy, and gravelly.
(3) The B horizons of the Gleyed Gray Luvisol soils are usually very sandy, and contain a few pockets of clay loam, sandy clay loam, or clay textured materials.

Limitations: Moderate. Fair source of roadfill, poor source of sand or gravel. Specific limitations include surface stoniness, sandy surface texture, erosion hazard, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave, excessive slope, thin deposit of sand or gravel.

MAP UNIT 6

Classification: Orthic Gray Luvisol — 70%; Gleyed Gray Luvisol — 10%; Orthic Gleysol — 10%; Terric Mesisol — 10%
Parent material: medium-textured till
Landform: undulating morainal (Mu), hummocky morainal (Mh)
Slope: undulating to strongly rolling (>2 to 30%)

MAP UNIT 6 (continued)

Surface Stoniness: stone free to exceedingly stony (0 to 4)
Drainage: well drained
Vegetation: predominantly aspen and balsam poplar, scattered balsam fir and white spruce
Profile Description:

Orthic Gray Luvisol

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M[1] %
L-H	7				6.6	40.0
Ae	15	silt loam	platy	very friable, moist	5.8	0.78
Bt	45	clay loam	subangular blocky	friable, moist	5.1	0.70
BC	at 60	loam	amorphous	very friable, moist	5.0	n.d.[2]

[1]O.M. — organic matter,
[2]n.d — not determined

Comments: (1) This map unit was classified as 100% Orthic Gray Luvisol in the 1973 report (Greenlee, 1973). However, much more extensive areas of Map Unit 6 soils were mapped during 1977, and numerous small depressions were noted, where Orthic Gleysols and Terric Mesisols occur. The Orthic Gray Luvisols are found in well-drained positions, and Gleyed Gray Luvisol soils were found to occur as transitions between the well-drained and poorly drained soils. The Gleyed Gray Luvisols are described under Map Unit 11, the Orthic Gleysols under Map Unit 13, and the Terric Mesisols under the T.M. Map Unit.
(2) The Ae horizons of the Orthic Gray Luvisols often have sandy loam, and occasionally loamy sand textures.
(3) Sand pockets are often found in the Bt horizons of the Orthic Gray Luvisols.
(4) The BC horizons of the Orthic Gray Luvisols commonly have a clay loam texture and a firm moist consistence.
Limitations: Slight to severe. Fair source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include surface stoniness, slow permeability, excessive slope, erosion hazard, moderate shrink-swell potential, and susceptibility to frost heave.

MAP UNIT 8

Classification: Gleyed Gray Luvisol — 80%; Gleyed Melanic Brunisol and Gleyed Eluviated Eutric Brunisol — 20% (The two Brunisolic soil subgroups are intimately and unpredictably associated.)
Parent Material: Luvisol — fine-textured till containing a high proportion of weathered shale. Brunisol — sand, overlying fine-textured till containing a high proportion of weathered shale.
Landform: undulating morainal (Mu), with some patches of glaciolacustrine veneer overlying undulating morainal ($L^{G}v/Mu$)
Slope: undulating (>2 to 5%)
Surface Stoniness: stone free to slightly stony (0 to 1)
Drainage: imperfectly drained
Vegetation: white spruce, balsam fir, aspen, balsam poplar, white birch

MAP UNIT 8 (continued)

Profile Description:

Gleyed Gray Luvisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	8-13			
Aeg	5-20	sandy loam to loamy sand	granular to single grain	friable to loose, moist
11Btg	35-40	clay loam to clay	subangular blocky	firm, moist
11Ccag	at 40-56	clay	amorphous	firm, moist

Gleyed Melanic Brunisol and Gleyed Eluviated Eutric Brunisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	8			
Ahg-Aeg	10	loam to sand	granular to single grain	loose to friable, moist
Bmg	46	sandy loam to sand	single grain	very friable to loose, moist
11Cca	at 56	clay	subangular blocky	firm, moist

Comments: Occasional pockets of sand overlying the till are found in unpredictable locations, and this is where the Brunisolic soils are found.

Limitations: Slight for paths and trails, severe for other uses. Poor source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include seasonally high groundwater table, slow permeability, high shrink-swell potential, susceptibility to frost heave, shallow depth to bedrock.

MAP UNIT 11

Classification: Gleyed Gray Luvisol — 70%; Orthic Gleysol — 20%; Terric Mesisol — 10%
Parent Material: moderately fine-textured till
Landform: level morainal (Ml), undulating morainal (Mu), hummocky morainal (Mh)
Slope: undulating to strongly rolling (>2 to 30%)
Surface Stoniness: slightly to very stony (1 to 3)
Drainage: imperfectly drained
Vegetation: predominantly balsam poplar and aspen; clumps of white spruce

MAP UNIT 11 (continued)

Gleyed Gray Luvisol, peaty phase

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
L-H	27				6.4	57.3
Aeg	13	silt loam	platy	friable, moist	6.6	1.02
Btg	30	clay loam	subangular block	firm, moist	7.0	1.19
Ccag	at 43	clay loam	amorphous	very firm, moist	7.9	n.d.[2]

[1]O.M. — organic matter,
[2]n.d. — not determined

Comments: (1) Map Unit 11 was classified as 100% Gleyed Gray Luvisol in the 1973 report (Greenlee, 1973). However, much more extensive areas of Map Unit 11 soils were mapped during 1977, and numerous small depressions were noted where Orthic Gleysols and Terric Mesisols occur. The Orthic Gleysols are described under Map Unit 13 and the Terric Mesisols under the T.M. Map Unit.
(2) Ah and Ahe surface horizons often occur in the Gleyed Gray Luvisols. The combined thickness is about 10 cm; and these horizons exhibit a loam texture, granular structure, and very friable consistence when moist.
(3) Occasional sand pockets occur in the Btg horizons of the Gleyed Gray Luvisols.
Limitations: Severe for campgrounds; otherwise moderate on suitable topography. Fair source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include surface stoniness, organic surface layer more than 15 cm thick, slow permeability, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave, excessive slope, erosion hazard.

MAP UNIT 13

Classification: Orthic Gleysol and Orthic Luvic Gleysol (These two subgroups are intimately and unpredictably associated.)
Parent Material: moderately fine-textured till
Landform: level morainal (Ml)
Slope: nearly level to undulating (0 to 5%)
Surface Stoniness: stone free to excessively stony (0 to 5)
Drainage: poorly drained
Vegetation: grass; scattered willow, alder, and white birch
Profile Description:

Orthic Gleysol and Orthic Luvic Gleysol

Horizon	Thickness cm	Field Texture	Structure	Consistence
Om-Oh	7-25			
Aeg	0-10	sand	single grain	loose, moist or dry
Bg-Btg	38-56	clay loam	amorphous	firm, moist
Ccag	at 38-56	clay loam	amorphous	firm, moist

Comments: Numerous sand pockets occur in the profiles of Map Unit 13 soils.
Limitations: Severe. Poor source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include surface stoniness, seasonally high groundwater table or surface ponding, moderate shrink-swell potential, susceptibility to frost heave.

MAP UNIT 14

Classification: Orthic Humic Gleysol
Parent Material: fine-textured glaciolacustrine sediments, overlying coarse-textured glaciolacustrine sediments (sand)
Landform: level glaciolacustrine ($L^{G}l$)
Slope: gently undulating (>0.5 to 2%)
Surface Stoniness: stone free (0)
Drainage: poorly drained
Vegetation: scattered aspen, willow, white spruce
Profile Description:

Orthic Humic Gleysol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	5-8			
Ahg	20	silty clay loam	granular	friable, moist
Btg	40	silty clay	subangular blocky	very firm, moist
Cg1	30	sandy loam	amorphous	friable, moist
Cg2	at 90	coarse sand	single grain	loose, moist

Limitations: Severe. Poor source of roadfill and sand, unsuitable as a source of gravel due to unsuitable texture. Specific limitations include seasonally high groundwater table or surface ponding, slippery or sticky when wet, slow permeability, high shrink-swell potential, susceptibility to frost heave.

MAP UNIT 15

Classification: Gleyed Gray Luvisol and Gleyed Dark Gray Luvisol (These two subgroups are intimately and unpredictably associated.)
Parent Material: fine-textured glaciolacustrine sediments
Landform: level glaciolacustrine ($L^{G}l$), undulating glaciolacustrine ($L^{G}u$)
Slope: gently undulating to undulating (>0.5 to 5%)
Surface Stoniness: stone free (0)
Drainage: imperfectly drained
Vegetation: aspen
Profile Description:

Gleyed Gray Luvisol and Gleyed Dark Gray Luvisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	3-10			
Ah	0-15	silt loam to silty clay	granular	friable, moist
Aeg	3-8	loam to silt loam	platy	friable, moist

MAP UNIT 15 (continued)

Horizon	Thickness cm	Field Texture	Structure	Consistence
Btg	35-50	clay	blocky	firm, moist
Ccag	at 56	clay loam	amorphous	firm, moist

Comments: (1) The Aeg horizon occurs only sporadically at some locations.
(2) These soils are sometimes underlain by gravel or coarse sand at about 60 cm below the surface.
Limitations: Moderate for paths and trails; otherwise severe. Poor source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include slow permeability, slippery or sticky when wet, high clay content, seasonally high groundwater table, high shrink-swell potential, susceptibility to frost heave.

MAP UNIT 17

Classification: Gleyed Cumulic Regosol
Parent Material: medium-textured fluvial sediments, overlying coarse-textured fluvial sediments (sand or gravel)
Landform: fluvial terraces (Ft)
Slope: gently undulating to undulating (>0.5 to 5%)
Surface Stoniness: stone free (0)
Drainage: imperfectly drained
Vegetation: aspen
Profile Description:

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	10-15	soft and fragile		
Cg1	5-10	sandy loam	platy to granular	very friable, moist
Cg2	40-95	loam to clay loam	granular	friable to firm, moist
Cg3	at 50-100	coarse sand or gravel	single grain	loose, moist

Comments: (1) Usually one to three Ahb horizons are found at 10 to 20 cm intervals in the Cg2 horizon. These are 5 to 10 cm thick, have a silt loam texture, a granular structure, and a very friable moist consistence.
(2) Where these soils are found in heavy use areas, such as campgrounds, the L-H horizon has been destroyed and is no longer evident.
Limitations: Slight for paths and trails; otherwise moderate. Fair source of roadfill, and sand or gravel. Specific limitation is a seasonally high groundwater table or surface ponding.

MAP UNIT 18

Classification: Cumulic Regosol
Parent Material: medium-textured fluvial sediments
Landform: fluvial terraces (Ft)
Slope: gently undulating to undulating (>0.5 to 5%)
Surface Stoniness: stone free (0)
Drainage: moderately well drained
Vegetation: grass; clumps of balsam poplar, willow, aspen

MAP UNIT 18 (continued)

Profile Description:

Cumulic Regosol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	8-10	soft and fragile		
C	15-45	loamy fine sand to fine sandy loam	single grain	loose to very friable, moist
Cg	at 15-45	silt loam	amorphous	friable, moist

Comments: (1) An Ahb horizon, 5 to 10 cm thick, is usually present between the C and Cg horizons. It has a silt loam texture, a granular structure, and a very friable moist consistence.
(2) Small pockets of fine sandy loam textured materials are found in the Cg horizon.
(3) These soil areas are dissected by numerous stream meander scars.

Limitations: Severe for road location; otherwise slight. Poor source of roadfill and sand, unsuitable as a source of gravel due to unsuitable texture. Specific limitations include susceptibility to frost heave, moderate shrink-swell potential, seasonally high groundwater table.

MAP UNIT 19

Classification: Orthic Gray Luvisol
Parent Material: medium-textured glaciolacustrine sediments, overlying moderately fine-textured till
Landform: glaciolacustrine blanket overlying undulating morainal ($L^{G}b/Mu$), glaciolacustrine blanket overlying hummocky morainal ($L^{G}b/Mh$)
Slope: undulating to gently rolling (>2 to 9%)
Surface Stoniness: stone free (0)
Drainage: well drained
Vegetation: predominantly balsam poplar, aspen, white birch; scattered white spruce
Profile Description:

Orthic Gray Luvisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	10-15			
Ae	5-10	loam	granular	friable, moist
Bt	35-50	clay loam	subangular blocky	friable to firm, moist
C	20-35	loam	amorphous	friable, moist
11C	at 60-100	clay loam	amorphous	firm, moist

Comments: (1) A thin Ah horizon is often found above the Ae. The Ah is about 2 to 3 cm thick, has a texture of loam, a granular structure, and a friable moist consistence.
(2) The till is usually more than 100 cm below the surface.

Limitations: Slight. Good source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture.

MAP UNIT 21

Classification: Orthic Eutric Brunisol and Orthic Melanic Brunisol (These two subgroups are intimately and unpredictably associated.)
Parent Material: medium- to very coarse-textured glaciolacustrine sediments
Landform: undulating glaciolacustrine ($L^{G}u$)
Slope: undulating to gently rolling (>2 to 9%)
Surface Stoniness: stone free (0)
Drainage: well drained
Vegetation: aspen
Profile Description:

Orthic Eutric Brunisol

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
L-H	8				5.9	57.8
Ah	4	sandy loam	amorphous	loose, moist	5.6	9.55
AB	7	loamy sand	single grain	loose, moist	5.9	0.85
Bm	54	sandy loam	amorphous	loose, moist	5.8	0.56
Bmg	35	loam	amorphous	very friable, moist	4.8	n.d.[2]

Orthic Melanic Brunisol

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M. %
L-H	12				6.4	67.0
Ah	8	silt loam	granular	very firm, moist	5.4	15.8
Bm	18	silty clay loam	amorphous	very firm, moist	5.4	2.12
BCg1	22	loamy sand	single grain	loose, moist	5.5	n.d.[2]
BCg2	27	loam	amorphous	friable, moist	6.2	n.d.
BCg3	25	sandy loam	amorphous	very friable, moist	5.4	n.d.

Comments: (1) Only one small area of Map Unit 21 soil was mapped during the 1972 survey (Greenlee, 1973). A second much more extensive area was mapped during the 1977 survey, and it was found that the Ah horizon is often more than 5 cm thick.
(2) Numerous sand lenses are found in these soils.
Limitations: Slight. Good source of roadfill, fair source of sand, unsuitable as a source of gravel due to unsuitable texture.

[1]O.M. — organic matter,
[2]n.d. — not determined

MAP UNIT 22

Classification: Gleyed Gray Luvisol — 40%; Orthic Dark Gray Chernozemic and Gleyed Rego Dark Gray Chernozemic — 30%; Orthic Gleysol — 20%; Terric Mesisol — 10%
Parent Material: moderately fine-textured till
Landform: hummocky morainal (Mh)
Slope: gently rolling (>5 to 9%)
Surface Stoniness: slightly to exceedingly stony (1 to 4)
Drainage: imperfectly drained
Vegetation: aspen, balsam poplar, white spruce
Profile Description:

Gleyed Gray Luvisol, peaty phase

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
L-H	27				6.4	57.3
Aeg	13	silt loam	platy	friable, moist	6.6	1.02
Btg	30	clay loam	subangular blocky	firm moist	7.0	1.19
Ccag	at 43	clay loam	amorphous	very firm, moist	7.9	n.d.[2]

Gleyed Rego Dark Gray Chernozemic — peaty carbonated phase

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
L-H	24				7.1	65.2
Ahk	12	silty loam	granular	very friable, moist	7.5	43.7
Cca	14	clay loam	amorphous	very friable, moist	7.5	7.02
Ccag	74	clay loam	amorphous	very firm, moist	7.7	n.d.[2]

Orthic Dark Gray Chernozemic

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	10			
Ah	7-15	loam to sandy loam	granular	very friable, moist
Ahe	3-8	loam to sandy loam	platy	very friable, moist

[1]O.M. — organic matter,
[2]n.d. — not determined

MAP UNIT 22 (continued)

Horizon	Thickness cm	Lab Texture	Structure	Consistence
Bt	10-15	clay loam	subangular blocky	firm, moist
Cca	at 33-50	clay loam	amorphous	firm, moist

Comments: (1) The Chernozemic soils occur as unpredictable pockets within Map Unit 22 soil areas, and are sometimes developed in gravel. The Orthic Dark Grays are found in well drained positions of the landscape. The Gleyed Rego Dark Grays occur at slightly lower elevations, usually in close association with the Orthics, but in positions of somewhat restricted drainage.
(2) The Orthic Gleysols and Terric Mesisols are found primarly in small closed depressions scattered throughout the landscape. The soils in most depressions consist dominantly of Gleysols, with the Mesisols occurring in the extreme centers where the depth of peat is greatest. The Gleysols and Mesisols are described under Map Unit 13 and the T.M. Map Unit respectively.

Limitations (for the Chernozemic soils): Moderate. Fair source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include surface stoniness, slippery or sticky when wet, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave. Limitations for the Gleyed Gray Luvisols, Orthic Gleysols, and Terric Mesisols are given under Map Unit 11, Map Unit 13, and the T.M. Map Unit respectively.

MAP UNIT 23

Classification: Gleyed Gray Luvisol — 40%; Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol — 30% (These two subgroups are intimately and unpredictably associated.); Orthic Gleysol — 20%; Terric Mesisol — 10%.
Parent Material: dominantly medium-textured till, with sand overlying the till in unpredictable pockets. The proportion covered by sand overlays is estimated to be about 30%.
Landform: undulating morainal (Mu), and unpredictable pockets of glaciofluvial veneer overlying undulating morainal ($F^{G}v/Mu$)
Slope: undulating (>2 to 5%)
Surface Stoniness: very stony (3)
Drainage: imperfectly drained
Vegetation: balsam poplar, aspen, some white spruce and balsam fir
Profile Description:

Gleyed Gray Luvisol, peaty phase

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
L-H	27				6.4	57.3
Aeg	13	silt loam	platy	friable, moist	6.6	1.02
Btg	30	clay loam	subangular blocky	firm, moist	7.0	1.19
Ccag	at 43	clay loam	amorphous	very firm, moist	7.9	n.d.[2]

Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	12	loose and unstable, contains numerous roots		

[1]O.M. — organic matter,
[2]n.d. — not determined

MAP UNIT 23 (continued)

Horizon	Thickness cm	Lab Texture	Structure	Consistence
Ae	0-12	sand	single grain	loose, moist or dry
Bmg	50-100	coarse sand	single grain	loose, moist or dry
IICg	at 45-100	clay loam	amorphous	firm to very firm, moist

Comments: (1) The Luvisols have developed in till, and the Brunisols occur in unpredictable pockets of sand overlying the till.
(2) The Orthic Gleysols and Terric Mesisols are found primarily in scattered small closed depressions. The soils in most depressions are dominantly Gleysols, and the Mesisols occur in the extreme centers where the depth of peat is greatest. The Gleysols and Mesisols are described under Map Unit 13 and the T.M. Map Unit respectively.

Limitations (for the Luvisolic soils): Severe for campgrounds; otherwise moderate. Fair source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include surface stoniness, organic surface layer more than 15 cm thick, slow permeability, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave. Limitations for the Gleyed Brunisols, Orthic Gleysols, and Terric Mesisols are given under Map Unit 5, Map Unit 13, and the T.M. Map Unit, respectively.

MAP UNIT 24

Classification: Gleyed Gray Luvisol — 40%; Orthic Gray Luvisol — 30%; Orthic Gleysol — 20%; Terric Mesisol — 10%
Parent Material: medium- to moderately fine-textured till
Landform: hummocky morainal (Mh)
Slope: gently rolling (>5 to 9%)
Surface Stoniness: very stony (3)
Drainage: imperfectly to well drained
Vegetation: aspen, balsam poplar, white spruce
Profile Description:

Gleyed Gray Luvisol, peaty phase

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
L-H	27				6.4	57.3
Aeg	13	silt loam	platy	friable, moist	6.6	1.02
Btg	30	clay loam	subangular blocky	firm, moist	7.0	1.19
Ccag	at 43	clay loam	amorphous	very firm, moist	7.9	n.d.[2]

Orthic Gray Luvisol

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
L-H	7				6.6	40.0
Ae	15	silt loam	platy	very friable, moist	5.8	0.78

[1]O.M. — organic matter,
[2]n.d. — not determined

MAP UNIT 24 (continued)

Horizon	Thickness cm	Lab Texture	Structure	Consistence	pH $CaCl_2$	O.M.[1] %
Bt	45	*clay loam*	subangular blocky	friable, moist	5.1	0.70
BC	at 60	loam	amorphous	very friable, moist	5.0	n.d.

Comments: (1) This map unit is characterized by hummocky topography, and the different soil subgroups occur in a predictable pattern of catenas. The Orthic Gray Luvisols are found on upper slopes and knolls; the Gleyed Gray Luvisols are found on mid and lower slopes; and the Gleysols and Mesisols are found in small closed depressions. The soils in most depressions are dominantly Gleysols, and the Mesisols occur in the extreme centers where the depth of peat is greatest.
(2) The Gleysols and Mesisols are described under Map Unit 13 and the T.M. Map Unit, respectively.
Limitations (for the Gleyed Gray Luvisols): Severe for campgrounds; otherwise moderate. Fair source of roadfill, unsuitable as a source of sand or gravel due to unsuitable texture. Specific limitations include surface stoniness, organic surface layer more than 15 cm thick, slow permeability, seasonally high groundwater table, moderate shrink-swell potential, susceptibility to frost heave. Limitations for the Orthic Gray Luvisols, Orthic Gleysols, and Terric Mesisols are given under Map Unit 6, Map Unit 13, and the T.M. Map Unit, respectively.

B.F. – G.

Classification: Orthic Regosol
Parent Material: fine beach gravel and coarse sand, overlying coarse gravel
Landform: undulating lacustrine (Lu)
Slope: gently undulating to gently rolling (>0.5 to 9%)
Surface Stoniness: slightly to exceedingly stony (1 to 4)
Drainage: rapidly drained
Vegetation: sparse cover of grass and willow
Profile Description:

Orthic Regosol

Horizon	Thickness cm	Field Texture	Structure	Consistence
C1	15-60	fine gravel to coarse sand	amorphous	loose, moist or dry
C2	at 15-60	gravel		

Comments: A narrow band of the B.G. Map Unit, varying from 3 to 12 m in width, usually occurs immediately adjacent to the shore of Lesser Slave Lake, paralleling the B.F. – G. Map Unit.
Limitations: Severe. Poor source of roadfill and sand (variable textures), fair source of gravel. Specific limitations include surface stoniness, sandy surface texture, flooding hazard (overflow), erosion hazard.

B.G.

Classification: Orthic Regosol
Parent Material: beach gravel
Landform: undulating lacustrine (Lu)
Slope: undulating to moderately rolling (>2 to 15%)
Surface Stoniness: excessively stony (5)
Drainage: rapidly drained
Vegetation: generally none; occasionally aspen

BG (continued)

Profile Description:

Orthic Regosol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	7	occurs under aspen		
C	100+	gravel		

Limitations: Severe. Poor source of roadfill, unsuitable as a source of sand due to unsuitable texture, fair source of gravel. Specific limitations include surface stoniness, flooding hazard (overflow), excessive slope.

B.G. — W.

Classification: Rego Gleysol
Parent Material: variable; sand, gravel, and stony moderately fine-textured till
Landform: undulating lacustrine (Lu)
Slope: nearly level to undulating (0 to 5%)
Surface Stoniness: excessively stony (5)
Drainage: poorly drained
Vegetation: willow and grass
Profile Description:

Rego Gleysol

Horizon	Thickness cm	Field Texture	Structure	Consistence
Of-Oh	1-7			
Cg	15-25+	variable (sand gravel, or clay loam)	amorphous	loose, moist or dry; or firm, moist

Comments: (1) Materials of different texture in the Cg horizons occur in various unpredictable sequences. The clay loam textured material is comprised of stony till.
(2) Buried layers of highly decomposed peat (Ohb) are occasionally found about 40 cm below the surface, and about 50 cm in thickness.
Limitations: Severe. Poor source or roadfill, and sand or gravel due to variable textures. Specific limitations include surface stoniness, seasonally high groundwater table or surface ponding, flooding hazard (overflow).

ROUGH BROKEN (R.B.)

Classification: Orthic Regosol
Parent Material: undifferentiated riverbank, predominantly medium- to moderately fine-textured till
Landform: inclined morainal (Mi)
Slope: strongly rolling (>30 to 60%)
Surface Stoniness: slightly to exceedingly stony (1 to 4)
Drainage: well drained
Vegetation: variable; always forested

ROUGH BROKEN (R.B.) (continued)

Orthic Regosol

Horizon	Thickness cm	Field Texture	Structure	Consistence
L-H	5-15			
C	at 0	variable, commonly sandy loam to clay loam	variable, amorphous to subangular blocky	variable, very friable to very firm, moist

Comments: These soils are found on steep valley walls bordering streams. Parent materials consist dominantly of moderately fine-textured till; but small pockets of gravel are sometimes found.
Limitations: Severe. Poor source of roadfill, poor source of sand or gravel due to unsuitable texture and unpredictable occurrence of sand and gravel pockets. Specific limitations include surface stoniness, excessive slope, erosion hazard.

MESISOL (M)

Classification: undifferentiated Mesisol
Parent Material: predominantly intermediately decomposed peat
Landform: horizontal bog (Bh)
Slope: nearly level (0 to 0.5%)
Surface Stoniness: stone free (0)
Drainage: very poorly drained
Vegetation: black spruce, larch, Labrador tea
Profile Description:

Mesisol

Horizon	Thickness cm	Field Description
Of	30	fibric peat
Om	130+	predominantly mesic peat

Comments: Occasional thin layers of fibric and humic peat occur in the Om horizon.
Limitations: Severe. Poor source of roadfill, unsuitable as a source of sand or gravel. Specific limitations include organic soil, high groundwater table, high shrink-swell potential, susceptibility to frost heave.

TERRIC MESISOL (T.M.)

Classification: Terric Mesisol
Parent Material: predominantly intermediately decomposed 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: grass, sedge

TERRIC MESISOL (T.M.) (continued)

Profile Description:

Terric Mesisol

Horizon	Thickness cm	Field Texture	Structure	Consistence
Om	75	mesic peat		
Oh	15	humic peat		
Cg	at 0	n.d.[1]	n.d.	n.d.

[1]n.d. — not determined

Comments: (1) It can be expected that the mineral material underlying these soils will be similar to the parent material of adjacent mineral soils.
(2) The peat thickness near the edges of these soil areas is often less than 40 cm, and the soils can be classified as peaty phases of Gleysols.

Limitations: Severe. Poor source of roadfill, unsuitable as a source of sand or gravel. Specific limitations include organic soil, high groundwater table or surface ponding, high shrink-swell potential, susceptibility to frost heave.

MISCELLANEOUS LAND TYPES

BURROW PIT (B.P.)

These are excavations made during construction activities, primarily road construction.

ESCARPMENTS

DISTURBED LAND (D.L.)

This land has been disturbed by man's activities. Examples are parking areas, roadways, oil pump sites, and other sites cleared for petroleum related installations. The soils were not classified.

SOIL INTERPRETATIONS

An explanation of soil interpretations and definitions of the soil limitation and suitability ratings are given in Greenlee (1981). The results of soil chemical and physical analyses are given in Tables 2 and 3. Engineering properties of some map units sampled were extrapolated to other map units not sampled, where soils of the different map units were developed on like or very similar parent materials. Map units developed on similar parent materials are shown at the bottom of Table 3.

The soils of map units 18, 19, and 21 are the most suitable for recreational development, and these are all found in the extreme northwestern corner of the mapped area. Map unit 6 soils, which are widespread throughout most of the mapped area, have a moderate limitation due to slow permeability of the subsoil or Bt horizon. The soils of map units 5, 17, and 22 also have moderate limitations, and soils of the remaining map units have severe limitations. Limiting factors include excessive slopes, sandy surface textures, soil erosion hazards, seasonally high groundwater tables or surface ponding, organic surface layers more than 15 cm thick, high clay content, slippery or sticky conditions when the soils are wet, and susceptibility to flooding.

The only soils that have no limitations for road construction purposes are those of map units 2, 19, and 21. Only one very small patch of map unit 2 soils is found in the mapped area, near the southern boundary close to the lakeshore. Soils of map units 5, 6, 11, 17, 22, 23, and 24 have only moderate limitations, and soils of the remaining map units have severe limitations. Limiting factors in addition

TABLE 2.
Chemical and Physical Analyses of Soil Samples from Lesser Slave Lake Park

Map Unit	Horizon	Depth cm	pH $CaCl_2$	pH H_2O	Exchangeable cations [1]meq /100 g Na	K	Ca	Mg	[2]CEC meq /100 g
5	L-H	16-0	5.8	5.9	[5]nd	nd	nd	nd	nd
	Aeg	0-10	5.0	5.4	0.02	0.23	3.59	0.46	4.5
	Bmg	10-18	5.7	6.3	0.06	0.22	2.59	0.46	3.6
	Btg	18-58	5.2	5.3	0.06	1.41	20.41	8.04	28.0
	BC	58-100	4.7	4.8	0.05	0.75	12.19	4.61	18.6
6	L-H	7-0	6.6	6.8	nd	nd	nd	nd	nd
	Ae	0-15	5.8	6.3	0.01	0.29	5.28	0.92	6.9
	Bt	15-60	5.1	5.3	0.09	0.71	14.28	4.66	20.1
	BC	60-100	5.0	5.1	0.47	0.58	16.72	7.22	22.7
11	L-H	27-0	6.4	6.9	nd	nd	nd	nd	nd
	Aeg	0-13	6.6	7.4	1.63	0.25	7.44	2.10	8.8
	Btg	13-43	7.0	7.5	1.77	0.55	21.4	8.76	25.7
	Ccag	at 43	7.6	7.9	nd	nd	nd	nd	nd
21	L-H	8-0	5.9	6.3	nd	nd	nd	nd	nd
	Ah	0-4	5.6	5.9	0.02	1.57	20.68	1.54	25.1
	AB	4-11	5.9	6.2	0.04	0.76	5.47	0.77	6.5
	Bm	11-65	5.8	6.3	0.02	0.51	9.53	1.33	9.9
	Bmg	65-100	4.8	5.1	0.12	0.26	12.41	2.61	16.2
	L-H	12-0	6.4	6.7	nd	nd	nd	nd	nd
	Ah	0-8	5.4	5.9	0.05	1.62	40.75	3.89	47.2
	Bm	8-26	5.4	5.6	0.01	1.12	17.91	3.64	23.0
	BCg_1	26-48	5.5	5.9	0.04	0.27	5.69	1.33	7.1
	BCg_2	48-75	6.2	6.5	0.05	0.29	13.66	2.97	15.1
	BCg_3	75-100	5.4	5.6	0.07	0.21	12.47	2.82	16.2

[1]meq/100 g — milliequivalents/100 g soil, [2] CEC — cation exchange capacity, [3]OC — organic carbon, [4]CF — coarse fragments (>2 mm diam) (field estimate), [5]nd — not determined, [6]gv — gravelly.

[3]OC %	$CaCO_3$ equiv %	Mechanical analysis % from fract <2 mm diam			[4]% CF	Texture	
		sand	silt	clay		Lab det	Field est
42.34	nd	nd	nd	nd	0	nd	—
0.61	nd	61	35	4	40	SL	[6]gv LS
0.20	nd	87	9	4	40	LS-S	gv S
0.74	nd	12	39	49	20	C	C
nd	0.2	38	34	28	20	CL	CL
23.54	nd	nd	nd	nd	0	nd	—
0.46	nd	23	70	7	20	SiL	L
0.41	nd	32	39	29	20	CL	CL
nd	0.2	30	44	26	20	L	CL
33.7	nd	—	—	—	0		
0.60	nd	23	66	11	10	SiL	L
0.70	nd	24	45	31	10	CL	CL
nd	9.4	28	42	30	10	CL	CL
33.98	nd	nd	nd	nd	0	nd	—
5.62	nd	69	29	2	0	SL	LS
0.50	nd	78	16	6	0	LS	LS
0.33	nd	71	17	12	0	SL	LS
nd	0.1	47	33	20	0	L	FSL
39.41	nd	nd	nd	nd	0	nd	—
9.30	nd	25	51	24	0	SiL	L
1.25	nd	19	53	28	0	SiCL	SiL
nd	nd	84	11	5	0	LS	S
nd	nd	49	34	17	0	L	L
nd	0.1	66	18	16	0	SL	SiL

TABLE 2.
Chemical and Physical Analyses of Soil Samples from Lesser Slave Lake Park

Map Unit	Horizon	Depth cm	pH $CaCl_2$	pH H_2O	Exchangeable cations [1]meq /100 g Na	K	Ca	Mg	[2]CEC meq /100 g
22	L-H	24-0	7.1	7.3	[5]nd	nd	nd	nd	nd
	AhK	0-12	7.5	8.0	nd	nd	nd	nd	nd
	Cca	12-26	7.5	8.1	nd	nd	nd	nd	nd
	Ckg	26-100	7.7	7.9	nd	nd	nd	nd	nd

[1]meq/100 g — milliequivalents/100 g soil, [2]CEC — cation exchange capacity, [3]OC — organic carbon, [4]CF — coarse fragments (>2 mm diam) (field estimate), [5]nd — not determined, [6]gv — gravelly.

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)	0.05 mm
6	90-120	16	100	100	100	100	99	93	62	59
8	90-120	39	100	100	100	100	100	100	98	96
8	90-120	40	100	100	100	100	100	100	94	90
11	90-120	26	100	100	100	100	99	95	76	73

(1) Map Units developed on similar parent material: 6, 5, 11, 13, 19, 22, 23 and 24.
(2) These values are obtained from charts worked out by the Highways Testing Laboratory, Alberta Transportation.

to those already listed include moderate to high shrink-swell potential, susceptibility to frost heaving, and for Map Unit 8 soils, shallow depth to bedrock. The soils of Map Unit 2 constitute a good source of sand, while those of Map Units 17 and 21, and soils of the BF-G and BG map units constitute fair sources of gravel. Soils of the BG-W map unit, and Map Unit 5, 14, 18, and 21 soils represent poor sources of sand or gravel. Limiting factors include thin deposits of sand or gravel, seasonally high groundwater tables or surface ponding, susceptibility to flooding, and unsuitable textures. Soils of the remaining map units are unsuitable as sources of sand or gravel due to unsuitable textures.

The organic soil map units (M and TM) have severe limitations for all uses 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

[3]OC %	$CaCO_3$ equiv %	Mechanical analysis % from fract <2 mm diam sand	silt	clay	[4]% CF	Texture Lab det	Field est
38.37	nd	nd	nd	nd	0	nd	—
25.70	29.4	2	80	18	0	SiL	L
4.13	51.3	25	40	35	0	CL	L
nd	2.3	35	36	29	30	CL	[6]gv CL

Percentage Smaller Than 0.005 mm	0.002 mm	0.001 mm	Liquid Limit	Plasticity Index	Optimum Moisture % (2)	Maximum Dry Density lb/ft³ (2)	Classification AASHO	Unified	USDA
43	35	32	36	14	22	98.5	A-6(10)	CL	CL
94	93	88	79	33	—	—	A-7-5(20)	MH	C
72	57	50	67	28	—	—	A-7-5(19)	MH	C
45	34	32	37	13	25	95	A-6(9)	CL	CL

Tables 4 to 10 inclusive. 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 severe limitation for a specified use. It follows, however, that 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 4 to 8, the soil limitations for various uses have been designated as none to slight, moderate, severe, and unsuitable. In Tables 9 and 10, the suitability of soils as sources of roadfill and as sources of sand and gravel respectively, have been designated as good, fair, poor, and unsuitable.

TABLE 4
Soil Limitations for Primitive Camping Areas[1]

Map[2] Symbol	Degree of Limitation: None to Slight	Moderate	Severe	Unsuitable
2/c0, 2/c1, 2/d0, 2/eo, 2/el			Sandy Er	
2/f0		Slope	Sandy Er	
5/c0, 5/c1, 5/d1, 5/d5, 5/e3		Sandy Er Wet		
6/c1, 6/c2, 6/c3, 6/c4, 6/d1, 6/d3, 6/e1, 6/e3		SI Perm		
6/f3		Slope Er SI Perm		
8/c1		Wet	SI Perm	
11/b0, 11/c1, 11/c2, 11/c3, 11/d1, 11/d2, 11/e3			Org Surf SI Perm Wet	
11/f2		Slope Er	Org Surf SI Perm Wet	
13/a0, 13/b0, 13/c4, 13/c5			Wet	
14/b0, 14/b2			Wet Slip SI Perm	
15/b0, 15/c0		Wet	SI Perm Slip Clay	
17/b0, 17/c0		Wet		
18/b0, 18/c0	NL			
19/c0, 19/d0	NL			
21/c0, 21/d0	NL			
[3]22/d3		Slip Wet		
[4]23/c3			Org Surf SI Perm Wet	
[5]24/d3			Org Surf SI Perm Wet	
BF-G/b1, BF-G/c1, BF-G/c2, BF-G/c4, BF-G/d4			Sandy Flood Er	
BG/c5, BG/d5, BG/e5			Flood	
BG-W/a5, BG-W/b5			Wet Flood	
BG-W/c5			Wet Flood	
RB/e3	NL			
RB/f3		Slope Er		

Map[2] Symbol			Degree of Limitation			
			None to Slight	Moderate	Severe	Unsuitable
RB g1	RB g3	RB g4			Slope Er	
	M				Org Wet	
	TM				Org Wet	

[1]Surface stoniness was not considered in determining these ratings.

[2]For explanation, see Soil Map.

[3]This rating applies to the Chernozemic soils of Map Unit 22. For the rating of the Luvisolic soils, refer to Map Unit 11.

[4]This rating applies to the Luvisolic soils of Map Unit 23. For the rating of the Brunisolic soils, refer to Map Unit 5.

[5]This rating refers to the imperfectly drained soils of Map Unit 24. For the rating of the well drained soils, refer to Map Unit 6.

ABBREVIATIONS

Clay - High clay content
Er - Erosion hazard
Flood - Flooding hazard (overflow)
NL - No limitations
Org - Organic soil
Org Surf - Organic surface layer >15 cm thick
Sandy - sandy surface texture
Slip - Slippery or sticky when wet
Slope - Excessive slope
SI Perm - Slow permeability
Wet - Seasonally high groundwater table or surface ponding

TABLE 5
Soil Limitations for Fully Serviced Campgrounds[1]

Map[2] Symbol	None to Slight	Moderate	Severe	Unsuitable
2/c0, 2/c1, 2/d0			Sandy Er	
2/e0, 2/e1		Slope	Sandy Er	
2/f0			Slope Sandy Er	
5/c0, 5/c1, 5/d1, 5/d5		Sandy Er Wet		
5/e3		Sandy Slope Er		
6/c1, 6/c2, 6/c3, 6/c4, 6/d1, 6/d3		SI Perm		
6/e1, 6/e3		Slope Er SI Perm		
6/f3		SI Perm	Slope Er	
8/c1		Wet	SI Perm	
11/b0, 11/c1, 11/c2, 11/c3, 11/d1, 11/d2			Org Surf SI Perm Wet	
11/e3		Slope Er	Org Surf SI Perm Wet	
11/f2			Slope Er Org Surf	
13/a0, 13/b0, 13/c4, 13/c5			Wet	
14/b0, 14/b2			Wet Slip SI Perm	
15/b0, 15/c0		Wet	SI Perm Slip Clay	
17/b0, 17/c0		Wet		
18/b0, 18/c0	NL			
19/c0, 19/d0	NL			
21/c0, 21/d0	NL			
[3]22/d3		Slip Wet		
[4]23/d3			Org Surf SI Perm Wet	
[5]24/d3			Org Surf SI Perm Wet	
BF-G/b1, BF-G/c1			Sandy Flood Er	
BF-G/c2, BF-G/c4, BF-G/d4			Sandy Flood Er	
BG/c5, Bg/d5			Flood	
BG/e5		Slope	Flood	
BG-W/a5, BG-W/b5, BG-W/c5			Wet Flood	
RB/e3		Slope Er		

Map[2] Symbol	None to Slight	Degree of Limitation Moderate	Severe	Unsuitable
RB f3	RB g1	RB g3	Slope Er	
	RB g4			
	M		Org Wet	
	TM		Org Wet	

[1]Surface stoniness was not considered in determining these ratings.

[2]For explanation, see Soil Map.

[3]This rating applies to the Chernozemic soils of Map Unit 22. For the rating of the Luvisolic soils, refer to Map Unit 11.

[4]This rating applies to the Luvisolic soils of Map Unit 23. For the rating of the Brunisolic soils, refer to Map Unit 5.

[5]This rating applies to the imperfectly drained soils of Map Unit 24. For the rating of the well drained soils, refer to Map Unit 6.

ABBREVIATIONS

Clay - High clay content
Er - Erosion hazard
Flood - Flooding hazard (overflow)
NL - No limitations
Org - Organic soil
Org Surf - Organic surface layer >15 cm thick
Sandy - sandy surface texture
Slip - Slippery or sticky when wet
Slope - Excessive slope
SI Perm - Slow permeability
Wet - Seasonally high groundwater table or surface ponding

TABLE 6
Soil Limitations for Paths[1]

Map[2] Symbol	None to Slight	Moderate	Severe	Unsuitable
2/c0, 2/c1, 2/d0			Sandy Er	
2/e0, 2/e1		Slope	Sandy Er	
2/f0			Sandy Slope Er	
5/c0, 5/c1, 5/d1, 5/d5		Sandy Er Wet		
5/e3		Sandy Slope Er		
6/c1, 6/c2, 6/c3, 6/c4, 6/d1, 6/d3	NL			
6/e1, 6/e3		Slope Er		
6/f3			Slope Er	
8/c1	NL			
11/b0, 11/c1, 11/c2, 11/c3, 11/d1, 11/d2		Org Surf Wet		
11/e3		Slope Er Org Surf		
11/f2		Org Surf Wet	Slope Er	
13/a0, 13/b0, 13/c4, 13/c5			Wet	
14/b0, 14/b2			Wet Slip	
15/b0, 15/c0		Slip Wet		
17/b0, 17/c0	NL			
18/b0, 18/c0	NL			
19/c0, 19/d0	NL			
21/c0, 21/d0	NL			
[3]22/d3		Slip		
[4]23/c3		Org Surf Wet		
[5]24/d3		Org Surf Wet		
BF-G/b1, BF-G/c1, BF-G/c2, BF-G/c4, BF-G/d4			Sandy Flood Er	
BG/c5, BG/d5			Flood	
BG/e5		Slope	Flood	
BG-W/a5, BG-W/b5, BG-W/c5			Wet Flood	
RB/e3		Slope Er		

Map[2] Symbol			Degree of Limitation None to Slight	Moderate	Severe	Unsuitable
RB f3	RB g1	RB g3			Slope Er	
	RB g4					
	M				Org Wet	
	TM				Org Wet	

[1]Surface stoniness was not considered in determining these ratings.

[2]For explanation, see Soil Map.

[3]This rating applies to the Chernozemic soils of Map Unit 22. For the rating of the Luvisolic soils refer to Map Unit 11.

[4]This rating refers to the Luvisolic soils of Map Unit 23. For the rating of the Brunisolic soils, refer to Map Unit 5.

[5]This rating applies to the imperfectly drained soils of Map Unit 24. For the rating of the well drained soils, refer to Map Unit 6.

ABBREVIATIONS

Er - Erosion hazard
Flood - Flooding hazard (overflow)
NL - No limitations
Org - Organic soil
Org Surf - Organic surface layer >15 cm thick
Sandy - sandy surface texture
Slip - Slippery or sticky when wet
Slope - Excessive slope
Wet - Seasonally high groundwater table or surface ponding

TABLE 7
Soil Limitations for Trails[1]

Map[2] Symbol	Degree of Limitation: None to Slight	Moderate	Severe	Unsuitable
2/c0, 2/c1, 2/d0, 2/e0, 2/e1			Sandy Er	
2/f0		Slope	Sandy Er	
5/c0, 5/c1, 5/d1, 5/d5, 5/e3		Sandy Er Wet		
6/c1, 6/c2, 6/c3, 6/c4, 6/d1, 6/d3, 6/e1, 6/e3	NL			
6/f3		Slope Er		
8/c1	NL			
11/b0, 11/c1, 11/c2, 11/c3, 11/d1, 11/d2, 11/e3		Org Surf Wet		
11/f2		Slope Er Org Surf		
13/a0, 13/b0, 13/c4, 13/c5			Wet	
14/b0, 14/b2			Wet Slip	
15/b0, 15/c0		Slip Wet		
17/b0, 17/c0	NL			
18/b0, 18/c0	NL			
19/c0, 19/d0	NL			
21/c0, 21/d0	NL			
[3]22/d3		Slip		
[4]23/c3		Org Surf Wet		
[5]24/d3		Org Surf Wet		
BF-G/b1, BF-G/c1, BF-G/c2, BF-G/c4			Sandy Flood Er	
BF-G/d4			Sandy Flood Er	
BG/c5, BG/d5, BG/e5			Flood	
BG-W/a5, BG-W/b5, BG-W/c5			Wet Flood	
RB/e3	NL			
RB/f3		Slope Er		

Map[2] Symbol			Degree of Limitation None to Slight	Moderate	Severe	Unsuitable
RB g1	RB g3	RB g4			Slope Er	
	M				Org Wet	
	TM				Org Wet	

[1]Surface stoniness was not considered in determining these ratings.

[2]For explanation, see Soil Map.

[3]This rating applies to the Chernozemic soils of Map Unit 22. For the rating of the Luvisolic soils refer to Map Unit 11.

[4]This rating refers to the Luvisolic soils of Map Unit 23. For the rating of the Brunisolic soils, refer to Map Unit 5.

[5]This rating applies to the imperfectly drained soils of Map Unit 24. For the rating of the well drained soils, refer to Map Unit 6.

ABBREVIATIONS

Er - Erosion hazard
Flood - Flooding hazard (overflow)
NL - No limitations
Org - Organic soil
Org Surf - Organic surface layer >15 cm thick
Sandy - sandy surface texture
Slip - Slippery or sticky when wet
Slope - Excessive slope
Wet - Seasonally high groundwater table or surface ponding

TABLE 8
Soil Limitations for Road Location[1]

Map[2] Symbol	None to Slight	Moderate	Severe	Unsuitable
2/c0, 2/c1, 2/d0	NL			
2/e0, 2/e1		Slope		
2/f0			Slope	
5/c0, 5/c1, 5/d1, 5/d5		M Sh-Sw Frost Wet		
5/e3		M Sh-Sw Frost Slope		
6/c1, 6/c2, 6/c3, 6/c4, 6/d1, 6/d3		M Sh-Sw Frost		
6/e1, 6/e3		Slope M Sh-Sw Frost		
6/f3		M Sh-Sw Frost	Slope	
8/c1		Wet BR	Sh-Sw Frost	
11/b0, 11/c1, 11/c2, 11/c3, 11/d1, 11/d2		Wet M Sh-Sw Frost		
11/e3		Slope Wet M Sh-Sw		
11/f2		Wet M Sh-Sw Frost	Slope Er	
13/a0, 13/b0, 13/c4, 13/c5		M Sh-Sw Frost	Wet	
14/b0, 14/b2			Wet Sh-Sw Frost	
15/b0, 15/c0		Wet	Sh-Sw Frost Clay	
17/b0, 17/c0		Wet		
18/b0, 18/c0		M Sh-Sw Wet	Frost	
19/c0, 19/d0	NL			
21/c0, 21/d0	NL			
22/d3		Wet M Sh-Sw Frost		
23/c3		Wet M Sh-Sw Frost		
324/d3		Wet M Sh-Sw Frost		
BF-G/b1, BF-G/c1, BF-G/c2, BF-G/c4, BF-G/d4			Flood	
BG/c5, BG/d5			Flood	
BG/e5		Slope	Flood	
BG-W/a5, BG-W/b5, BG-W/c5			Wet Flood	

Map[2] Symbol			Degree of Limitation None to Slight	Moderate	Severe	Unsuitable
	RB e3			Slope		
RB f3	RB g1	RB g3			Slope	
	RB g4					
	M				Org Wet Sh-Sw Frost	
	TM				Org Wet Sh-Sw Frost	

[1]Surface stoniness was not considered in determining these ratings.

[2]For explanation, see Soil Map.

[3]This rating refers to the imperfectly drained soils of Map Unit 24. For the rating of the well drained soils, refer to Map Unit 6.

ABBREVIATIONS

BR - Shallow depth to bedrock
Clay - High clay content
Er - Erosion hazard
Flood - Flooding hazard (overflow)
Frost - Susceptibility to frost heave
M Sh-Sw - Moderate shrink-swell potential
NL - No limitations
Org - Organic soil
Sh-Sw - High shrink-swell potential
Slope - Excessive slope
Wet - Seasonally high groundwater table or surface ponding

TABLE 9
Soil Suitability for Source of Roadfill[1]

Map[2] Symbol	Degree of Suitability			
	Good	Fair	Poor	Unsuitable
2/c0 2/c1 2/d0 2/e0 2/e1	NL			
2/f0		Slope		
5/c0 5/c1 5/d1 5/d5 5/e3		M Sh-Sw Frost Wet		
6/c1 6/c2 6/c3 6/c4 6/d1 6/d3 6/e1 6/e3		M Sh-Sw Frost		
6/f3		M Sh-Sw Frost Slope		
8/c1		Wet BR	Sh-Sw Frost	
11/b0 11/c1 11/c2 11/c3 11/d1 11/d2 11/e3		Wet M Sh-Sw Frost		
11/f2		Slope Er Wet		
13/a0 13/b0 13/c4 13/c5		M Sh-Sw Frost	Wet	
14/b0 14/b2			Wet Sh-Sw Frost	
15/b0 15/c0		Wet	Sh-Sw Frost Clay	
17/b0 17/c0		Wet		
18/b0 18/c0		M Sh-Sw Wet	Frost	
19/c0 19/d0	NL			
21/c0 21/d0	NL			
22/d3		Wet M Sh-Sw Frost		
23/c3		Wet M Sh-Sw Frost		
[3]24/d3		Wet M Sh-Sw Frost		
BF-G/b1 BF-G/c1 BF-G/c2 BF-G/c4 BF-G/d4			Flood	
BG/c5 BG/d5 BG/e5			Flood	
BG-W/a5 BG-W/b5 BG-W/c5			Wet Flood	
RB/e3	NL			
RB/f3		Slope		
RB/g1 RB/g3 RB/g4			Slope	

Map[2] Symbol	Degree of Suitability Good	Fair	Poor	Unsuitable
M			Org Wet Sh-Sw Frost	
TM			Org Wet Sh-Sw Frost	

[1]Surface stoniness was not considered in determining ratings.

[2]For explanation, see Soil Map.

[3]This rating refers to the imperfectly drained soils of Map Unit 24. For the ratings of the well drained soils, refer to Map Unit 6.

ABBREVIATIONS

BR - Shallow depth to bedrock
Clay - High clay content
Er - Erosion hazard
Flood - Flooding hazard (overflow)
Frost - Susceptibility to frost heave
M Sh-Sw - Moderate shrink-swell potential
NL - No limitations
Org - Organic soil
Sh-Sw - High shrink-swell potential
Slope - Excessive slope
Wet - Seasonally high groundwater table or surface ponding

TABLE 10
Soil Suitability for Source of Sand or Gravel

Map[1] Symbol	Good	Fair	Poor	Unsuitable
2/c0 2/c1 2/d0 2/e0 2/e1 2/f0	NL			
5/c0 5/c1 5/d1 5/d5 5/e3			Thin Wet	
6/c1 6/c2 6/c3 6/c4 6/d1 6/d3 6/e1 6/e3 6/f3				Text
8/c1				Text
11/b0 11/c1 11/c2 11/c3 11/d1 11/d2 11/e3 11/f2				Text
13/a0 13/b0 13/c4 13/c5				Text
14/b0 14/b2			Wet	
15/b0 15/c0				Text
17/b0 17/c0		Wet		
18/b0 18/c0			Text	
19/c0 19/d0				Text
21/c0 21/d0		Text		
22/d3				Text
23/c3				Text
24/d3				Text
BF-G/b1 BF-G/c1 BF-G/c2 BF-G/c4 BF-G/d4		Flood		
BG/c5 BG/d5 BG/e5		Flood		
BG-W/a5 BG-W/b5 BG-W/c5			Wet Flood Text	
RB/e3 RB/f3 RB/g1 RB/g3 RB/g4			Text	
M				Org Text
TM				Org Text

[1]For explanation, see Soil Map.

ABBREVIATIONS

Flood - Flooding hazard (overflow)
NL - No limitations
Org - Organic soil
Text - Unsuitable texture
Thin - Thin deposit of sand or gravel
Wet - Seasonally high groundwater or surface ponding

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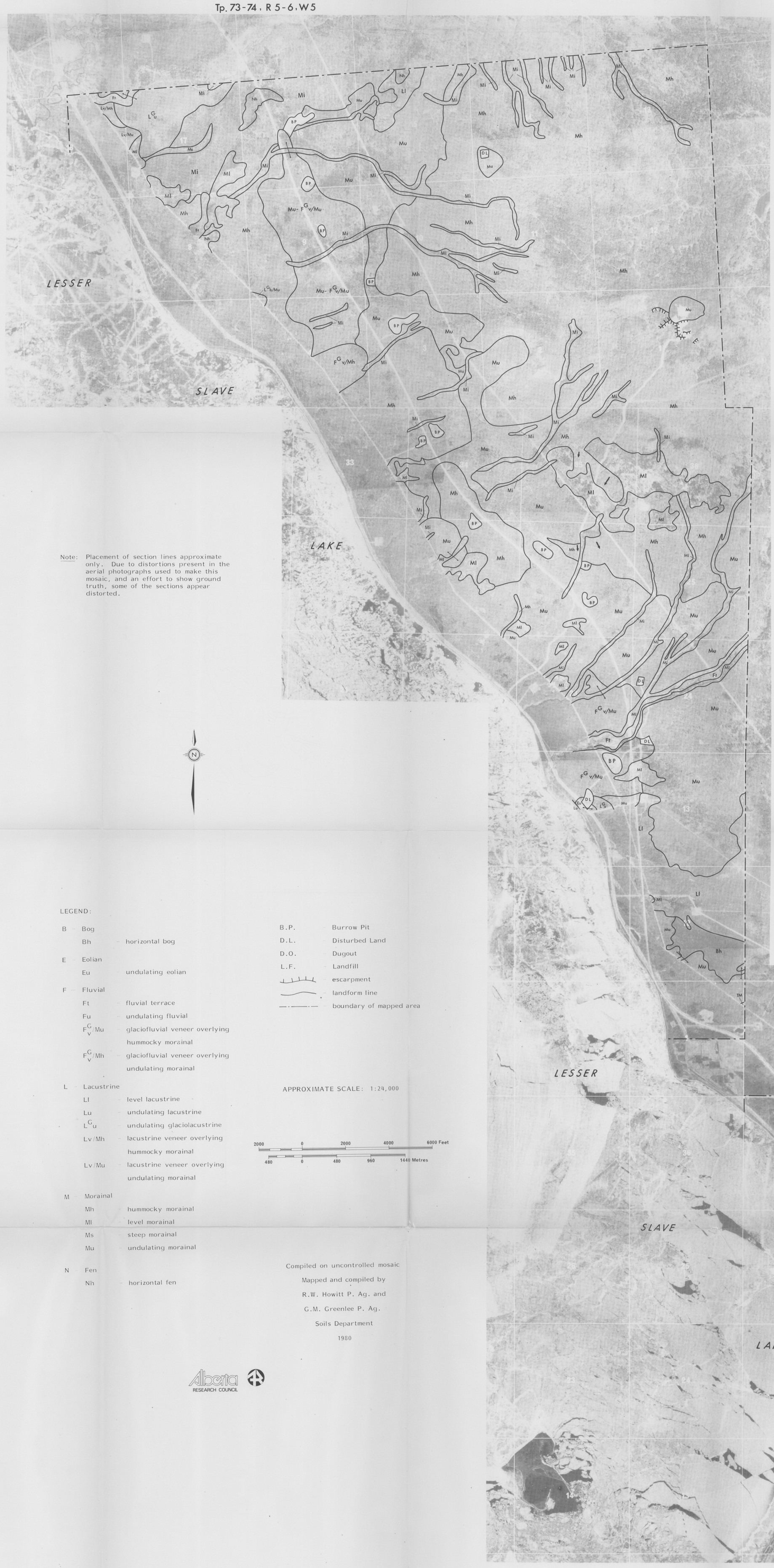
LANDFORM MAP OF LESSER SLAVE LAKE PROVINCIAL PARK

Tp. 73-74, R 5-6, W5



Note: Placement of section lines approximate only. Due to distortions present in the aerial photographs used to make this mosaic, and an effort to show ground truth, some of the sections appear distorted.

LEGEND:

- B – Bog
  - Bh – horizontal bog
- E – Eolian
  - Eu – undulating eolian
- F – Fluvial
  - Ft – fluvial terrace
  - Fu – undulating fluvial
  - F^{G}_{v}/Mu – glaciofluvial veneer overlying hummocky morainal
  - F^{G}_{v}/Mh – glaciofluvial veneer overlying undulating morainal
- L – Lacustrine
  - Ll – level lacustrine
  - Lu – undulating lacustrine
  - $L^{G}u$ – undulating glaciolacustrine
  - Lv/Mh – lacustrine veneer overlying hummocky morainal
  - Lv/Mu – lacustrine veneer overlying undulating morainal
- M – Morainal
  - Mh – hummocky morainal
  - Ml – level morainal
  - Ms – steep morainal
  - Mu – undulating morainal
- N – Fen
  - Nh – horizontal fen

- B.P. – Burrow Pit
- D.L. – Disturbed Land
- D.O. – Dugout
- L.F. – Landfill
- escarpment
- landform line
- boundary of mapped area

APPROXIMATE SCALE: 1:24,000

2000 0 2000 4000 6000 Feet

480 0 480 960 1440 Metres

Compiled on uncontrolled mosaic

Mapped and compiled by

R.W. Howitt P. Ag. and

G.M. Greenlee P. Ag.

Soils Department

1980

Alberta RESEARCH COUNCIL

SOILS MAP OF LESSER SLAVE LAKE PROVINCIAL PARK

Tp. 73-74, R 5-6, W5

APPROXIMATE SCALE: 1:24,000

2000 0 2000 4000 6000 Feet

480 0 480 960 1440 Metres

LEGEND:

Map Symbol

6 / c3 ← map unit / surface stoniness rating / topographic class

B.P. -Burrow Pit

D.L. -Disturbed Land

D.O. -Dugout

L.F. -Landfill

-escarpment

-soil line

-boundary of mapped area

Compiled on uncontrolled mosaic

Mapped and compiled by:
R.W. Howitt P.Ag. and
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Soils Department
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Alberta RESEARCH COUNCIL

Note: Placement of section lines approximate only. Due to distortions present in the aerial photographs used to make this mosaic, and an effort to show ground truth, some of the sections appear distorted.

SOIL CLASSIFICATION

MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
2	Brunisolic	Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol	sand
5	Brunisolic - 70%	Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol	sand, overlying moderately fine textured till
	Luvisolic - 30%	Gleyed Gray Luvisol and Gleyed Brunisolic Gray Luvisol	
6	Luvisolic - 80%	Orthic Gray Luvisol - 70%	medium textured till
		Gleyed Gray Luvisol - 10%	
	Gleysolic - 10%	Orthic Gleysol	
	Organic - 10%	Terric Mesisol	
8	Luvisolic - 80%	Gleyed Gray Luvisol	fine textured till containing a high proportion of weathered shale
	Brunisolic - 20%	Gleyed Melanic Brunisol and Gleyed Eluviated Eutric Brunisol	sand, overlying fine textured till containing a high proportion of weathered shale
11	Luvisolic - 70%	Gleyed Gray Luvisol	moderately fine textured till
	Gleysolic - 20%	Orthic Gleysol	
	Organic - 10%	Terric Mesisol	
13	Gleysolic	Orthic Gleysol and Orthic Luvic Gleysol	moderately fine textured till
14	Gleysolic	Orthic Humic Gleysol	fine textured lacustrine sediments overlying sand
15	Luvisolic	Gleyed Gray Luvisol and Gleyed Dark Gray Luvisol	fine textured lacustrine sediments
17	Regosolic	Gleyed Cumulic Regosol	medium textured fluvial sediments, overlying coarse textured fluvial sediments (sand or gravel)
18	Regosolic	Cumulic Regosol	medium textured fluvial sediments
19	Luvisolic	Orthic Gray Luvisol	medium textured lacustrine sediments, overlying moderately fine textured till
21	Brunisolic	Orthic Eutric Brunisol and Orthic Melanic Brunisol	medium to very coarse textured fluvial sediments
22	Luvisolic - 40%	Gleyed Gray Luvisol	moderately fine textured till
	Chernozemic - 30%	Orthic Dark Gray Chernozemic and Gleyed Rego Dark Gray Chernozemic	
	Gleysolic - 20%	Orthic Gleysol	
	Organic - 10%	Terric Mesisol	
23	Luvisolic - 40%	Gleyed Gray Luvisol	dominantly medium textured till; unpredictable pockets of sand overlying the till
	Brunisolic - 30%	Gleyed Eutric Brunisol and Gleyed Eluviated Eutric Brunisol	
	Gleysolic - 20%	Orthic Gleysol	
	Organic - 10%	Terric Mesisol	
24	Luvisolic - 70%	Gleyed Gray Luvisol - 40% Orthic Gray Luvisol - 30%	medium to moderately fine textured till
	Gleysolic - 20%	Orthic Gleysol	
	Organic - 10%	Terric Mesisol	
B.F.-G.	Regosolic	Orthic Regosol	fine beach gravel and coarse sand, overlying coarse gravel
B.G.	Regosolic	Orthic Regosol	beach gravel
B.G.-W.	Gleysolic	Rego Gleysol	variable; sand, gravel, and stony moderately fine textured till
R.B.	Regosolic	Orthic Regosol	undifferentiated riverbank, predominantly medium to moderately fine textured till
M	Organic	undifferentiated Mesisol	predominantly intermediately decomposed peat
T.M.	Organic	Terric Mesisol	predominantly intermediately decomposed peat, overlying undifferentiated mineral material