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SOIL SURVEY  
OF  
CHAIN LAKES PROVINCIAL PARK  
AND  
INTERPRETATION FOR RECREATIONAL USE

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## PREFACE

This report is one of a series describing detailed and semi-detailed soil surveys, which were conducted in the following Alberta Provincial Parks during the summer of 1974: Chain Lakes, Winagami Lake, Gregoire Lake, Long Lake and Cross Lake. Also included were areas in the vicinities of Lake Newell, the Wildcat Hills, and Pinehurst Lake. The total area surveyed was approximately 11,900 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. Also included is a glossary. Specific results and interpretations for the areas covered by this study are presented in the ensuing report.

## ACKNOWLEDGMENTS

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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.

## SUMMARY

Chain Lakes Park is approximately 410 ha in size, adjacent to the eastern shore of Chain Lakes Reservoir at the southern end, and is located about 40 km southwest of Nanton. The Park is situated in the Porcupine Hills Division of the Interior Plains Physiographic Region, and the land surface slopes sharply from east to west toward the reservoir. The majority of the Park is covered by a blanket of medium to moderately fine

textured till, overlying sandstone. Very coarse textured fluvial sediments (gravel) occur in most of the Willow Creek floodplain; and south of this, the surficial deposits consist primarily of moderately fine to fine textured glaciolacustrine sediments. This region has a cold snow-forest climate with humid winters, characterized by frozen ground and a snow cover of several months duration. Summers have less than four months with an average temperature above 10°C, and the average temperature of the coldest month is below -3°C. The Park is situated in the grasslands region, and the vegetation type is rough fescue.

Seven map units were recognized in the Park. The key profile types are Orthic Black Chernozems, Gleyed Orthic Black Chernozems, Orthic Black Chernozems Lithic eroded phase, Orthic Black Chernozems Lithic phase, Orthic and Calcareous Dark Gray Chernozems Lithic phase, Gleyed Rego Black Chernozems carbonated, and Orthic Regosols. These are distributed over the landscape in relation to landform, parent material, and drainage. Map units consist of single soil series, phases, and groupings of series (complexes); and their distribution is shown on the soil map.

Soil interpretations of each map unit are made for fully serviced campgrounds, picnic areas, lawns and landscaping, paths, buildings (with and without basements), septic tank absorption fields, road location, source of roadfill, and source of sand or gravel.

The soils best suited to recreational development in the Park are those of Map Unit 1 when found on suitable topography; and these are widespread, especially in the northern third. Map Unit 2 soils, widespread in most of the remainder, have moderate limitations due to seasonally high groundwater tables. Map Unit 7 soils, common to the south of Willow Creek, also have moderate limitations when found on suitable topography; because they may be slippery or sticky when wet, and have slow permeability. Most soils in the Park, including those of Map Units 1, 2, and 7, have severe limitations for road construction because of high shrink-swell potentials and susceptibility to frost heave. Map Unit 6 soils have very severe limitations because of surface stoniness, but otherwise only moderate limitations due to a flooding hazard (overflow); however, these occur only in the Willow Creek floodplain. Map Unit 6 soils also constitute a good source of gravel, and a source of sand was not found. Careful study of the soil map and Tables 4 to 13 inclusive (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 which occur in the field cannot be shown on the soil map. Thus, for design and construction of specific recreation facilities, an on-site investigation is usually required.

## INTRODUCTION

### SIZE AND LOCATION

Chain Lakes Park is approximately 410 ha in size, and is located

approximately 40 km southwest of Nanton (Figure 1), which in turn is approximately 70 km south of Calgary along Highway 2. The Park is adjacent to the eastern shore of Chain Lakes Reservoir at the southern end; and includes part of the southeast quarter, most of the northeast quarter, and part of the northwest quarter of section 27; most of the southeast quarter, part of the southwest quarter, most of the northwest quarter, and part of the northeast quarter of Section 34; Township 14, Range 2; and part of the southeast quarter, most of the west half, and part of the northeast quarter of Section 3; Township 15, Range 2; all west of the fifth meridian.

## PHYSIOGRAPHY AND SURFICIAL DEPOSITS

The Park is situated in the Porcupine Hills Division of the Interior Plains Physiographic Region (Government and the University of Alberta, 1969). The hills constitute a striking feature above the plains landscape to the east, and slowly decrease in altitude toward the north. Green (1972) classified the bedrock as the Paleocene Tertiary Porcupine Hills Formation, which is non-marine. The land surface within the Park slopes sharply from east to west, toward the reservoir. The highest elevation of approximately 1375 m occurs near the northeastern corner of the Park, and the lowest of approximately 1295 m is found in the southwestern portion at the edge of the reservoir, for a difference of some 80 m. The Park is drained into Chain Lakes Reservoir, which in turn is drained by Willow Creek to the east.

The majority of the Park is covered by a blanket of medium to moderately fine textured till, overlying sandstone. Only a veneer occurs on the steep banks bordering the reservoir along most of the western park boundary; and the steep south-facing banks of several drainage channels which flow from east to west and outlet into the reservoir. Also, the texture is medium to moderately coarse. The texture of the morainal veneer overlying sandstone on the steep north-facing banks of these drainage channels is medium to moderately fine. In most of the small portion of the Park south of Willow Creek, the surficial deposits consist of moderately fine to fine textured glaciolacustrine sediments. Very coarse textured fluvial sediments (gravel) occur in most of the Willow Creek floodplain. One very small patch of medium to moderately coarse textured fluvial sediments is found at the outlet of a drainage channel into the reservoir, in the northern portion of the Park.

## CLIMATE

The climate of the mapped area is designated as humid microthermal in Koppen'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 Turner Valley, at an elevation of 1237 m and approximately 50 km north of the Park, show the following values (Environment Canada, 1982): a mean annual temperature of 2.1°C. July is the warmest month with a mean temperature of 14.4°C, and

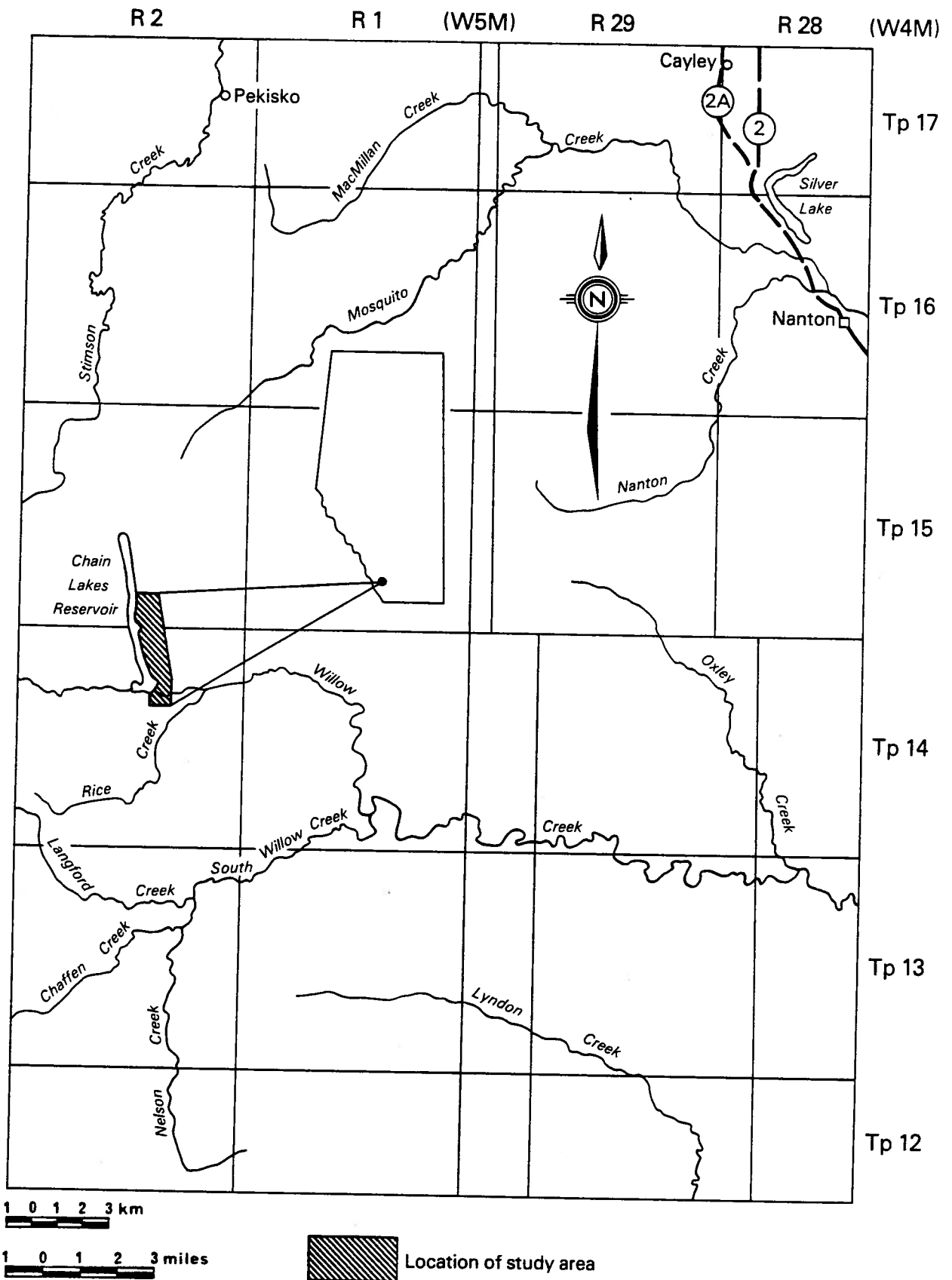


Figure 1. Map showing location of study area.

January is the coldest with a mean temperature of  $-11.9^{\circ}\text{C}$ . The mean annual precipitation is 574 mm with 60% falling as rain. The average frost free period is 79 days.

## VEGETATION

The Park is situated in the grasslands region, as classified by Hosie (1969). Trembling aspen forms groves or bluffs around wet depressions, and several other species of poplar are usually found along rivers and in moist locations with willows and some white spruce. The vegetation type in the Park is rough fescue as classified by Wroe *et al.* (1979). These grasslands are distinguished by the presence of rough fescue.

The vegetation in the northern third of the Park and south of Willow Creek is grass, with some aspen and willow clumps. Aspen is dominant on steep north-facing banks of drainage channels. Willow is dominant throughout most of the remainder, and scattered patches of grass also occur. Some balsam poplar is found in the Willow Creek floodplain.

Since the Outdoor Recreation Planning Branch of Alberta Recreation and Parks conducts biological studies of provincial parks and recreation areas, the vegetation is not discussed extensively in this report. However, some of the more common plant species observed growing on different soils are indicated as part of the map unit descriptions, and these are listed as follows (Moss, 1959; Cormack, 1967): native grass (various species), forbs, willow (Salix spp), other shrubs, aspen (Populus tremuloides), and balsam poplar (Populus balsamifera).

## SOILS

Seven map units were recognized in Chain Lakes Park. The soils of six were classified in the Chernozemic Order, and one in the Regosolic Order in the Canadian soil classification system (Canada Soil Survey Committee, 1978). The system is outlined in Greenlee (1981). Pertinent features of the map units are outlined in Table 1.

Soils of the 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 forbes 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.

Table 1. Key to the Soils.

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
1	Orthic Balck Chernozem	medium to moderately fine textured till	loam	C,c,d,E,e,F,f,g (> 2 to 60%)	1	well drained	Depth to sandstone ranges from 100 to > 150 cm below surface. Slight to severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel - excessive slopes, erosion hazard, moderate to high shrink-swell potential, susceptibility to frost heave, slow permeability, shallow depth to bedrock.
2	Gleyed Orthic Black Chernozem	medium to moderately fine textured till	loam	b,C,c,d,d,E (> 0.5 to 15%)	1	imperfect	(1) Depth to sandstone sometimes > 125 cm below surface, usually less. (2) Depth to water table varies from 75 to 125 cm below surface. Slight to severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel - seasonally high groundwater table, excessive slopes, erosion hazard, moderate to high shrink-swell potential, susceptibility to frost heave, groundwater contamination hazard, slow permeability.
3	Orthic Black Chernozem, Lithic eroded phase-70% Orthic Black Chernozem, Lithic phase - 30%	medium to moderately coarse textured till, overlying sandstone	loam	G,g,H (> 30 to > 60%)	1	well drained	The eroded phase soils are sometimes carbonated. Very severe limitations, very poor source of roadfill, unsuitable as a source of sand or gravel - excessive slopes, erosion hazard, shallow depth to bedrock, susceptibility to frost heave, groundwater contamination hazard.
4	Orthic and Calcareous Dark Gray Chernozem, Lithic phase - 90% Orthic Regosol, Lithic phase - 10%	medium to moderately fine textured till	loam	G,H (> 30 to > 60%)	1	well drained	Regosols occur as unpredictable patches. Very severe limitations, poor to very poor source of roadfill, unsuitable as a source of sand or gravel - excessive slopes, erosion hazard, shallow depth to bedrock, moderate shrink-swell potential, slow permeability.
5	Gleyed Rego Black Chernozem, carbonated	medium to moderately coarse textured fluvial sediments	loam	C (> 2 to 5%)	0	imperfect	Water table occurs at 75 cm below surface. Moderate to very severe limitations, fair source of roadfill, unsuitable as a source of

Table 1. Key to the Soils.

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
5 cont'd							sand or gravel - flooding hazard (overflow), seasonally high groundwater table, high lime content (soil nutrient imbalance), groundwater contamination hazard.
6	Orthic Regosol	very coarse textured fluvial sediments (gravel)	sandy loam	b (> 0.5 to 2%)	5	rapid	Moderate to very severe limitations; very poor source of roadfill (surface stoniness), otherwise good source; good source of gravel; unsuitable as a source of sand. Flooding hazard (overflow), rapid permeability (droughtiness), thin Ah horizon, groundwater contamination hazard.
7	Orthic Black Chernozem	moderately to fine to very fine textured glaciolacustrine sediments	silty clay loam	c,d,f (> 2 to 30%)	0	well drained	Water table occurs at 1.5 to 1.8 m below surface. Slight to very severe limitations, poor source of roadfill, unsuitable as a source of sand or gravel - slippery or sticky when wet, slow permeability, excessive slopes, erosion hazard, high shrink-swell potential, susceptibility to frost heave.



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 drained Black Chernozemic soils developed on medium to moderately fine textured till are found throughout most of the northern third of the Park; and well drained Black Chernozemics developed on moderately fine to fine textured glaciolacustrine sediments occur in most of the small portion south of Willow Creek. The soils throughout most of the remainder are imperfectly drained Black Chernozemics developed on medium to moderately fine textured till.

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

Rapidly drained Regosolic soils developed on very coarse textured glaciofluvial sediments (gravel) occur in the Willow Creek floodplain. Also, occasional patches of well drained Regosolic soils developed on a veneer of medium to moderately fine textured till overlying sandstone are found on the steep north-facing banks of drainage channels in the northern third of the Park.

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 separation of different map units. They are described in chronological order, and horizon thicknesses represent averages. Thicknesses of comparative horizons in identical soil profiles often vary as much as 10 to 40 percent from the norm at different points in the landscape.

The dominant plant species are listed, using common names. These are very general lists, and not purported to be complete.

MAP UNIT 1

Classification: Orthic Black Chernozem.

Parent material: medium to moderately fine textured till.

Landform: morainal blanket, overlying hummocky bedrock (Mb/Rh);  
morainal blanket, overlying inclined bedrock (Mb/Ri);  
morainal blanket, overlying undulating bedrock (Mb/Ru).

Slope: undulating and gently sloping, to hilly (>2 to 60%).

Surface stoniness: slightly stony (1).

Drainage: well drained.

Vegetation: grass, forbs, aspen clumps; some willow clumps.

Profile description: Orthic Black Chernozem.

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	2-5	leaf and root litter (occurs under aspen)		
Ah	20-35	loam	granular	very friable, moist
AB	0-15	loam	prismatic, breaking to granular	very friable, moist
Bt or	55-85	clay loam to clay	prismatic, breaking to blocky	friable to firm, moist
Bm	55-85	loam to clay loam	prismatic, breaking to sub- angular blocky	very friable, moist
Cca	at 75 to 120	loam to clay loam	amorphous	soft, dry; very friable to firm, moist
IICca	at 125 to 150	sandstone		

- Comments:
- (1) The AB horizon is often absent.
  - (2) A Bt horizon is more commonly found than a Bm.
  - (3) The depth to sandstone ranges from 100 to more than 150 cm below the surface.

Limitations: Slight to severe-moderate on suitable topography for buildings with basements; severe to very severe for septic tank absorption fields, and road location; slight on suitable topography for all other uses; poor source of roadfill; unsuitable as a source of sand or gravel due to unsuitable textures. Other limitations include excessive slopes, erosion hazard, moderate to high shrink-swell potential, susceptibility to frost heave, slow permeability, and shallow depth to bedrock.

## MAP UNIT 2

- Classification: Gleyed Orthic Black Chernozem.
- Parent material: medium to moderately fine textured till.
- Landform: morainal blanket, overlying hummocky bedrock (Mb/Rh); morainal blanket, overlying inclined bedrock (Mb/Ri); morainal blanket, overlying level bedrock (Mb/Rl); and morainal blanket, overlying undulating bedrock (Mb/Ru).
- Slope: gently undulating to strongly sloping (>0.5 to 15%).
- Surface stoniness: slightly stony (1).
- Drainage: imperfect.
- Vegetation: willow, grass, forbs.
- Profile description: Gleyed Orthic Black Chernozem.

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	25-35	loam	granular	very friable, moist
ABg	0-15	loam	prismatic, breaking to subangular blocky	very friable, moist
Btg	40-50	clay loam to clay	prismatic, breaking to blocky	friable to firm, moist
Ccag	15-35	loam to clay loam	amorphous to subangular blocky	very friable to firm, moist
IICca	at 100-125	sandstone		

Comments:

- (1) The AB horizon usually is not present.
- (2) The depth to sandstone is sometimes more than 125 cm below the surface.
- (3) The depth to a water table varies from 75 to 125 cm below the surface.

Limitations:

Slight to severe-slight on suitable topography for buildings without basements; severe for buildings with basements, septic tank absorption fields, and road locations; moderate for campgrounds, picnic areas, lawns and landscaping, and paths; poor source of roadfill; unsuitable as a source of sand or gravel due to unsuitable textures. Other limitations include seasonally high groundwater tables, excessive slopes, erosion hazard, moderate to high shrink-swell potential, susceptibility to frost heave, groundwater contamination hazard, and slow permeability.

MAP UNIT 3

Classification: Orthic Black Chernozem, Lithic eroded phase - 70%  
 Orthic Black Chernozem, Lithic phase - 30%  
 (these two phases are intimately and unpredictably associated).

Parent material: medium to moderately coarse textured till, overlying sandstone.

Landform: morainal veneer, overlying hummocky bedrock (Mv/Rh);  
 morainal veneer, overlying inclined bedrock (Mv/Ri).

Slope: hilly and very steeply sloping, to extremely sloping (>30 to 60%).

Surface stoniness: slightly stony (1).

Drainage: well drained.

Vegetation: grass and forbs.

Profile description: Orthic Black Chernozem, Lithic eroded phase.

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	7-10	loam	granular	very friable, moist
Bm	7-20	loam	prismatic, breaking to subangular blocky	very friable, moist
Cca	at 15-30	sandy loam to loam	subangular blocky	very friable, moist
IICca	at 25-50	sandstone		

Orthic Black Chernozem, Lithic phase

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	15-20	loam	granular	very friable, moist
Bm	15-45	loam	prismatic, breaking to subangular blocky	very friable, moist
Cca	at 30-65	loam	amorphous to subangular blocky	very friable, moist
IICca	at 30-75	sandstone		

Comments: (1) The eroded phase soils are sometimes carbonated (Ahk and Bmk horizons).  
(2) The Cca and IICca horizons are often commensurate.

Limitations: Very severe for all uses due to excessive slopes; poor to very poor source of roadfill; unsuitable as a source of sand or gravel due to unsuitable textures. Other limitations include erosion hazard, shallow depth to bedrock, susceptibility to frost heave, and groundwater contamination hazard.

MAP UNIT 4

Classification: Orthic and Calcareous Dark Gray Chernozem, Lithic phase - 90%.  
Orthic Regosol, Lithic phase - 10%  
(these two subgroups are intimately and unpredictably associated).

Parent material: medium to moderately fine textured till.

Landform: morainal veneer, overlying inclined bedrock (Mv/Ri).

Slope: very steeply sloping to extremely sloping (>30 to 60%).

Surface stoniness: slightly stony (1).

Drainage: well drained.

Vegetation: aspen, shrubs; some willow.

Profile description: Orthic and Calcareous Dark Gray Chernozem, Lithic phase

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	2-5	leaf and root litter		
Ah	5-15	loam	granular	very friable, moist
Bm or Bmk	7-23	loam	prismatic, breaking to subangular blocky	very friable, moist
Cca	at 12-38	loam to clay loam	subangular blocky	very friable, moist
IICca	at 25-75	sandstone		

Orthic Regosol, Lithic phase

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	2-5	leaf and root litter		
Cca	at 0+	loam to clay loam	subangular blocky	very friable, moist
IICca	at 25-75	sandstone		

Comments:

(1) The Orthic Chernozems have Bm horizons, and the Calcareous Chernozems have Bmk horizons.

(2) The Regosols occur as unpredictable patches, in association with the Chernozemic soils.

Limitations: Very severe for all uses due to excessive slopes; poor to very poor source of roadfill; unsuitable as a source of sand or gravel due to unsuitable textures. Other limitations include erosion hazard, shallow depth to bedrock, moderate shrink-swell potential, and slow permeability.

MAP UNIT 5

Classification: Gleyed Rego Black Chernozem, carbonated.

Parent material: medium to moderately coarse textured fluvial sediments.

Landform: inclined fluvial (Fi).

Slope: gently sloping (>2 to 5%).

Surface stoniness: nonstony (0).

Drainage: imperfect.

Vegetation: grass, and forbs.

Profile description: Gleyed Rego Black Chernozem, carbonated.

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ahkg	15	loam	granular	very friable, moist
Ccag	85	loam to fine sandy loam	subangular blocky	very friable, moist

Comment: A water table was found 75 cm below the surface.

Limitations: Moderate to very severe-very severe for septic tank absorption fields; moderate for picnic areas, and paths; severe for all other uses; fair source of roadfill; unsuitable as a source of sand or gravel due to unsuitable textures. Other limitations include flooding hazard (overflow), seasonally high groundwater table, high lime content (soil nutrient imbalance), and groundwater contamination hazard.



MAP UNIT 6

Classification: Orthic Regosol.  
Parent material: very coarse textured fluvial sediments (gravel).  
Landform: level fluvial (Fi).  
Slope: gently undulating (>0.5 to 2%).  
Surface stoniness: exceedingly stony (5).  
Drainage: rapid.  
Vegetation: grass; sparse small balsam poplar.  
Profile description: Orthic Regosol.

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	2-5	sandy loam	granular	very friable, moist
Bm	at 2-5+	gravel	amorphous	loose, moist

Limitations: Moderate to very severe; severe for septic tank absorption fields; very severe due to surface stoniness for all other uses; otherwise severe for lawns and landscaping, and buildings; and moderate for campgrounds, picnic areas, paths, and road location; very poor source of roadfill due to surface stoniness, otherwise a good source; good source of gravel; unsuitable as a source of sand due to unsuitable textures. Other limitations include flooding hazard (overflow), rapid permeability (droughtiness), thin Ah horizon, and groundwater contamination hazard.

MAP UNIT 7

Classification: Orthic Black Chernozem.

Parent material: moderately fine to very fine textured glaciolacustrine sediments.

Landform: hummocky glaciofluvial (LG<sub>h</sub>), undulating glaciofluvial (LG<sub>u</sub>).

Slope: undulating to strongly rolling (>2 to 30%).

Surface stoniness: nonstony (0).

Drainage: well drained.

Vegetation: grass, forbs; occasional clump of aspen or willows.

Profile description: Orthic Black Chernozem.

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	20-25	silty clay loam	granular	very friable, moist
Bt	20-40	silty clay	blocky	firm, moist
Cca	76-84	silty clay loam to heavy clay	subangular blocky	firm to very firm, moist

Comment: A water table occurs 1.5 to 1.8 m below the surface.

Limitations: Slight to very severe-slight on suitable topography for buildings without basements; moderate on suitable topography for recreational uses; severe for buildings with basements, and road location; very severe for septic tank absorption fields; poor source of roadfill; unsuitable as a source of sand or gravel due to unsuitable textures. Other limitations include slippery or sticky when wet, slow permeability, excessive slopes, erosion hazard, high shrink-swell potential, and susceptibility to frost heave.

### SPECIAL FEATURES

The soils in Alberta have been classified into broad general zones (Figure 2) as established by Alberta Soil Survey during the normal course of soil surveys, and correlated with temperature and precipitation records. Annual precipitation amounts change gradually from one soil zone to another, and are not abrupt changes at the point where a zone boundary has been located. 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 centre of the Brown Soil Zone (annual precipitation about 30 to 33 cm), topsoil colors are brown. Similarly, in the centre of the Dark Brown Soil Zone (annual precipitation about 38 cm), topsoil colors are dark brown. Between these two zones, topsoil colors are brown to dark brown, and annual precipitation is about 35 cm. The boundary between the two soil zones has been placed approximately at that midpoint.

Zonal soils are soils with well developed soil characteristics that reflect the zonal or normal influences of climate and living organisms, mainly vegetation, as active factors of soil genesis. Examples are Brown, Dark Brown, or Black soils of the Brown, Dark Brown, or Black Soil Zones respectively. Intrazonal soils are soils with morphology that reflects the influence of some local factor of relief, parent material, or age; rather than of climate and vegetation. An example is solonetzic soils, which develop as a result of salinization. This 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 are soils without distinct genetic horizons, and are represented by Regosolic soils in Canada.

The Park is situated in the Black soil zone, and most of the soils are classified as Black Chernozemic, which are zonally normal. One exception is the azonal Regosolic soils. Dark Gray Chernozemics are found on some steep north-facing slopes under forest vegetation, bordering deep drainage channels. These soils are probably much more prevalent only a few kilometres further west, at higher elevations and under forest vegetation. Soils of the Park can be considered typical, both locally and regionally, as compared to other soils found nearby and further away within the general region (Wyatt et al., 1960; Kocaoglu, 1977).

Special features of soils in Chain Lakes Park are the thick black Ah horizons of the Chernozemic soils found throughout most of the Park. These horizons have relatively high organic matter content, are well aggregated, resilient to compaction, and relatively resistant to erosion. Also, they have high natural fertility, and compare favourably with the best agricultural soils to be found anywhere in the Province. However, the Park is situated in Agro-Climatic Area 5H of the Province, where the average frost-free period is so short (generally less than 60 days) that it is not practical to grow cereal crops (Bowser, 1967). Consequently, hay crops are all that are recommended.

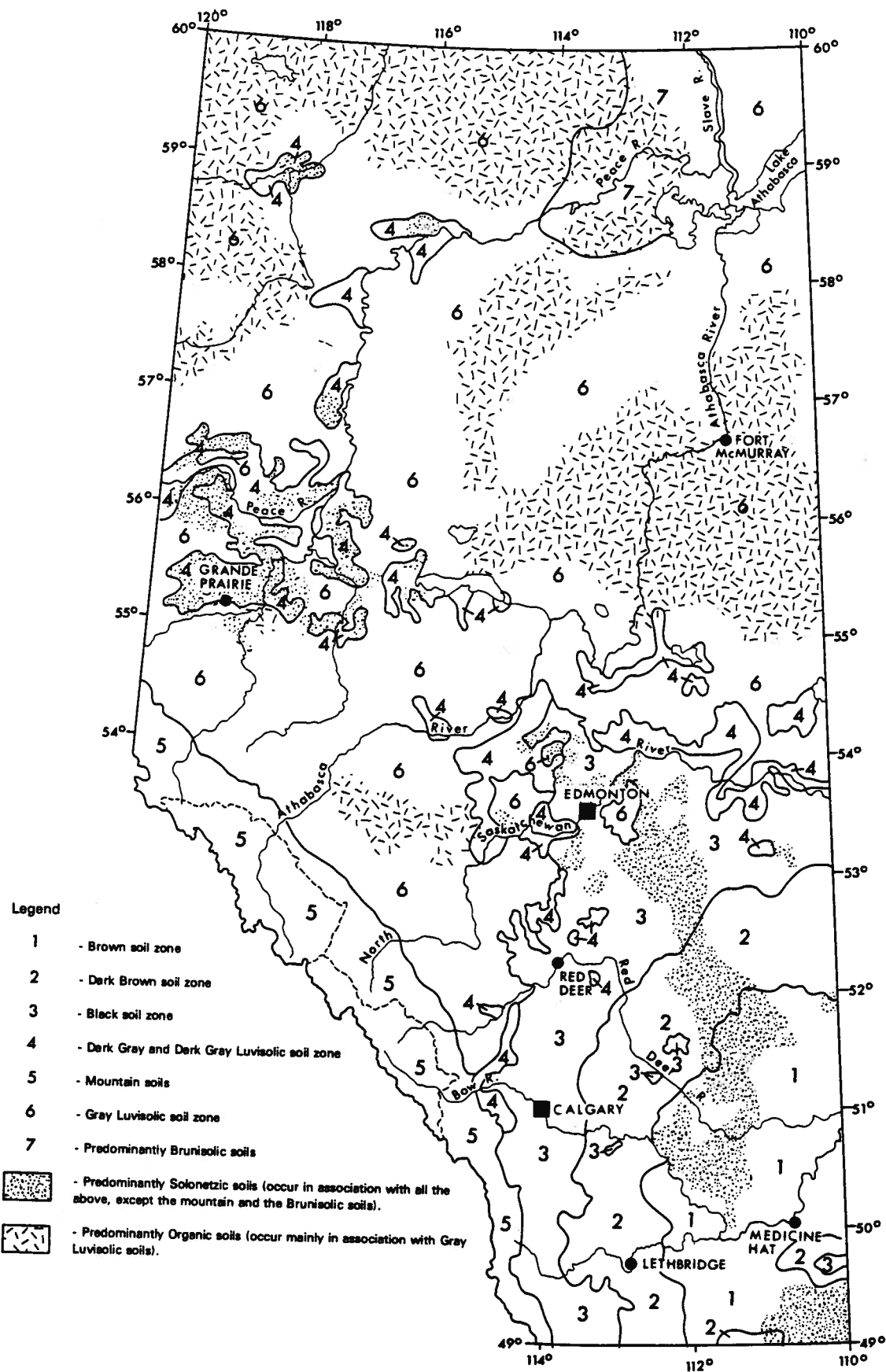
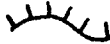




Figure 2. Map showing soil zones of Alberta (from Soil Group Map of Alberta, Alberta Institute of Pedology, undated).

### MISCELLANEOUS SYMBOLS

- D.L. This symbol indicates disturbed land, or places where the soil solum has been removed by construction activities, thereby exposing the C horizon or soil parent material at the surface. The soil characteristics are generally similar to properties of adjacent soil C horizons. Limitations will include surface stoniness, rapid permeability (droughtiness), slow permeability, groundwater contamination hazard, lack of Ah horizon, high lime content (soil nutrient imbalance), moderate to high shrink-swell potential, and susceptibility to frost heave.
-  This symbol indicates escarpments. These have very severe limitations for all uses because of extreme slopes and erosion hazard.
-  This symbol indicates periodic wet or water filled depressions characterized by the growth of hydrophytic vegetation, including sedge, grass, and willow around the fringes. They have severe to very severe limitations for all uses because of seasonally high groundwater tables or surface ponding.
- 0 This symbol indicates open water.
- P.L. This symbol indicates a parking area.
-  This symbol indicates sandstone outcrops. These are devoid of vegetation, and have gentle to very steep slopes. They commonly have very severe limitations for most uses, because of extreme slopes and the inherent properties of bedrock. Small portions may be suitable for routing paths or trails.

### 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.

The soils best suited to recreational development in the Park are those of Map Unit 1 when found on suitable topography; and these are widespread, especially in the northern third. Map Unit 2 soils, widespread in most of the remainder, have moderate limitations due to seasonally high groundwater tables. Map Unit 7 soils, common to the south of Willow Creek, also have moderate limitations when found on suitable topography; because they may be slippery or sticky when wet, and have slow permeability. Soils of other map units, which are much less widespread, have moderate to very severe limitations due to various factors; including excessive slopes, erosion hazard, shallow depth to bedrock, flooding hazard (overflow), seasonally high groundwater tables, and surface stoniness.

TABLE 2. Chemical Analyses of Selected Map Units<sup>1</sup>

MAP UNIT	DEPTH cm	pH H <sub>2</sub> O	<sup>2</sup> EC	<sup>3</sup> Na	<sup>3</sup> SO <sub>4</sub>	<sup>3</sup> OM	<sup>3</sup> CaCO <sub>3</sub>
1	0-15	6.2	0.3	L	-	H-	-
	15-30	6.3	0.2	L	-	L+	-
2	0-15	6.8	0.3	L	-	M+	-
	15-30	7.3	0.2	L	-	M-	-
3	0-15	7.6	0.7	L-	-	L+	L
	15-30	6.6	0.3	L-	-	M-	-
5	0-15	8.0	0.5	L	-	L+	M+
	15-30	8.1	0.4	L	-	L	-
6	0-15	7.6	0.3	L-	-	L+	-
	15-30	8.1	0.3	L-	-	L+	-
7	0-15	6.1	0.3	L	-	M	-
	30-45	6.3	0.3	L	-	L+	-

<sup>1</sup>Chemical Analyses done by Alberta Soil and Feed Testing Laboratory,  
<sup>2</sup>EC - electrical conductivity, millimhos/cm, <sup>3</sup>These tests are rated into  
4 categories: High (H), Medium (M), Low (L), and none (-). The degree  
within each category is indicated by a + or - sign. The tests for OM  
(organic matter) and CaCO<sub>3</sub> (free lime) are visual estimates only, <sup>4</sup>nd -  
not determined.

Table 3. Physical Analyses of Selected Map Units (1)

[illegible]

- (1) Map Units developed on similar parent material: 1, 2, and 4.
- (2) These values are obtained from charts worked out by the Highways Testing Laboratory, Alberta Transportation.

Most soils in the Park, including those of Map Units 1, 2, and 7, have severe limitations for road construction because of high shrink-swell potential and susceptibility to frost heave. Map Unit 6 soils have very severe limitations because of surface stoniness, but otherwise only moderate limitations due to a flooding hazard (overflow); however, these occur only in the Willow Creek floodplain. Map Unit 5 soils have severe limitations because of a flooding hazard, and seasonally high groundwater table; and Map Units 3 and 4 soils have very severe limitations because of extreme slopes, erosion hazard, and shallow depth to bedrock.

Map Unit 6 soils, in the Willow Creek floodplain, constitute a good source of gravel; and a source of sand was not found in the Park. Soils of all other map units are unsuitable because of unsuitable textures.

Specific limitations and suitabilities of the various soils for selected uses are shown in Tables 4 to 13 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 very 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 11 inclusive, the soil limitations for various uses have been designated as none to slight, moderate, severe, and very severe. In Tables 12 and 13, the suitability of soils as sources of roadfill and as sources of sand and gravel respectively, have been designated as good, fair, poor, and very poor.



TABLE 4. Soil Limitations for Fully Serviced Campgrounds

MAP SYMBOL	DEGREE OF LIMITATION 2	MAP SYMBOL	DEGREE OF LIMITATION
$\frac{1}{CI}$ $\frac{1}{CI}$ $\frac{1}{DI}$	SL	$\frac{3}{GI}$ $\frac{3}{GI}$ $\frac{3}{HI}$	VS - Slope, Er, BR
$\frac{1}{EI}$ $\frac{1}{EI}$	M - Slope, Er	$\frac{4}{GI}$ $\frac{4}{HI}$	VS - Slope, Er, BR
$\frac{1}{FI}$ $\frac{1}{FI}$	S - Slope, Er	$\frac{5}{CO}$	S - Flood, Wet
$\frac{1}{GI}$	VS - Slope, Er	$\frac{6}{b5}$	VS - Stony M - Flood
$\frac{2}{bI}$ $\frac{2}{CI}$ $\frac{2}{cI}$	M - Wet	$\frac{7}{c0}$ $\frac{7}{d0}$	M - Slip, Sl Perm
$\frac{2}{DI}$ $\frac{2}{dI}$		$\frac{7}{f0}$	S - Slope, Er, Slip
$\frac{2}{EI}$	M - Slope, Er, Wet		

1. For explanation, see Soil Map.
2. SL - None to slight, M - Moderate, S - Severe, VS - Very severe.

#### ABBREVIATIONS

BR - Shallow depth to bedrock  
 Clay - High clay content  
 Er - Erosion hazard  
 Flood - Flooding hazard (overflow)  
 Org - Organic soil  
 Org Surf - Organic surface layer  
                   > 15 cm thick  
 Sandy - Sandy surface texture

Slip - Slippery or sticky when  
           wet  
 Slope - Excessive slope  
 Sl Perm - Slow permeability  
 Solz - Solonetzic soil  
 Stony - Surface stoniness  
 Wet - Seasonally high groundwater  
           table or surface ponding

TABLE 5. Soil Limitations for Picnic Areas

MAP <sup>1</sup> SYMBOL	DEGREE OF LIMITATION <sup>2</sup>	MAP SYMBOL	DEGREE OF LIMITATION
$\frac{1}{CI}$ $\frac{1}{cI}$ $\frac{1}{dI}$	SL	$\frac{4}{GI}$ $\frac{4}{HI}$	VS - Slope, Er, BR
$\frac{1}{EI}$ $\frac{1}{eI}$	M - Slope, Er	$\frac{5}{CO}$	M - Flood, Wet
$\frac{1}{FI}$ $\frac{1}{fI}$	S - Slope, Er	$\frac{6}{b5}$	VS - Stony M - Flood
$\frac{1}{gI}$	VS - Slope, Er	$\frac{7}{c0}$ $\frac{7}{d0}$	M - Slip, Sl Perm
$\frac{2}{bI}$ $\frac{2}{CI}$ $\frac{2}{cI}$	M - Wet	$\frac{7}{f0}$	S - Slope, Er, Slip
$\frac{2}{DI}$ $\frac{2}{dI}$	M - Slope, Er, Wet		
$\frac{2}{EI}$			
$\frac{3}{GI}$ $\frac{3}{gI}$ $\frac{3}{HI}$	VS - Slope, Er, BR		

1. For explanation, see Soil Map.

2. SL - None to slight, M - Moderate, S - Severe, VS - Very severe.

#### ABBREVIATIONS

BR - Shallow depth to bedrock  
Clay - High clay content  
Er - Erosion hazard  
Flood - Flooding hazard (overflow)  
Org - Organic soil  
Org Surf - Organic surface layer  
> 15 cm thick  
Sandy - Sandy surface texture

Slip - Slippery or sticky when wet  
Slope - Excessive slope  
Sl Perm - Slow permeability  
Solz - Solonetzic soil  
Stony - Surface stoniness  
Wet - Seasonally high groundwater  
table or surface ponding

TABLE 6. Soil Limitations for Lawns and Landscaping

MAP <sup>1</sup> SYMBOL	DEGREE OF LIMITATION <sup>2</sup>	MAP SYMBOL	DEGREE OF LIMITATION
$\frac{1}{Cl}$ $\frac{1}{cl}$ $\frac{1}{dl}$	SL	$\frac{4}{Gl}$ $\frac{4}{Hl}$	VS - Slope, Er, BR
$\frac{1}{El}$ $\frac{1}{el}$	M - Slope, Er	$\frac{5}{Co}$	S - Wet, Flood, Lime
$\frac{1}{Fl}$ $\frac{1}{fl}$	S - Slope, Er	$\frac{6}{b5}$	S - R Perm, Thin Ah, Flood VS - Stony
$\frac{1}{gl}$	VS - Slope, Er	$\frac{7}{c0}$ $\frac{7}{d0}$	M - Sl Perm, Slip
$\frac{2}{bl}$ $\frac{2}{cl}$ $\frac{2}{cl}$ $\frac{2}{dl}$ $\frac{2}{dl}$	M - Wet	$\frac{7}{f0}$	S - Slope, Er, Sl Perm
$\frac{2}{El}$	M - Slope, Er, Wet		
$\frac{3}{Gl}$ $\frac{3}{gl}$ $\frac{3}{Hl}$	VS - Slope, Er, BR		

1. For explanation, see Soil Map.
2. SL - None to slight, M - Moderate, S - Severe, VS - Very severe.

#### ABBREVIATIONS

BR - Shallow depth to bedrock  
 Clay - High clay content  
 Er - Erosion hazard  
 Flood - Flooding hazard (overflow)  
 Lime - High lime content (soil  
 nutrient imbalance)  
 Org - Organic soil  
 Org Surf - Organic surface layer  
 > 15 cm thick  
 R Perm - Rapid permeability  
 (droughtiness)

Saline - Surface soil salinity  
 Sandy - Sandy surface texture  
 Slope - Excessive slope  
 Sl Perm - Slow permeability  
 Solz - Solonetzic soil  
 Stony - Surface stoniness  
 Thin Ah - Thin or no Ah horizon  
 Wet - Seasonally high groundwater  
 table or surface ponding

TABLE 7. Soil Limitations for Paths

MAP <sup>1</sup> SYMBOL	DEGREE OF LIMITATION <sup>2</sup>	MAP SYMBOL	DEGREE OF LIMITATION
$\frac{1}{CI}$ $\frac{1}{cI}$ $\frac{1}{dI}$	SL	$\frac{4}{GI}$ $\frac{4}{HI}$	VS - Slope, Er, BR
$\frac{1}{EI}$ $\frac{1}{eI}$	M - Slope, Er	$\frac{5}{CO}$	M - Flood, Wet
$\frac{1}{FI}$ $\frac{1}{fI}$	S - Slope, Er	$\frac{6}{b5}$	VS - Stony M - Flood
$\frac{1}{gI}$	VS - Slope, Er	$\frac{7}{c0}$ $\frac{7}{d0}$	M - Slip
$\frac{2}{bI}$ $\frac{2}{CI}$ $\frac{2}{cI}$	M - Wet	$\frac{7}{f0}$	S - Slope, Er, Slip
$\frac{2}{DI}$ $\frac{2}{dI}$	M - Slope, Er, Wet		
$\frac{2}{EI}$			
$\frac{3}{GI}$ $\frac{3}{gI}$ $\frac{3}{HI}$	VS - Slope, Er, BR		

1. For explanation, see Soil Map.
2. SL - None to slight, M - Moderate, S - Severe, VS - Very severe.

#### ABBREVIATIONS

Clay - High clay content  
 Er - Erosion hazard  
 Flood - Flooding hazard (overflow)  
 Org - Organic soil  
 Org Surf - Organic surface layer  
                   > 15 cm thick  
 Sandy - Sandy surface texture

Slip - Slippery or sticky when wet  
 Slope - Excessive slope  
 Solz - Solonetzic soil  
 Stony - Surface stoniness  
 Wet - Seasonally high groundwater  
           table or surface ponding

TABLE 8. Soil Limitations for Buildings with Basements.

MAP SYMBOL	DEGREE OF LIMITATION	MAP SYMBOL	DEGREE OF LIMITATION
$\frac{1}{c1}$ $\frac{1}{c1}$ $\frac{1}{d1}$	M - M Sh-Sw, Frost, BR	$\frac{3}{g1}$ $\frac{3}{g1}$ $\frac{3}{h1}$	VS - Slope, BR, Frost
$\frac{1}{e1}$ $\frac{1}{e1}$	M - Slope, M Sh- Sw, Frost	$\frac{4}{g1}$ $\frac{4}{h1}$	VS - Slope, Br, M Sh-Sw
$\frac{1}{f1}$ $\frac{1}{f1}$	S - Slope, M Sh- Sw, Frost	$\frac{5}{c0}$	S - Flood, Wet
$\frac{1}{g1}$	VS - Slope, M Sh- Sw, Frost	$\frac{6}{b5}$	VS - Stony S - Flood
$\frac{2}{b1}$ $\frac{2}{c1}$ $\frac{2}{c1}$ $\frac{2}{d1}$ $\frac{2}{d1}$	S - Wet, M Sh-Sw, Frost	$\frac{7}{c0}$ $\frac{7}{d0}$	S - Sh-Sw, Frost
$\frac{2}{e1}$	S - Wet, Slope, M Sh-Sw	$\frac{7}{f0}$	S - Slope, Sh-Sw, Frost

1. For explanation, see Soil Map.
2. SL - None to slight, M - Moderate, S - Severe, VS - Very severe.

#### ABBREVIATIONS

BR - Shallow depth to bedrock  
 Clay - High clay content  
 Flood - Flooding hazard (overflow)  
 Frost - Susceptibility to frost  
           heave  
 M Sh-Sw - Moderate shrink-swell  
           potential  
 Org - Organic soil

Sh-Sw - High shrink-swell potential  
 Slope - Excessive slope  
 Stony - Surface stoniness  
 Sulfate - Possible concrete corrosion  
           hazard (soluble sulfate)  
 Wet - Seasonally high groundwater  
       table or surface ponding

Table 9 Soil Limitations for Buildings Without Basements

Map 1 Symbol	Degree of Limitation <sup>2</sup>	Map Symbol	Degree of Limitation	Map Symbol	Degree of Limitation
$\frac{1}{C1} \frac{1}{c1} \frac{1}{d1}$	SL	$\frac{4}{G1} \frac{4}{H1}$	VS - Slope, BR		
$\frac{1}{E1} \frac{1}{e1}$	M - Slope	$\frac{5}{Co}$	S - Flood, Wet		
$\frac{1}{F1} \frac{1}{f1}$	S - Slope	$\frac{6}{b5}$	VS - Stony S - Flood		
$\frac{1}{g1}$	VS - Slope	$\frac{7}{co} \frac{7}{do}$	SL		
$\frac{2}{b1} \frac{2}{C1} \frac{2}{c1}$	SL	$\frac{7}{fo}$	S - Slope		
$\frac{2}{D1} \frac{2}{d1}$					
$\frac{2}{E1}$	M - Slope				
$\frac{3}{G1} \frac{3}{g1} \frac{3}{H1}$	VS - Slope, BR				

<sup>1</sup> For explanation, see Soil Map

<sup>2</sup> SL - None to slight, M - Moderate, S - Severe, VS - Very severe

### Abbreviations

BR - Shallow depth to bedrock  
Flood - Flooding hazard (overflow)  
Org - Organic soil

Slope - Excessive slope  
Stony - Surface stoniness  
Wet - Seasonally high groundwater  
table or surface ponding

TABLE 10. Soil Limitations for Septic Tank Absorption Fields

MAP <sup>1</sup> SYMBOL	DEGREE OF LIMITATION <sup>2</sup>	MAP SYMBOL	DEGREE OF LIMITATION
$\frac{1}{C1}$ $\frac{1}{c1}$ $\frac{1}{d1}$	S - Sl Perm, BR	$\frac{4}{G1}$ $\frac{4}{H1}$	VS - Slope, BR, Sl Perm.
$\frac{1}{E1}$ $\frac{1}{e1}$	S - Sl Perm, Slope, BR	$\frac{5}{C0}$	VS - Wet, GW, Flood
$\frac{1}{F1}$ $\frac{1}{f1}$	S - Slope, Sl Perm, BR	$\frac{6}{b5}$	S - R Perm, GW, Flood
$\frac{1}{g1}$	VS - Slope, Sl Perm, BR	$\frac{7}{c0}$ $\frac{7}{d0}$	VS - Sl Perm
$\frac{2}{b1}$ $\frac{2}{C1}$ $\frac{2}{c1}$ $\frac{2}{D1}$ $\frac{2}{d1}$ $\frac{2}{E1}$	S - Wet, GW, Sl Perm	$\frac{7}{f0}$	VS - Sl Perm, Slope
$\frac{3}{G1}$ $\frac{3}{g1}$ $\frac{3}{H1}$	VS - Slope, BR, GW		

1. For explanation, see Soil Map.
2. SL - None to slight, M - Moderate, S - Severe, VS - Very severe.

#### ABBREVIATIONS

BR - Shallow depth to bedrock  
 Clay - High clay content  
 Flood - Flooding hazard (overflow)  
 GW - Groundwater contamination  
 hazard  
 Org - Organic soil

R Perm - Rapid permeability  
 Slope - Excessive slope  
 Sl Perm - Slow permeability  
 Wet - Seasonally high groundwater  
 table or surface ponding

TABLE 11. Soil Limitations for Road Location

MAP SYMBOL	DEGREE OF LIMITATION 2	MAP SYMBOL	DEGREE OF LIMITATION
$\frac{1}{c1}$ $\frac{1}{c1}$ $\frac{1}{d1}$	S - Sh-Sw, Frost	$\frac{3}{G1}$ $\frac{3}{g1}$ $\frac{3}{H1}$	VS - Slope, Er, BR
$\frac{1}{E1}$ $\frac{1}{e1}$	S - Sh-Sw, Slope, Er	$\frac{4}{G1}$ $\frac{4}{H1}$	VS - Slope, Er, BR
$\frac{1}{F1}$ $\frac{1}{f1}$	S - Slope, Er, Sh-Sw	$\frac{5}{C0}$	S - Flood, Wet
$\frac{1}{g1}$	VS - Slope, Er, Sh-Sw	$\frac{6}{b5}$	VS - Stony M - Flood
$\frac{2}{b1}$ $\frac{2}{c1}$ $\frac{2}{c1}$	S - Sh-Sw, Wet, Frost	$\frac{7}{c0}$ $\frac{7}{d0}$	S - Sh-Sw, Frost
$\frac{2}{D1}$ $\frac{2}{d1}$		$\frac{7}{f0}$	S - Slope, Er, Sh-Sw
$\frac{2}{E1}$	S - Sh-Sw, Slope, Er		

1. For explanation, see Soil Map.

2. SL - None to slight, M - Moderate, S - Severe, VS - Very severe.

#### 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

Org - Organic soil  
 Sh-Sw - High shrink-swell  
           potential  
 Slope - Excessive slope  
 Stony - Surface stoniness  
 Wet - Seasonally high groundwater  
       table or surface ponding



TABLE 12. Soil Suitability for Source of Roadfill

MAP SYMBOL	DEGREE OF SUITABILITY 2	MAP SYMBOL	DEGREE OF SUITABILITY
$\frac{1}{C1}$ $\frac{1}{c1}$ $\frac{1}{d1}$	P - Sh-Sw, Frost	$\frac{4}{G1}$	P - Slope, Er, BR
$\frac{1}{E1}$ $\frac{1}{e1}$		$\frac{4}{H1}$	VP - Slope, Er, BR
$\frac{1}{F1}$ $\frac{1}{f1}$	P - Sh-Sw, Slope, Er	$\frac{5}{C0}$	F - Wet, Flood
$\frac{1}{g1}$	P - Slope, Er, Sh-Sw	$\frac{6}{b5}$	VP - Stony, other- wise G
$\frac{2}{b1}$ $\frac{2}{C1}$ $\frac{2}{c1}$	P - Sh-Sw, Frost	$\frac{7}{c0}$ $\frac{7}{d0}$	P - Sh-Sw, Frost
$\frac{2}{D1}$ $\frac{2}{d1}$ $\frac{2}{E1}$		$\frac{7}{f0}$	P - Sh-Sw, Slope, Er
$\frac{3}{G1}$ $\frac{3}{g1}$	P - Slope, Er, BR		
$\frac{3}{H1}$	VP - Slope, Er, BR		

1. For explanation, see Soil Map.
2. G - Good, F - Fair, P - Poor, VP - Very poor.

#### 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

Org - Organic soil  
 Sh-Sw - High shrink-swell  
           potential  
 Slope - Excessive slope  
 Stony - Surface stoniness  
 Wet - Seasonally high groundwater  
       table or surface ponding

TABLE 13. Soil Suitability for Source of Sand or Gravel

MAP <sup>1</sup> SYMBOL	DEGREE OF SUITABILITY <sup>2</sup>	MAP SYMBOL	DEGREE OF SUITABILITY
$\frac{1}{C1}$ $\frac{1}{c1}$ $\frac{1}{d1}$ $\frac{1}{E1}$ $\frac{1}{e1}$ $\frac{1}{F1}$ $\frac{1}{f1}$ $\frac{1}{g1}$	VP - Text	$\frac{6}{b5}$	G
$\frac{2}{b1}$ $\frac{2}{C1}$ $\frac{2}{c1}$ $\frac{2}{D1}$ $\frac{2}{d1}$ $\frac{2}{E1}$	VP - Text	$\frac{7}{c0}$ $\frac{7}{d0}$ $\frac{7}{f0}$	VP - Text
$\frac{3}{G1}$ $\frac{3}{g1}$ $\frac{3}{H1}$	VP - Text		
$\frac{4}{G1}$ $\frac{4}{H1}$	VP - Text		
$\frac{5}{C0}$	VP - Text, Wet, Flood		

1. For explanation, see Soil Map.
2. G - Good, F - Fair, P - Poor, VP - Very poor.

#### ABBREVIATIONS

Flood - Flooding hazard (overflow)  
 OB - Excessive overburden  
 Org - Organic soil  
 Text - Unsuitable texture

Thin - Thin deposit of sand  
 or gravel  
 Wet - Seasonally high groundwater  
 table or surface ponding

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Soil Map, Chain Lakes Provincial Park

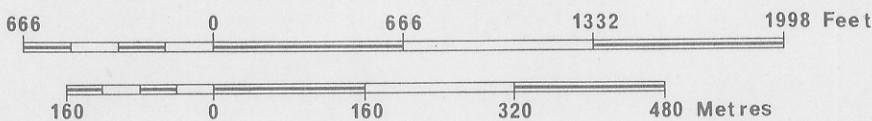
Tp 14-15, R 2, W5M

G.M. Greenlee  
Published 1985  
Fieldwork conducted in 1975

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Natural Resources Division  
Terrain Sciences Department

Cartography by Alberta Research Council, Graphic Services.

APPROXIMATE SCALE 1:8000



LEGEND:

Map Symbol:

- 1 ← map unit
- d1 ← surface stoniness rating
- topographic class
- soil line
- boundary of mapped area
- escarpment
- sandstone outcrop
- ← - direction of slope
- DL - disturbed land
- PL - parking area
- ⊥ - wet or water filled depression
- - open water

SOIL CLASSIFICATION			
MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Chernozemic	Orthic Black	medium to moderately fine textured till
2	Chernozemic	Gleyed Black	medium to moderately fine textured till
3	Chernozemic	Orthic Black, Lithic eroded phase-70% Orthic Black, Lithic phase-30%	medium to moderately coarse textured till, overlying sandstone
4	Chernozemic 90%	Orthic and Calcareous Dark Gray, Lithic phase-90%	medium to moderately fine textured till
	Regosolic-10%	Orthic Regosol, Lithic phase-10%	
5	Chernozemic	Gleyed Rego Black carbonated	medium to moderately coarse textured fluvial sediments
6	Regosolic	Orthic Regosol	very coarse textured fluvial sediments (gravel)
7	Chernozemic	Orthic Black	moderately fine to very fine textured glaciolacustrine sediments



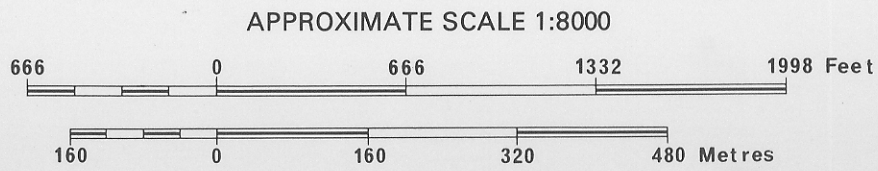
# Soil Limitations for Recreation, Chain Lakes Provincial Park

Tp 14-15, R 2, W5M

G.M. Greenlee  
Published 1985  
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## LEGEND:

- SL - none to slight soil limitations
- M - moderate soil limitations
- S - severe soil limitations
- VS - very severe soil limitations

- soil limitation line
- boundary of mapped area
- escarpment
- sandstone outcrop
- direction of slope
- DL - disturbed land
- PL - parking area
- wet or water filled depression
- open water





# Landform Map, Chain Lakes Provincial Park

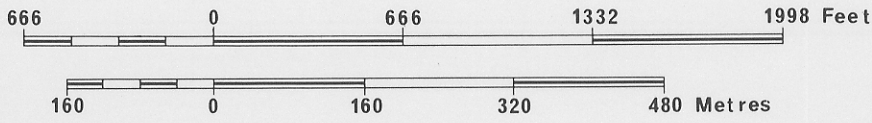
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## LEGEND:

- landform line
- boundary of mapped area
- escarpment
- sandstone outcrop
- direction of slope
- DL - disturbed land
- PL - parking area
- ψ - wet or water filled depression
- - open water

## LEGEND:

- F - Fluvial
- Fi - inclined fluvial
  - FI - level fluvial
- L - Lacustrine
- L<sup>G</sup><sub>h</sub> - hummocky glaciolacustrine
  - L<sup>G</sup><sub>u</sub> - undulating glaciolacustrine
- M - Morainal
- Mb/Rh - morainal blanket, overlying hummocky bedrock
  - Mb/Ri - morainal blanket, overlying inclined bedrock
  - Mb/Rl - morainal blanket, overlying level bedrock
  - Mb/Ru - morainal blanket, overlying undulating bedrock
  - Mv/Rh - morainal veneer, overlying hummocky bedrock
  - Mv/Ri - morainal veneer, overlying inclined bedrock

