Earth Sciences Report 88-1

Soil survey of

Saskatoon Island Provincial Park

and interpretation for recreational use

G.M. Greenlee

ALBERTA RESEARCH COUNCIL

Terrain Sciences Department

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Cover:
Alberta provincial park picnic area.

TERRAIN SCIENCES DEPARTMENT, ALBERTA RESEARCH COUNCIL
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Summary

The mapped area comprises about 100 ha and is situated about 19 km west and 3 km north of Grande Prairie. Most of the park is covered by moderately fine to very fine textured till. This region has a cold snow-forest climate with humid winters, characterized by frozen ground and a snow cover of several months duration. Summers are cool and short, having less than four months with an average temperature above 10°C; the average temperature of the coldest month is below −3°C. The study area is situated in the mixedwood section of the boreal forest region, where the characteristic forest association of well-drained uplands is a mixture, but trembling aspen is the cover type of greatest areal extent.

Seven map units were recognized in the study area. The key profile types are Dark Gray Luvisols, Eluviated Black Chernozemics, Orthic Gray Luvisols, Gleyed Gray Luvisols, Gleyed Black Solodized Solonetz, Gleyed Gray Solodized Solonetz, Orthic Gleysols and Orthic Humic Gleysols. These are distributed over the landscape in relation to landform, parent material and drainage. Map units consist of single soil series or groupings of series (complexes); their distribution is shown on the soil map.

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 fully serviced campgrounds, primitive camping areas, picnic areas, lawns and landscaping, paths, trails, buildings (with and without basements) and road location. The soils best suited to recreational development in Saskatoon Island park are those of Map Units 1, 3, 4, and 5; and these all have moderate limitations. Map Units 3 and 4 soils are widespread throughout most of the park. Soils of other map units have severe limitations for recreational development. All soils in the park have severe limitations for road construction. Careful study of the soil map and table 6 (soil limitations) will reveal areas suitable for particular uses.

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

Introduction

This report is one of a series describing detailed and semi-detailed soil surveys which have been conducted in Alberta provincial parks and recreation areas. As well as the Saskatoon Island Provincial Park, during the summer of 1981 a soil survey was conducted in the Willow Creek Provincial Park study area northwest of Claresholm. The total area surveyed was approximately 280 ha.

A general guidebook has been prepared to accompany soil survey reports written for Alberta provincial parks and recreation areas (Greenlee, 1981). It 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 landform 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 also included. Specific results and interpretations for the areas covered by this study are presented in this report.

Size and location

The mapped area, comprising about 100 ha, is situated about 19 km west and 3 km north of Grande Prairie (figure 1). It includes part of the west half of section 6, township 72, range 7, and parts of the southeast, southwest, northeast and northwest quarters of section 1, township 72, range 8, all west of the sixth meridian.

Physiography and surficial deposits

The mapped area lies within the Wapiti Plain division of the Interior Plains physiographic region (Government and the University of Alberta, 1969). This area is described by Allan and Carr (1946) as a gently rolling plain that slopes gradually towards the Wapiti River to the south. Green (1972) has classified the bedrock as the Upper Cretaceous Wapiti Formation, which is non-marine. Surface elevations are somewhat less than 730 m in the park; very little local relief occurs. The land surface is relatively flat and slopes gradually from the central portion of the park toward the lake shores to the north and south and toward the eastern and western ends of the park. Drainage of the mapped area is into Saskatoon and Little Lakes, which bound the park on the north and south and which appear to be internally drained.

Most of the park is covered by moderately fine to very fine textured till. A narrow band of moderately fine to fine textured lacustrine sediment occurs along part of the northern boundary and two small patches occur in the extreme eastern end.

Climate

The climate of the mapped area is designated as humid microthermal in Köppen's climatic classification (Trewartha and Horn, 1980). This is described as a cold snow-forest climate with humid winters, characterized by frozen ground and a snow cover of several months duration. Summers are cool and short, having less than four months with an average temperature above 10°C. The average temperature of the coldest month is below −3°C.

Weather records for 1951 through 1980 from Grande Prairie, at an elevation of 669 m, show the following values (Environment Canada, 1982). The mean annual temperature is 1.2°C. July is the warmest month with a mean temperature of 15.9°C and January is the coldest with a mean temperature of −17.7°C. The mean an-

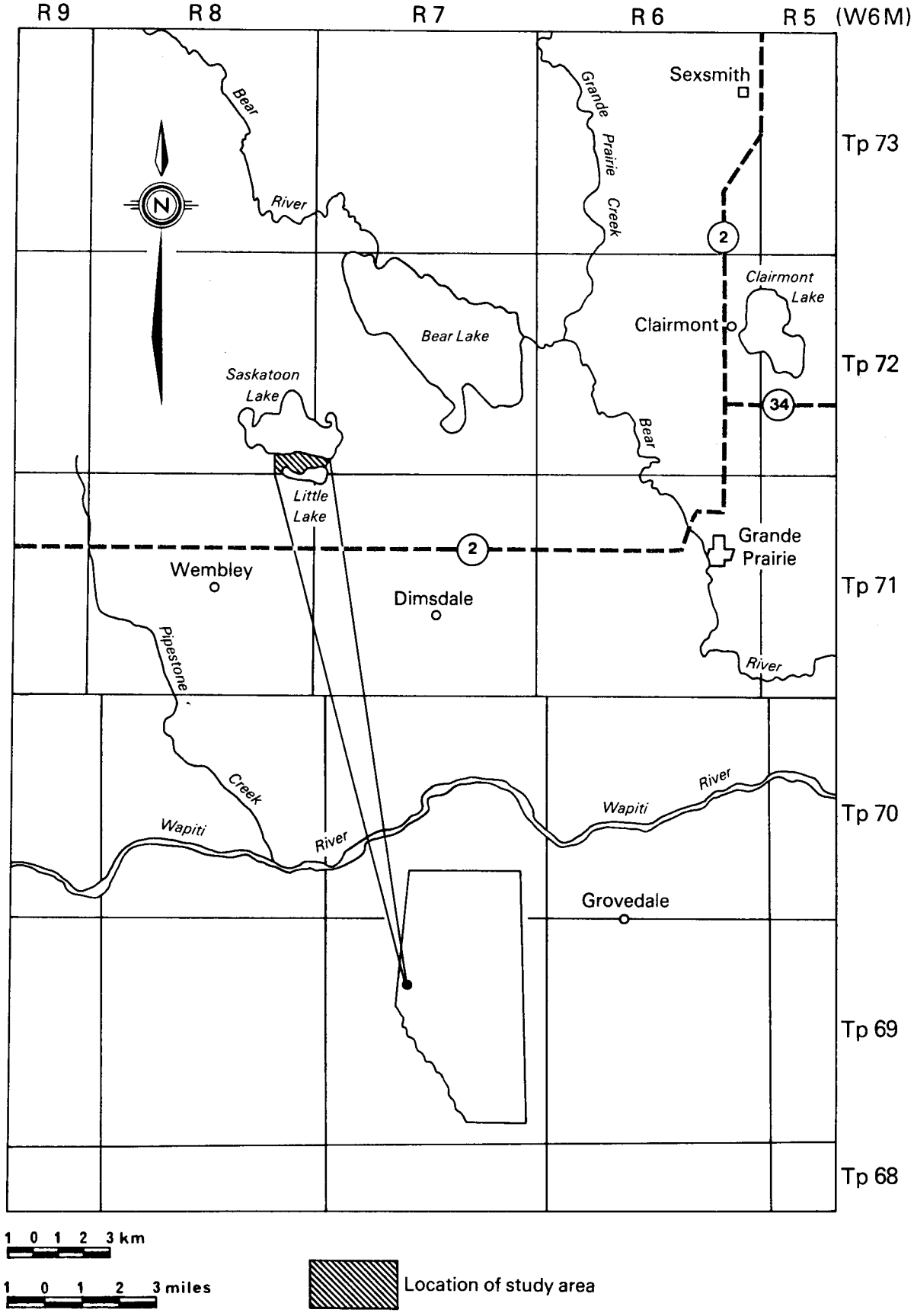

Figure 1. Map showing location of study area.

nual precipitation is 453 mm; 60 percent falls as rain. The average frost free period is 116 days.

Vegetation

The study area is situated in the mixedwood section of the boreal forest region, as classified by 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. In addition to its usual dominance in sandy areas, jack pine is found in the forest composition on the drier till soils and is mixed with black spruce on plateau-like tops of the higher hills. Black spruce and larch muskeg have developed in lower positions and the upper water catchment areas.

Since the Outdoor Recreation Planning Branch of Alberta Recreation and Parks conducts biological studies of provincial parks and proposed park areas, the vegetation is not extensively discussed in this report. Some of the more common plant species observed growing on different soils are indicated, however, as part of the map unit descriptions; these are listed as follows (Moss 1959, Cormack, 1967): aspen *(Populus tremuloides),* balsam poplar *(Populus balsamifera),* saskatoon-berry *(Amelanchier alnifolia),* dogwood *(Cornus stolonifera),* low-bush cranberry *(Viburnum edule),* chokecherry *(Prunus virginiana),* willow *(Salix spp),* wild rose *(Rosa spp),* fireweed *(Epilobium angustifolium),* wild strawberry *(Fragaria spp),* western wood lily *(Lilium philadelphicum var andinum),* Western Canada violet *(Viola rugulosa),* bunchberry *(Cornus canadensis),* northern bedstraw *(Galium boreale),* wild vetch *(Vicia americana),* indian paintbrush *(Castilleja spp),* meadow rue *(Thalictrum spp),* wild sweet pea *(Lathyrus ochroleucus),* dwarf raspberry *(Rubus acaulis),* baneberry *(Actaea rubra),* twisted-stalk *(Streptopus amplexifolius),* native grass *(various species),* fescue *(Festuca spp),* buckbrush *(Symphoricarpos occidentalis),* common yarrow *(Achillea millefolium),* common dandelion *(Taraxacum officinale),* northern green bog orchid *(Habenaria hyperborea),* slough grass *(Beckmannia syzigachne),* sedge *(Carex spp)* and wild mint *(Mentha arvensis var villosa).*

Soils

Seven map units were recognized in the study area. The soils of four units were classified in the Luvisolic order, two in the Gleysolic order and one in the Solonetzic order in the Canadian soil classification system (Canada Soil Survey Committee, 1978). Minor components of two units were also mapped in the Chernozemic order. The system is outlined in Greenlee (1981). Pertinent features of the map units are outlined in table 1.

Soils of the Luvisolic order are well to imperfectly drained mineral soils characterized by an Ae horizon near the surface, generally varying from 7.5 to 30 cm in thickness. It is a leached gray 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 ranges from 2.5 to 12.5 cm or more in thickness; however, the Ah horizon below is usually less than 5 cm thick and often absent altogether. When Luvisolic soils are cultivated, the L-H and Ah horizons quickly become mixed with the Ae, resulting in gray fields. The L-H and Ah horizons rapidly break 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, the Ae horizon is often baked and hard, so that 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.

The majority of the park is covered by well-drained Luvisolic soils developed on moderately fine to very fine textured till. A narrow band of imperfectly drained Luvisolic soils, developed on moderately fine textured lacustrine sediments, occurs along part of the northern park boundary; and a very small patch occurs in the extreme northeastern corner.

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 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 ranges from 10 to 25 cm in thickness; 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 characteristics and relative use capabilities.

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; they are usually found in southern and southeastern Alberta. Black Chernozemic soils have A horizons that are higher in organic matter content, darker and thicker than those of the other great groups; they 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 modifi-

Table 1. Key to the soils

Map Unit	Classification	Parent material	Surface texture	Slope (class and gradient)	Surface stoniness	Drainage	Comments and limitations
1	Gleyed Black Solodized Solonetz, and Gleyed Gray Solodized Solonetz	fine textured till	loam to silty clay loam	b (>0.5 to 2%)	0	imperfect	Black Solodized Solonetz occur under grass, and Gray Solodized Solonetz occur under aspen. Moderate to severe limitations—seasonally high water table, slippery or sticky when wet, Solonetzic soil, slow permeability, flooding hazard (overflow), moderate to high shrink-swell potential, susceptibility to frost heave.
2	Orthic Gleysol	fine textured till	sandy clay loam to silty clay	a (0 to 0.5%)	0	poor	Sandy clay loam textured Bg_1 horizon not always found. Severe limitations—seasonally high water table or surface ponding, flooding hazard (overflow), slippery or sticky when wet, high clay content, lack of Ah horizon, moderate to high shrink-swell potential.
3	Dark Gray Luvisol-70% Eluviated Black Chernozemic -20% Orthic Gray Luvisol -10%	moderately fine to very fine textured till	loam to silty clay loam	b,c (>0.5 to 5%)	1	well drained	(1) Luvisolic soils occur under aspen and saskatoon clumps. (2) Chernozemic soils occur under grass and saskatoon clumps. Slight to severe limitations—slippery when wet, high clay content, slow permeability, thin Ah horizon, moderate to high shrink-swell potential, susceptibility to frost heave.
4	Dark Gray Luvisol-60% Eluviated Black Chernozemic-40%	moderately fine to very fine textured till	loam to silty clay loam	D (>5 to 9%)	1	well drained	(1) Luvisolic soils occur under saskatoon and aspen clumps. (2) Chernozemic soils occur under saskatoon clumps and grass. Slight to severe limitations—slippery or sticky when wet, high clay content, slow permeability, erosion hazard, thin Ah horizon, moderate to high shrink-swell potential, susceptibility to frost heave.
5	Gleyed Gray Luvisol	moderately fine textured lacustrine	sand	b (>0.5 to 2%)	0	imperfect	C horizons contain occasional thin bands or pockets of sand. Moderate to severe limitations—seasonally high water table or surface ponding, flooding hazard (overflow), sandy surface texture, thin Ah horizon, moderate to high shrink-swell potential, susceptibility to frost heave.
6	Orthic Gray Luvisol	fine textured till	silt loam	F (>15 to 30%)	1	well drained	Severe limitations—excessive slope, erosion hazard, slippery or sticky when wet, thin Ah horizon, moderate to high shrink-swell potential, susceptibility to frost heave.
7	Orthic Humic Gleysol-80% Orthic Gleysol-20%	moderately fine to fine textured lacustrine	silt loam to silty clay loam	b (>0.5 to 2%)	0	poor	Occasional sand lenses occur in the soil profile. Severe limitations—seasonally high water table or surface ponding, flooding hazard (overflow), slippery or sticky when wet, moderate to high shrink-swell potential.

cations 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; 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 Black soils) 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-drained Black Chernozemic soils, developed under grass and saskatoon-berry on moderately to very fine textured till, occur as minor components of Map Units 3 and 4 throughout most of the park.

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 with 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 occur in the park, one near the western end and two at the eastern end. The patch at the western end is developed on fine textured till. One patch at the eastern end is developed on moderately fine to fine textured lacustrine sediments; part of the other patch is developed on the lacustrine sediments, and part on fine textured till.

Soils of the Solonetzic order are well to imperfectly drained mineral soils having Solonetzic B horizons and saline C horizons. A Solonetzic B is characterized by a columnar (round or flat-topped) or prismatic macrostructure that can usually be broken into a blocky mesostructure. These blocks, which are hard to very hard when dry and are relatively impermeable, usually show dark surface stains or coatings. Chemically, the Solonetzic B horizons show evidence of alkalinization and have ratios of exchangeable calcium to exchangeable sodium of 10 or less, which is significantly lower than that for other non-Solonetzic B horizons. The C horizons are generally saline and usually show an accumulation of salts.

Solonetzic soils are further divided into three major divisions: the Solonetz, Solodized Solonetz, and Solod Great Groups. Solonetz and Solodized Solonetz soils have Solonetzic B horizons that are essentially intact and have not undergone significant breakdown. Generally, an abrupt break appears between the A and B horizons; the A horizon is usually thin in relation to the B. Solodized Solonetz soils are characterized by the presence of an acidic Ae horizon, which is lacking in Solonetz soils. Solod soils are characterized by a greater development of this acidic Ae horizon and an AB transitional horizon in which the former Solonetzic B structure is in the process of physical disintegration. A horizons are generally thicker in relation to B horizons than in associated Solonetz and Solodized Solonetz soils. The contact between the AB and Solonetzic B horizons is not well defined and the remnant B horizons are more easily broken into darkly stained aggregates than in Solonetz and Solodized Solonetz soils.

Structural limitations of Solonetzic B horizons, which tend to become sticky and plastic when wet, and very hard when dry, restrict moisture penetration and root development. Rainwater usually remains at or near the surface and much is lost by evaporation. Because of the proximity of saline and alkaline subsoils, periodic salinization of surface horizons occurs when these soils are irrigated. This presents further limitations to healthy plant growth and to water availability. Consequently, Solonetzic soils are usually distinctly inferior in productivity to other associated soils. Another limitation of Solonetzic soils is their high erodibility, which results from unstable soil aggregates caused by high sodium contents. In Solod soils, the limitations of structure and salinity are moderate in comparison to those for Solonetz and Solodized Solonetz soils. Solods, although somewhat inferior, more closely approach the associated Chernozemic soils in general productivity. Management problems in the cultivation of Solonetzic soils involve the timely use of tillage equipment to conserve moisture and to prevent caking of surface clods and dessication of the underlying B horizon.

Only two patches of imperfectly drained Solonetzic soils, developed on fine textured till, are found in the park: one at the western end and one near the eastern end.

Very minor differences exist among some map units; however, the differences are usually significant with regard to a particular recreational or engineering use and thus justify different map units. They are described in sequence; 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 purported to be complete.

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 precipitation records. Annual precipitation amounts change gradually from one soil zone to another, not abruptly at the point where a zone boundary has been located. Thus a zone boundary is a broad transitional belt, which can be many kilometres across. Topsoil colors reflect this gradual change; for example, in the center of the Brown soil zone (annual precipitation about 300 to 330 mm), topsoil colors are brown. Similarly in the center of the Dark Brown soil zone (annual precipitation about 380 mm), topsoil colors are dark brown. Between these two zones, topsoil colors are brown to dark brown; annual precipitation is about 350 mm. The boundary between the two soil zones has been placed approximately at that midpoint.

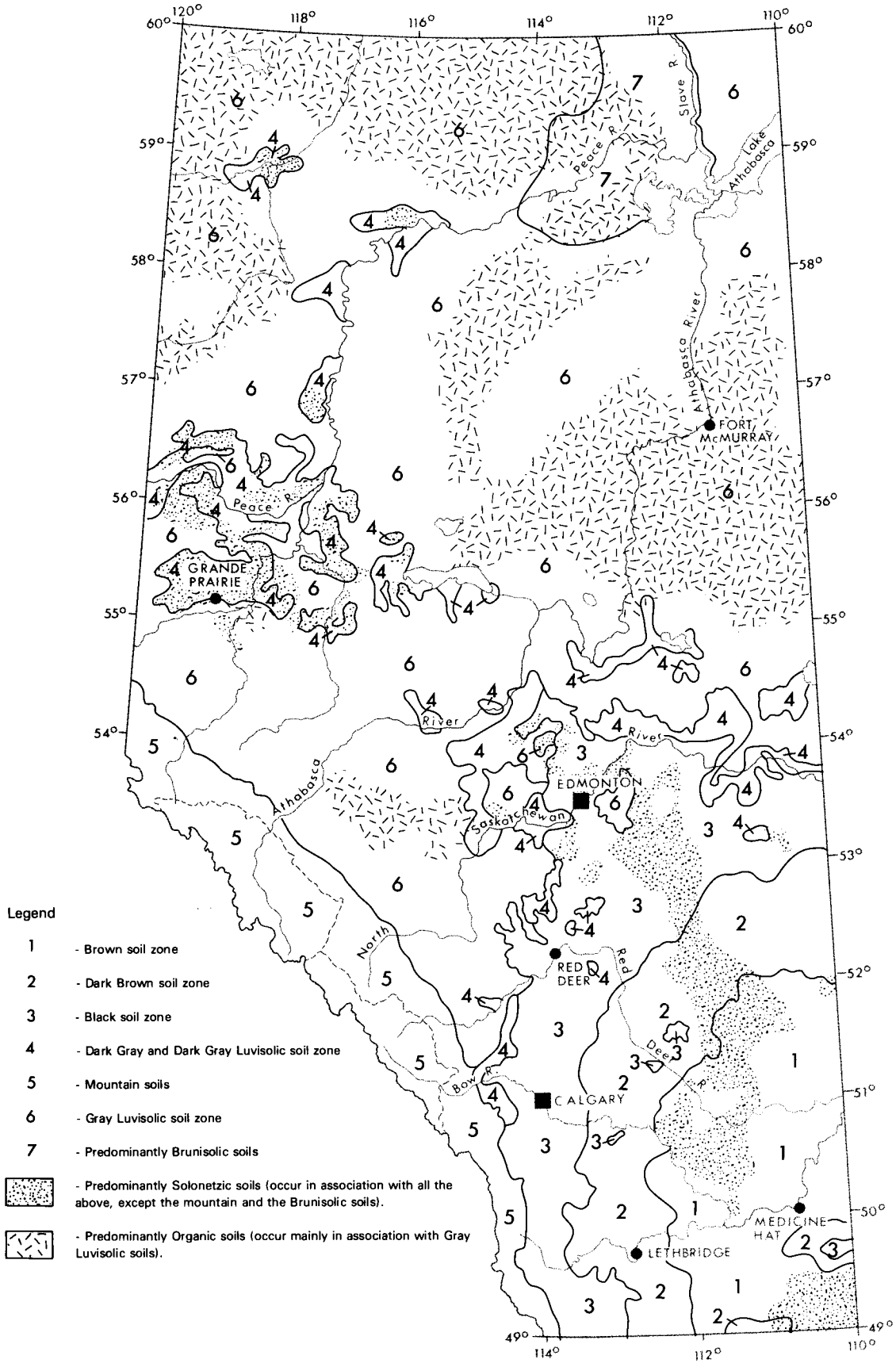

Figure 2. Map showing soil zones of Alberta (from Soil Group Map of Alberta, Alberta Institute of Pedology, undated).

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 soil, which develops as a result of salinization. The salinization may originate internally from a saline parent material or from saturation by external saline waters. Solonetzic soils are found across many soil zones (figure 2). Azonal soils without distinct genetic horizons, are represented in Canada by Regosolic soils.

The mapped area is situated in the Dark Gray and Dark Gray Luvisolic soil zones; most of the soils are classified as Dark Gray Luvisolic, which are zonally normal. Significant occurrences of Black Chernozemic soils are also found, along with minor amounts of Orthic Gray Luvisols. These types are normally found in the transitional Dark Gray and Dark Gray Luvisolic soil zones. Minor amounts of Gleysolic and Solonetzic soils are also found within the park. These are intrazonal and occur across all the soil zones. Soils within the park can be considered normal, both locally and regionally, although somewhat higher proportions of Solonetzic soils are indicated on the soil map published for this vicinity (Odynsky et al., 1961). Map Unit 1 soils within the park have been classified as Solonetzic and soils of several other map units have distinctive Solonetz-like morphological features, although their B horizons lack the required chemical criteria for classification in the Solonetzic order. The Bt horizons of Map Units 3, 4, 5 and 6 all have morphological features indicative of Solonetzic Bnt horizons, although none has been classified as such. The Bt horizons of Map Unit 5 Luvisolic soils resemble Bnt horizons of Solodized Solonetz soils, while the Bt horizons of Map Units 3 and 4 Luvisolic and Chernozemic soils, and those of Map Unit 6 Luvisolic soils, all resemble Bnt horizons of Solod soils.

Special features of soils in the mapped area are their extremely high clay contents, inherent in the parent materials from which they have formed. This feature, combined with high silt contents of some surface soils, renders them slippery or sticky when wet after vegetation is removed. Because of a high incidence of surface runoff resulting from low infiltration and soil permeability rates, fine textured soils are also often highly susceptible to water erosion after the removal of vegetation. Erosion hazard is not considered serious over most of Saskatoon Island Park, however, partly because of relatively high organic matter contents of most surface soils and the general absence of steep slopes. The fine textured nature of the soil parent material may also be a causative factor of the Solonetz-like morphological features preponderant in soils throughout most of the park.

Map Unit 1

Classification: Gleyed Black Solodized Solonetz and Gleyed Gray Solodized Solonetz
Parent material: fine textured till
Landform: level morainal (Ml)
Slope: gently undulating (>0.5 to 2%)
Surface stoniness: nonstony (0)
Drainage: imperfect
Vegetation: native grass, fescue, fireweed, indian paintbrush, wild strawberry, common dandelion, wild vetch, common yarrow; patches of aspen, wild rose, northern bedstraw, western wood lily, meadow rue; patches of buckbrush; some saskatoon-berry, willow, sedge, northern green bog orchid.

Profile description: Gleyed Black Solodized Solonetz

Horizon	Thickness (cm)	Field texture	Structure	Consistence
Ah	5-15	silt loam to silty clay loam	granular	friable to very friable, moist; slightly hard, dry
Aeg	0-5	loam	platy	very friable, moist; slightly hard, dry
Bnjtg	27-38	silty clay	columnar, with round tops, breaking to sub-angular blocky	firm to very firm, moist; very hard, dry
BCg	0-25	silty clay	amorphous	very firm, moist; very hard, dry
Ccag	35-55	silty clay	amorphous	very firm, moist; very hard, dry

Profile description: Gleyed Gray Solodized Solonetz

Horizon	Thickness (cm)	Field texture	Structure	Consistence
L-H	5-8	leaf and root litter		
Ah	2-5	loam to silt loam	granular	very friable, moist
Aeg	5-8	silt loam	platy	very friable, moist
Bnjtg	20-30	silty clay to clay	columnar, breaking to subangular blocky	very firm, moist
BCg	0-40	silty clay to clay	amorphous	very firm, moist
Ccag	20-70	silty clay to clay	amorphous	very firm, moist

Comments:
(1) Strictly speaking, the soils of Map Unit 1 cannot be classified as Solonetzic because they do not have Bn horizons. According to the definition of Solonetzic soils given by the Canada Soil Survey Committee (1978), the Ca/Na ratio is 10 or less in a Bn horizon. The ratio is 10.8 in the B horizons of Map Unit 1 soils, so these must be designated as Bnj horizons. Because of the distinctive Solonetz-like morphology of Map Unit 1 soils, however, they have been classified as Solonetzic and can be expected to behave as such under field conditions.
(2) The Black Solodized Solonetz soils occur under grass, the Gray Solodized Solonetz under aspen.
(3) Tonguing of the Ah horizons is evident in the Black Solodized Solonetz soils and the Aeg horizons are discontinuous.
(4) The BCg horizons are found only occasionally.

Limitations: Moderate to severe; severe for buildings and road location; moderate for all other uses. Specific limitations include seasonally high water table, slippery or sticky when wet, Solonetzic soil, slow permeability, flooding hazard (overflow), moderate to high shrink-swell potential and susceptibility to frost heave.

Map Unit 2

Classification: Orthic Gleysol
Parent material: fine textured till
Landform: level morainal (Ml)
Slope: nearly level (0 to 0.5%)
Surface stoniness: nonstony (0)
Drainage: poor
Vegetation: willow, slough grass, sedge, wild mint

Profile description: Orthic Gleysol

Horizon	Thickness (cm)	Field texture	Structure	Consistence
Of-Oh	5-13	fibric to humic peat		
Bg1	0-20	sandy clay loam	amorphous	firm, moist
Bg2	10-43	silty clay	amorphous or subangular blocky	firm to very firm, moist
Ccag	57-70	silty clay	amorphous	very firm, moist

Comments: The sandy clay loam textured Bg1 horizon is not always found.

Limitations: Severe for all uses. Specific limitations include seasonally high water table or surface ponding, flooding hazard (overflow), slippery or sticky when wet, high clay content, lack of Ah horizon, moderate to high shrink-swell potential.

Map Unit 3

Classification: Dark Gray Luvisol - 70%
Eluviated Black Chernozemic - 20%
Orthic Gray Luvisol - 10%

Parent material: moderately fine to very fine textured till

Landform: level morainal (Ml) undulating morainal (Mu)

Slope: gently undulating to undulating (>0.5 to 5%)

Surface stoniness: slightly stony (1)

Drainage: well drained

Vegetation: mainly aspen; understory of saskatoon-berry, dogwood, chokecherry, wild rose, fireweed, meadow rue, Western Canada violet, buckbrush, wild vetch, northern bedstraw, wild sweet pea, baneberry, native grass; also some open patches of native grass, with patches of saskatoon-berry.

Profile description: Dark Gray Luvisol

Horizon	Thickness (cm)	Lab texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	10	leaf and root litter - plentiful, very fine to coarse, horizontal roots			6.6	54.6
Ah	6	silt loam to silty clay loam	granular	soft, dry	6.3	16.3
Ae	7	silt loam	platy	hard, dry	5.9	1.9
Bt	17	heavy clay	subangular blocky	very firm, moist	4.9	nd[2]
BC	27	heavy clay	amorphous	very firm, moist	5.2	nd
Cca1	20	clay	amorphous	very firm, moist	7.5	nd
Cca2	23	silty clay loam	amorphous	hard, dry	7.8	nd

[1] organic matter; [2] not determined.

Profile description: Eluviated Black Chernozemic

Horizon	Thickness (cm)	Field texture	Structure	Consistence
L-H	2-5	leaf and root litter	turfy	
Ah	10-13	loam to silt loam	granular	very friable, moist; soft, dry
Ae	5-8	loam to silt loam	platy	very friable, moist; slightly hard, dry
Bt	20-25	silty clay loam to silty clay	subangular blocky	firm to very firm, moist
BC	30-40	silty clay	amorphous	very firm, moist; very hard, dry
Cca	20-35	silty clay	amorphous	very firm, moist; very hard, dry

Profile description: Orthic Gray Luvisol

Horizon	Thickness (cm)	Field texture	Structure	Consistence
L-H	5-8	leaf and root litter		
Ah	2-5	loam to silt loam	granular	very friable, moist; soft, dry
Ae	5-8	loam to silt loam	platy	very friable, moist; slightly hard, dry
Bt	20-25	silty clay loam to silty clay	subangular blocky	firm to very firm, moist
BC	30-40	silty clay	amorphous	very firm, moist; very hard, dry
Cca	23-38	silty clay	amorphous	very firm, moist; very hard, dry

Comments: (1) The Luvisolic soils occur under aspen and saskatoon clumps and are predominantly Dark Gray Luvisols. Only occasional unpredictable patches of Orthic Gray Luvisols are found.
(2) The Chernozemic soils occur under grass and saskatoon clumps. The L-H horizon is absent under grassland.
(3) Occasional silty clay loam textured pockets, 15 to 25 cm thick, are found in the C horizon of Map Unit 3 soils.

Limitations: Slight to severe—slight for buildings without basements; severe for road location; moderate for all other uses. Specific limitations include slippery or sticky when wet, high clay content, slow permeability, thin Ah horizon, moderate to high shrink-swell potential susceptibility to frost heave.

Map Unit 4

Classification: Dark Gray Luvisol - 60%
Eluviated Black Chernozemic - 40%
Parent material: moderately fine to very fine textured till
Landform: inclined morainal (Mi)
Slope: moderately sloping (>5 to 9%)
Surface stoniness: slightly stony (1)
Drainage: well drained
Vegetation: mainly saskatoon-berry, some wild rose, forbs, native grass, some open patches of native grass; some aspen clumps, with understory of saskatoon-berry, dogwood, chokecherry, wild rose, fireweed, meadow rue, Western Canada violet, buckbrush, wild vetch, northern bedstraw, wild sweet pea, baneberry, native grass

Profile description: Dark Gray Luvisol

Horizon	Thickness (cm)	Lab texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	10	leaf and root litter - plentiful, very fine to coarse, horizontal roots			6.6	54.6
Ah	6	silt loam to silty clay loam	granular	soft, dry	6.3	16.3
Ae	7	silt loam	platy	hard, dry	5.9	1.9
Bt	17	heavy clay	subangular blocky	very firm, moist	4.9	nd[2]
BC	27	heavy clay	amorphous	very firm, moist	5.2	nd
Cca1	20	clay	amorphous	very firm, moist	7.5	nd
Cca2	23	silty clay loam	amorphous	hard, dry	7.8	nd

[1] organic matter; [2] not determined.

Profile description: Eluviated Black Chernozemic

Horizon	Thickness (cm)	Field texture	Structure	Consistence
L-H	2-5	leaf and root litter	turfy	
Ah	10-13	loam to silt loam	granular	very friable, moist; soft, dry
Ae	5-8	loam to silt loam	platy	very friable, moist; slightly hard, dry
Bt	20-25	silty clay loam to silty clay	subangular blocky	firm to very firm, moist
BC	30-40	silty clay	amorphous	very firm, moist; very hard, dry
Cca	20-35	silty clay	amorphous	very firm, moist; very hard, dry

Comments: (1) The Luvisolic soils occur under aspen and saskatoon clumps.
(2) The Chernozemic soils occur under grass and saskatoon clumps. The L-H horizon is absent on grassland.
(3) Occasional silty clay loam textured pockets, 15 to 25 cm thick, are found in the C horizon of Map Unit 4 soils.

Limitations: Slight to severe—slight for buildings without basements; severe for road location; moderate for all other uses. Specific limitations include slippery or sticky when wet, high clay content, slow permeability, thin Ah horizon, moderate to high shrink-swell potential, susceptibility to frost heave.

Map Unit 5

Classification: Gleyed Gray Luvisol
Parent material: moderately fine textured lacustrine sediments
Landform: level lacustrine (Ll)
Slope: gently undulating (>0.5 to 2%)
Surface stoniness: nonstony (0)
Drainage: imperfect
Vegetation: mainly aspen; some balsam poplar; understory of dogwood, willow, saskatoon-berry, low-bush cranberry, wild rose, fireweed, twisted stalk, northern bedstraw, wild sweet pea, wild strawberry, bunchberry, dwarf raspberry, native grass

Profile description: Gleyed Gray Luvisol

Horizon	Thickness (cm)	Lab texture	Structure	Consistence	pH $CaCl_2$	OM[1] %
L-H	10	leaf and root litter - plentiful, very fine to coarse, horizontal roots			5.5	24.6
Ah	3	sand	granular	soft, dry	4.9	6.8
Aeg	12	sand	amorphous	loose, moist	5.4	nd[2]
Btg	27	heavy clay	columnar, breaking to subangular blocky	very firm, moist	5.8	nd[2]
Ccag1	10	sandy clay loam	amorphous	firm, moist	7.7	nd
Ckg	8	sandy loam	platy	very friable to firm, moist	7.4	nd
Ccag2	40	clay loam	platy	firm, moist	7.8	nd

[1] organic matter; [2] not determined.

Comments: (1) A few small rounded pebbles usually occur in the lower portion of the Aeg horizon.
(2) The C horizons contain occasional thin bands or pockets of sand.

Limitations: Moderate to severe—moderate for campgrounds and picnic areas; severe for all other uses. Specific limitations include seasonally high water table or surface ponding, flooding hazard (overflow), sandy surface texture, thin Ah horizon, moderate to high shrink-swell potential, susceptibility to frost heave.

Map Unit 6

Classification: Orthic Gray Luvisol
Parent material: fine textured till
Landform: inclined morainal (Mi)
Slope: steeply sloping (>15 to 30%)
Surface stoniness: slightly stony (1)
Drainage: well drained
Vegetation: aspen, low-bush cranberry, willow, wild rose, various forbs, native grass

Profile description: Orthic Gray Luvisol

Horizon	Thickness (cm)	Field texture	Structure	Consistence
L-H	7-8	leaf and root litter		
Ah	0-5	silt loam	granular	very friable, moist
Ae	2-8	silt loam to sandy loam	platy	very friable, moist
Bt	20-30	silty clay loam to silty clay	subangular blocky	firm to very firm, moist
BC	25-85	silty clay	amorphous	very firm, moist
Cca	at 60-115	silty clay	amorphous	very firm, moist

Limitations: Severe for all uses. Specific limitations include excessive slope, erosion hazard, slippery or sticky when wet, thin Ah horizon, moderate to high shrink-swell potential, susceptibility to frost heave.

Map Unit 7

Classification: Orthic Humic Gleysol - 80%
Orthic Gleysol - 20% (these two Great Groups are intimately and unpredictably associated)
Parent material: moderately fine to fine textured lacustrine sediments
Landform: level lacustrine (Ll)
Slope: gently undulating (>0.5 to 2%)
Surface stoniness: nonstony (0)
Drainage: poor
Vegetation: aspen, balsam poplar, willow, low-bush cranberry, dogwood, saskatoon-berry, wild rose, various forbs, native grass

Profile description: Orthic Humic Gleysol and Orthic Gleysol

Horizon	Thickness (cm)	Field texture	Structure	Consistence
L-H	7-13	leaf and root litter		
Ah	0-15	silt loam	granular	very friable, moist
Bg	45-63	silt loam to silty clay loam	amorphous to subangular blocky	very friable to firm, moist
BCg	0-60	silty clay loam to silty clay	amorphous	firm to very firm, moist
Ccag	at 60-100	silty clay loam to silty clay	amorphous	firm to very firm, moist

Comments: Occasional sand lenses, 10 to 15 cm thick, are found in the BCg and Ccag horizons; occasionally the entire Bg horizon is sand.
Limitations: Severe for all uses. Specific limitations include seasonally high water table or surface ponding, flooding hazard (overflow), slippery or sticky when wet, moderate to high shrink-swell potential.

Soil interpretations

Greenlee (1981) gives an explanation of soil interpretations and definitions of the soil limitation ratings. The results of soil chemical and physical analyses are given in tables 2 and 3.

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

The soils best suited to recreational development in Saskatoon Island Park are those of Map Units 1, 3, 4 and 5; these all have moderate limitations. Limitations of Map Unit 1 soils are seasonally high water table, slippery and sticky when wet and Solonetzic soil; limitations of Map Units 3 and 4 soils are high clay content, slow permeability, slippery or sticky when wet and erosion hazard for Map Unit 4 soils; and limitations for Map Unit 5 soils are seasonally high water table or surface ponding, flooding hazard (overflow) and sandy surface texture. Map Units 3 and 4 soils are widespread throughout most of the park. Soils of other map units have severe limitations for the reasons already listed; Map Unit 6 soils also have excessive slope.

All soils in the park have severe limitations for road construction because of high clay contents, high shrink-swell potential and susceptibility to frost heave. Map Units 1, 2, 5 and 7 soils have the additional limitation of seasonally high water table or surface ponding; Map Units 2 and 7 soils have the further limitation of flooding hazard (overflow).

Specific limitations of the various soils for selected uses are shown in table 6. 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, generally 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. It follows, however, that the steeper the slope, the more severe the limitation. This fact should be kept in mind while using the soil interpretation tables. The soil limitations for various uses have been designated as none to slight, moderate, severe and very severe.

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

Map Unit	Horizon	Depth cm	pH $CaCl_2$	Exchangeable cations meq/100 g soil Na^+	K^+	Ca^{++}	Mg^{++}	CEC meq/100 g	OC %	$CaCO_3$ equiv %	Mech analysis % from frac <2 mm diam sand	silt	clay	% VFS	% CF	Texture Lab det	Texture Field est
1	Bnjtg	13-40	5.5	1.1	0.48	11.9	1.3	26.2	nd	nd	22	33	45	nd	0	C	SiC
3 and 4	L-H	10-0	6.6	nd	nd	nd	nd	nd	32.1	nd	nd	nd	nd	nd	0	nd	nd
	Ah	0-6	6.3	0.01	2.6	39.7	6.2	54.2	9.6	nd	17	56	27	6	5	SiL-SiCL	L
	Ae	6-13	5.9	0.01	0.45	7.9	1.9	12.1	1.1	nd	16	65	19	7	5	SiL	SiL
	Bt	13-30	4.9	0.35	0.70	21.2	10.9	39.4	nd	nd	9	25	66	nd	5	HC	SiC
	BC	30-57	5.2	0.58	0.58	22.2	12.4	44.4	nd	nd	8	25	67	nd	5	HC	SiC
	Cca1	57-77	7.5	nd	nd	nd	nd	nd	nd	3.8	20	32	48	nd	5	C	SiC
	Cca2	77-100	7.8	nd	nd	nd	nd	nd	nd	7.2	7	57	36	nd	5	SiCL	SiCL
5	L-H	10-0	5.5	nd	nd	nd	nd	nd	14.5	nd	nd	nd	nd	nd	0	nd	nd
	Ah	0-3	4.9	0.01	0.21	11.7	2.2	18.3	4.0	nd	90	5	5	2	0	S	SL
	Aeg	3-15	5.4	0.01	0.08	1.2	0.37	1.9	nd	nd	96	2	2	1	0	S	S
	Btg	15-42	5.8	0.11	0.65	20.0	9.31	32.1	nd	nd	10	27	63	nd	0	HC	SiC
	Ccag1	45-52	7.7	nd	nd	nd	nd	nd	nd	6.7	49	18	33	nd	0	SCL	SiCL
	Ckg	52-60	7.4	nd	nd	nd	nd	nd	nd	0.21	80	9	11	nd	0	SL	CL-FS (bands)
	Ccag2	60-100	7.8	nd	nd	nd	nd	nd	nd	7.2	40	27	33	nd	0	CL	SiCL

[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.

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

Map unit	3,4
Depth, cm	120-150
Field moisture, %	15
Mechanical analysis:	
Percentage passing sieve	
1 inch	100
3/4 inch	100
5/8 inch	100
#4 (4.7 mm)	99
#10 (2.0 mm)	99
#40 (0.42 mm)	95
#200 (0.074 mm)	83
Percentage smaller than	
0.05 mm	81
0.005 mm	58
0.002 mm	52
0.001 mm	50
Liquid limit	46
Plasticity index	26
Optimum moisture, %[2]	21
Maximum dry density, (lb/ft^3)[2]	102.5
Classification	
AASHO	A-7-6 (15)
Unified	CL
USDA	C

[1] Map units developed on similar parent material: 1, 2, 3, 4, and 6.
[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
3 and 4	Ah	0.27
	Ae	0.51
	Cca1	0.27
	Cca2	0.43
5	Ah	0.03
	Aeg	0.04
	Ccag2	0.26

Note:
- The K-values were determined from data provided in this report using the soil erodibility nomograph presented in figure 5 of Greenlee (1981).
- Where the percent organic matter was more than 4, it was taken as 4 for the purposes of the nomograph; where it was not determined, it was assumed to be 0.
- Where the percent very fine sand was not determined, it was assumed to be 0 for the purposes of the nomograph.
- Where the percent sand was more than 90, it was assumed to be 90 for the purposes of the nomograph.

Table 5. Predicted water erosion hazards of selected map units.

Map unit	Horizon	Erosion hazard[1]
3/b1	Ah	Low
	Ae	Low-moderate
	Cca1	Low
	Cca2	Low
3/c1	Ah	Low
	Ae	Moderate
	Cca1	Low
	Cca2	Low-moderate
4/D1	Ah	Low-moderate
	Ae	Moderate-high
	Cca1	Low-moderate
	Cca2	Moderate
5/b0	Ah	Low
	Aeg	Low
	Ccag2	Low

[1] 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 various uses.

Map symbol[1]	Fully serviced camp-grounds	Primitive camping area	Picnic areas	Lawns and land-scaping	Paths	Trails	Buildings with basements	Buildings without basements	Road location
1 / b0	Moderate Wet, Slip, Solz	Moderate Wet, Slip, Solz	Moderate Wet, Slip, Solz	Moderate Solz, Wet, Sl Perm	Moderate Wet, Slip, Solz	Moderate Wet, Slip, Solz	Moderate Wet, Flood, M Sh-Sw	Severe Flood, Wet	Severe Sh-Sw, Wet, Frost
2 / a0	Severe Wet, Flood, Slip	Severe Wet, Flood, Slip	Severe Wet, Slip, Clay	Severe Wet, Clay, Thin Ah	Severe Wet, Slip, Clay	Severe Wet, Slip, Clay	Severe Wet, Flood, M Sh-Sw	Severe Wet, Flood	Severe Wet, Flood, Sh-Sw
3 / b1 3 / c1	Moderate[2] Slip, Sl Perm, Clay	Moderate[2] Slip, Sl Perm, Clay	Moderate[2] Slip, Sl Perm, Clay	Moderate[4] Sl Perm, Clay, Thin Ah	Moderate[2] Slip	Moderate[2] Slip	Moderate M Sh-Sw, Frost, Clay	Slight	Severe Sh-Sw, Frost, Clay
4 / D1	Moderate[3] Slip, Sl Perm, Er	Moderate[3] Slip, Sl Perm, Er	Moderate[3] Slip, Sl Perm, Er	Moderate[5] Sl Perm, Thin Ah, Er	Moderate[3] Slip, Er	Moderate[3] Slip, Er	Moderate M Sh-Sw, Frost, Clay	Slight	Severe Sh-Sw, Frost, Er
5 / b0	Moderate Wet, Flood, Sandy	Moderate Wet, Flood, Sandy	Moderate Wet, Sandy	Severe Sandy, Wet, Thin Ah	Severe Sandy, Wet	Sever Sandy, Wet	Severe Flood, Wet M Sh-Sw	Severe Flood, Wet	Severe Sh-Sw, Frost, Wet
6 / F1	Severe Slope, Er, Slip	Severe Er, Slope, Slip	Severe Slope, Er, Slip	Severe Slope, Er, Thin Ah	Severe Slope, Er, Slip	Severe Er, Slope, Slip	Severe Slope, M Sh-Sw, Frost	Severe Slope	Severe Slope, Sh-Sw, Frost
7 / b0	Severe Wet, Flood, Slip	Severe Wet, Flood, Slip	Severe Wet, Slip	Severe Wet	Severe Wet, Slip	Severe Wet, Slip	Severe Wet, Flood, M Sh-Sw	Severe Wet, Flood	Severe Wet, Sh-Sw, Flood

Abbreviations

Clay = High clay content
Er = Erosion hazard
Flood = Flooding hazard (overflow)
Frost = Susceptibility to frost heave
M Sh-Sw = Moderate shrink-swell potential
Sandy = Sandy surface texture
Sh-Sw = High shrink-swell potential
Slip = Slippery or sticky when wet
Slope = Excessive slope
Sl Perm = Slow permeability
Solz = Solonetzic soil
Thin Ah = Thin or no Ah horizon
Wet = Seasonally high water table or surface ponding

[1] For explanation, see Soil Map.
[2] These ratings are for the Dark Gray Luvisols. The Chernozemic soils are somewhat more resistant to erosion and compaction; the Orthic Gray Luvisols are less resistant.
[3] These ratings are for the Dark Gray Luvisols. The Chernozemic soils are somewhat more resistant to erosion and compaction.
[4] These ratings are for the Luvisolic soils. Thin Ah is not a limitation for the Chernozemic soils.
[5] These ratings are for the Luvisolic soils. The Chernozemic soils are somewhat more resistant to erosion; Thin Ah is not a limitation.

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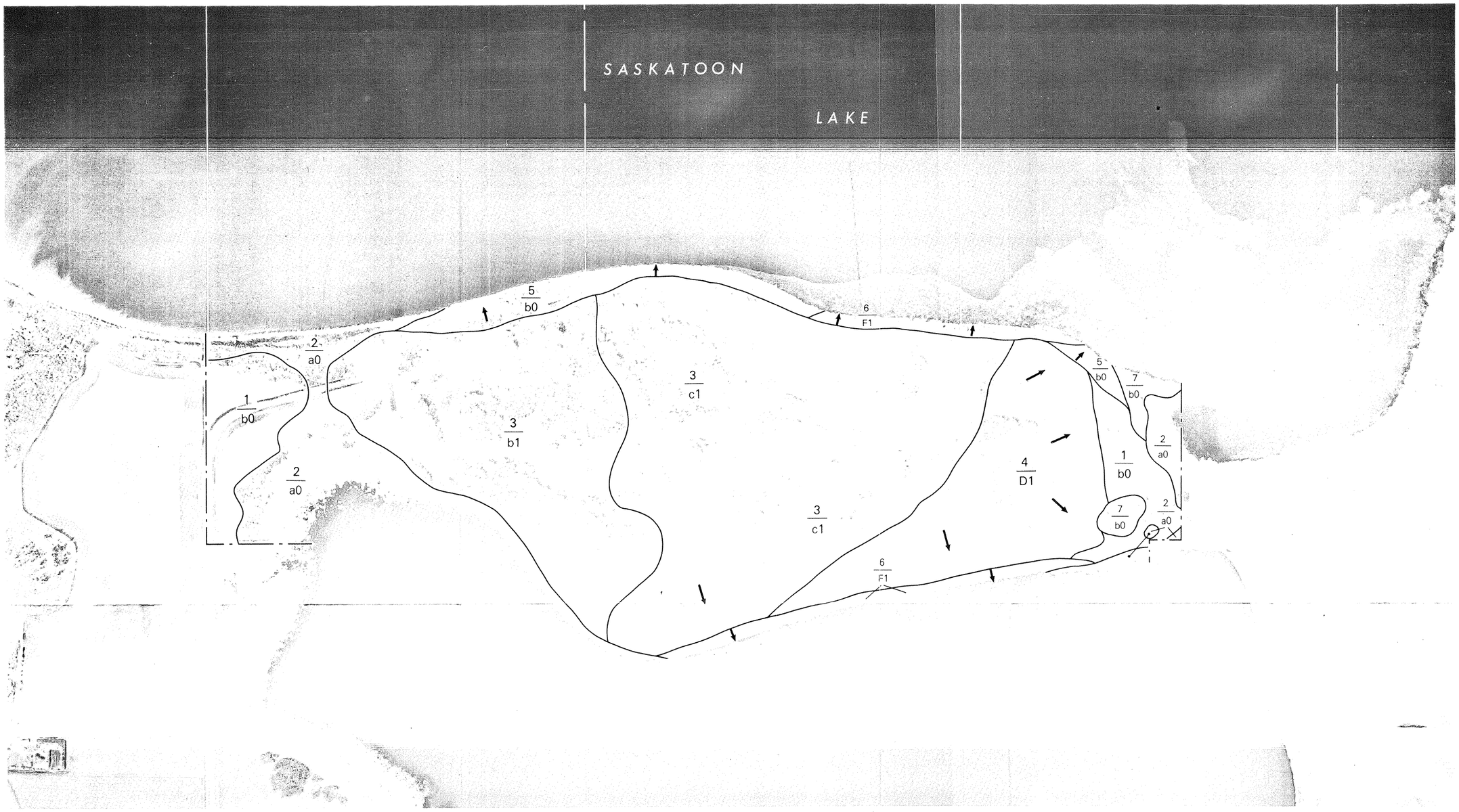
SOIL MAP OF SASKATOON ISLAND PROVINCIAL PARK

Tp 72, R 7-8, W 6 M



SOIL CLASSIFICATION			
MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Solonetzic	Gleyed Black Solodized Solonetz, Gleyed Gray Solodized Solonetz	fine textured till
2	Gleysolic	Orthic Gleysol	fine textured till
3	Luvisolic-80%	Dark Gray Luvisol-70% Orthic Gray Luvisol-10%	moderately fine to very fine textured till
	Chernozemic-20%	Eluviated Black Chernozem-20%	
4	Luvisolic-60%	Dark Gray Luvisol-60%	moderately fine to very fine textured till
	Chernozemic-40%	Eluviated Black Chernozem-40%	
5	Luvisolic	Gleyed Gray Luvisol	moderately fine textured lacustrine sediments
6	Luvisolic	Orthic Gray Luvisol	fine textured till
7	Gleysolic	Orthic Humic Gleysol-80% Orthic Gleysol-20%	moderately fine to fine textured lacustrine sediments

N

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

LEGEND:

Map Symbol:

3 — map unit
b1 — surface stoniness rating
topographic class

- soil line
- boundary of mapped area
- direction of slope

Compiled on uncontrolled mosaic
Mapped and Compiled by:
G.M. Greenlee, P. Ag.
Soils Department
1984

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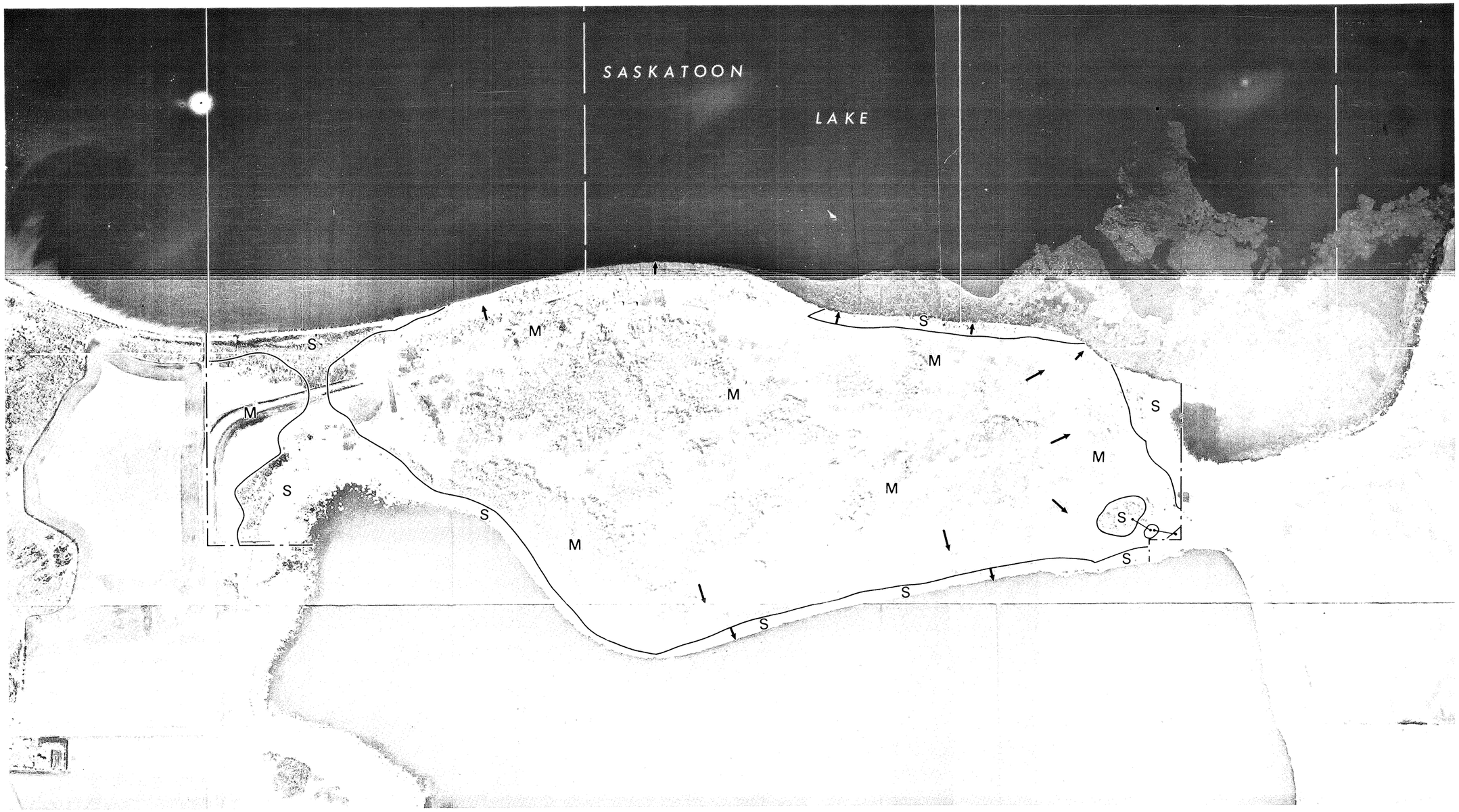
SOIL LIMITATIONS FOR RECREATION IN SASKATOON ISLAND PROVINCIAL PARK

Tp 72, R 7-8, W 6 M



LEGEND:

SL - none to slight soil limitations

M - moderate soil limitations

S - severe soil limitations

VS - very severe soil limitations

LEGEND:

- soil limitation line

- boundary of mapped area

- direction of slope

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
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Soils Department
1984

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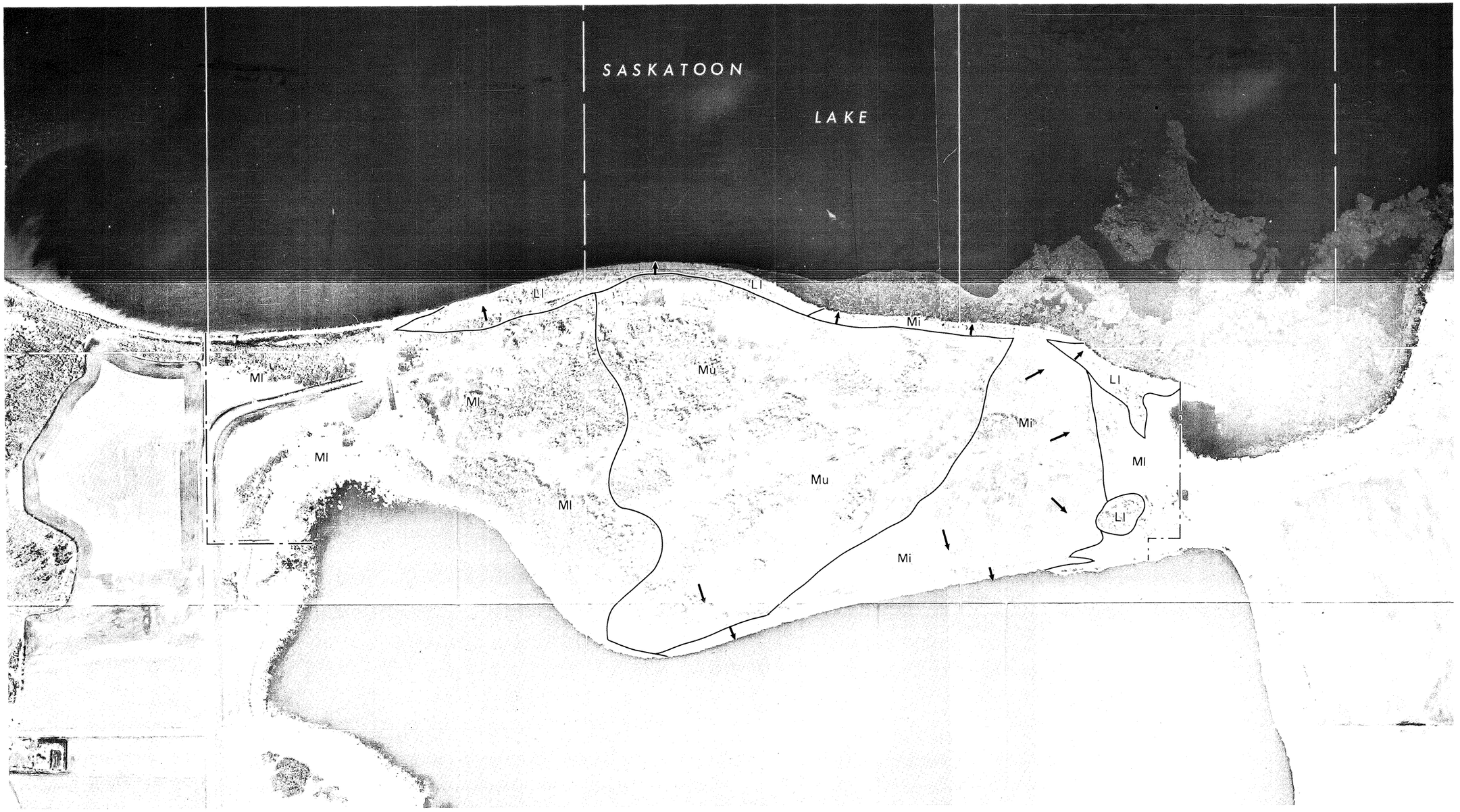
LANDFORM MAP OF SASKATOON ISLAND PROVINCIAL PARK

Tp 72, R 7-8, W 6 M



LEGEND:

L - Lacustrine
- LI - level lacustrine

M - Morainal
- Mi - inclined morainal
- MI - level morainal
- Mu - undulating morainal

LEGEND:

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

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

Compiled on uncontrolled mosaic
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