SOIL SURVEY OF GOOSEBERRY LAKE 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 have been conducted in Alberta provincial parks and recreation areas. As well as Gooseberry Lake Provincial Park, soil surveys were conducted in the following provincial parks during the summer of 1975: Big Knife, Rochon Sands, Vermilion, Pembina River and Garner Lake. Also included were areas in the vicinities of Upper and Lower Kananaskis Lakes, Cold Lake (Lund's Point), Calling Lake, and Notikewin River. The total area mapped was approximately 11,380 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.

Also in 1975, soil samples were collected from an archaeological site excavated by the Parks Planning Branch in the Cypress Hills. A detailed field soil profile description was made, laboratory analyses have been completed and a report will be prepared.

ACKNOWLEDGEMENTS

The Alberta Research Council provided the staff and the Parks Planning Branch of Alberta Recreation, Parks and Wildlife contributed the operating costs for the 1975-76 Provincial Parks soil survey program. The University of Alberta provided office and laboratory space.

Mrs. Kathie Skogg typed and assisted in compiling and proof reading the report. Mrs. J. Dlask drafted the soil, landform and soil limitations for recreation maps, while Mr. J. Beres determined the physical properties of the soils. The soil chemical analyses were determined by the Alberta Soil and Feed Testing Laboratory.

Able field assistance was given by Mr. M. Hennie.

Special acknowledgement is given to the Park Rangers, as well as other park employees, who cooperated by allowing soil investigations to be conducted throughout the parks, and also invariably offered assistance.

SUMMARY

Gooseberry Lake Park is about 60 ha in size, and is located about 12 km north of Consort. Most of the Park is covered by a blanket of very coarse textured glaciofluvial sediments (sand), overlying moderately fine textured till; and near the lake shore, the thickness of glaciofluvial sediments is

somewhat less. A narrow band of a very thin, very coarse textured glaciolacustrine veneer (gravel) overlies fine textured till adjacent to the lake shore, and occasional pockets of thicker deposits (sand and gravel) also occur. The climate of the region is described as a cold snow-forest type characterized by cool summers, and humid winters with frozen ground and a snow cover of several months duration. The average temperature of the coldest month is less than -3°C, and of the warmest month is between 10 and 22°C. The Park is situated in the aspen grove section of the boreal forest region, where only trembling aspen is abundant in natural stands.

Six map units were recognized in Gooseberry Lake Park. The key profile types are Orthic Dark Brown Chernozems, Gleyed Regosols, a Gleyed Dark Brown Solonetz carbonated, and Rego Gleysols. These are distributed over the landscape in relation to landform, parent material, and drainage. Each map unit is a soil series, 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, trails, buildings (with and without basements), septic tank absorption fields, road location, source of roadfill, and source of sand or gravel.

The soils most suitable for recreational development in Gooseberry Lake Park are those of Map Units 1 and 2, when found on suitable topography, and they have moderate limitations due to sandy surface textures. Soils of these two map units cover almost the whole Park. Soils of most other map units adjacent to the lake shore have severe to very severe limitations. The soils best suited for road construction are those of the same two map units, and they have only slight limitations when found on suitable topography. Map unit 6 soils have moderate limitations, and soils of other map units have severe to very severe limitations. Map unit 1 soils, which cover most of the Park, can provide a good source of sand; however a good source of gravel was not found. Map unit 4 soils can provide only a poor source because of wetness. Careful study of the soil map in conjunction with Tables 3 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 recreational facilities, an on-site investigation is usually required.

INTRODUCTION

SIZE AND LOCATION

Gooseberry Lake Park is about 60 ha in size, and is adjacent to the northwestern shore of Gooseberry Lake. It is located about 12 km north of Consort (Figure 1), which in turn is about 250 km east of Red Deer along Highway 12. The Park includes most of the southwest quarter, and part of the southeast quarter of section 26, township 36, range 6, west of the fourth meridian.

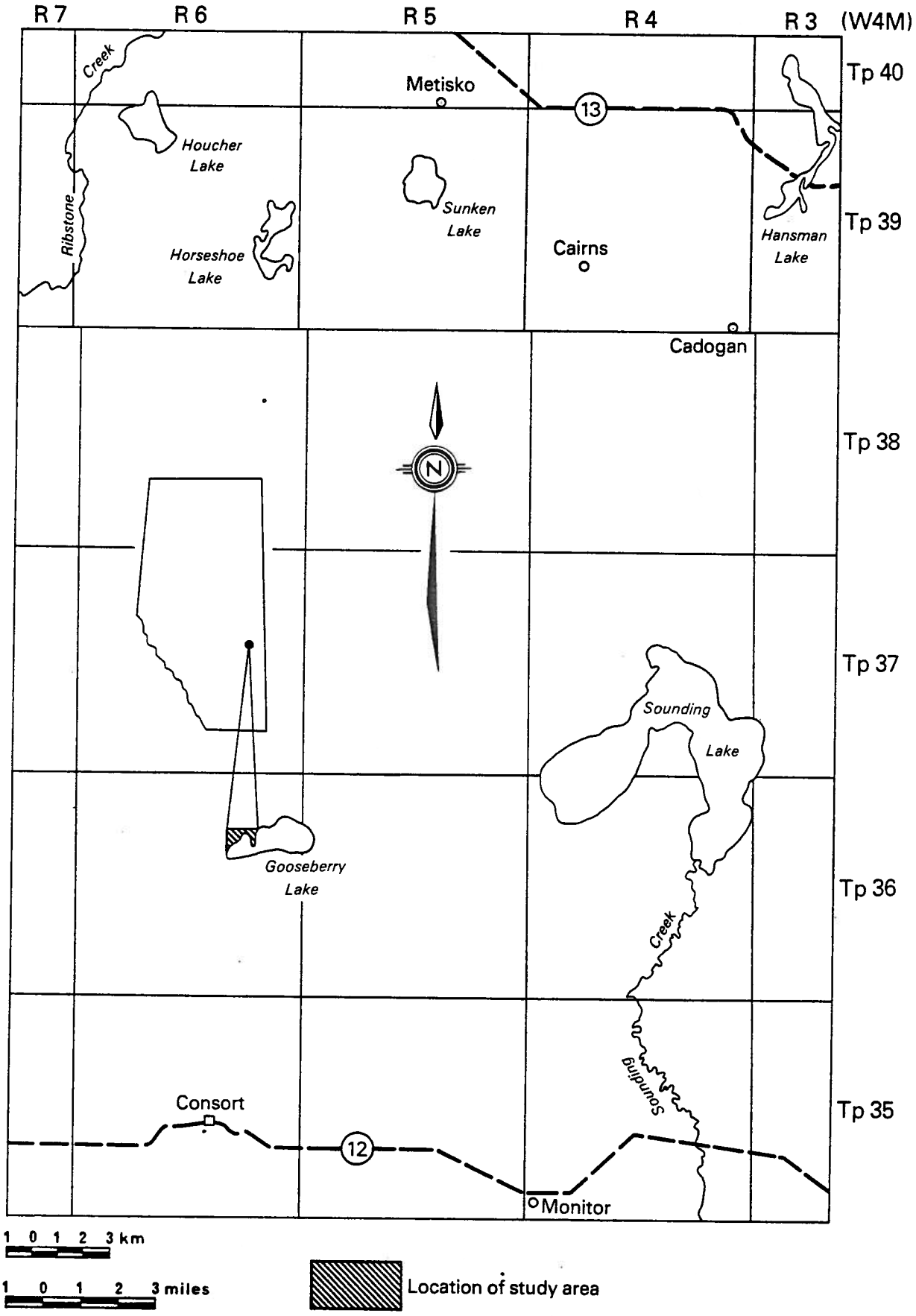


Figure 1. Map showing location of study area.

PHYSIOGRAPHY AND SURFICIAL DEPOSITS

Gooseberry Lake Park is positioned on the extreme southeastern edge of the Neutral Hills Upland within the Interior Plains Physiographic Region (Government and the University of Alberta, 1969). Maximum surface elevations in the Neutral Hills are slightly more than 850 m; but range from about 730 m near the northwestern corner of the Park to slightly less than 700 m adjacent to the lake shore, for a difference of slightly more than 30 m. According to Hackbarth (1975), much of this region is hummocky containing many undrained depressions, and internal drainage is characteristic. Drainage of the Park is into Gooseberry Lake, and it appears to be internally drained. The bedrock has been classified by Green (1972) as the Upper Cretaceous Bearpaw Formation, which is marine.

Most of the Park is covered by a blanket of very coarse textured glaciofluvial sediments (sand), overlying moderately fine textured till. Near the lake shore the thickness of glaciofluvial sediments is less, as the till commences usually slightly more than 1 m below the surface and sometimes slightly less. A narrow band of a very thin very coarse textured glaciolacustrine veneer (gravel) overlies fine textured till adjacent to the lake shore, and occasional pockets of thicker deposits (sand or gravel) also occur.

CLIMATE

The climate is designated in Koppen's classification of climates as humid microthermal (Trewartha and Horn, 1980). It is described as a cold snow-forest climate characterized by cool summers, and humid winters with frozen ground and a snow cover of several months duration. The average temperature of the coldest month is less than -3°C, and the warmest month is between 10 and 22°C.

Records for 1951 through 1980 from a weather station at Coronation, about 45 km west of the Park and at an elevation of 791 m, show the following values (Environment Canada, 1982): a mean annual temperature of 2.0°C. July is the warmest month of the year with a mean temperature of 17.3°C, and January is the coldest with a mean temperature of -16.5°C. The mean annual precipitation is 374 mm with 63% falling as rain. The average frost free period is 115 days.

VEGETATION

The Park is situated in the aspen grove section of the boreal forest region, where only trembling aspen is abundant in natural stands (Rowe, 1972). Balsam poplar is frequently present on moist lowlands, and occasionally prominent on uplands after fire. White birch has a sporadic distribution, but is usually found only on rough broken land. A clear gradation occurs in the heights reached by trembling aspen from forest to prairie; with the best growth attained in continuous stands of the north, and only low bluffs and patches in depressions and around sloughs in the south.

The vegetation throughout most of the Park is grass, and numerous patches of aspen occur in a narrow band near the lake shore. Also a few patches of balsam poplar occur immediately adjacent to the lake shore in the western portion.

Since the Outdoor Recreation Planning Branch of Alberta Recreation and Parks conducts biological studies in provincial parks and recreation areas, the vegetation is not discussed extensively in this report. However, some of the more common plant species indicated as part of the map unit descriptions are listed as follows (Moss, 1959; Cormack, 1967): aspen (Populus tremuloides), balsam poplar (Populus balsamifera), saskatoon-berry (Amelanchier alnifolia), dogwood (Cornus stolonifera), choke cherry (Prunus virginiana), pin cherry (Prunus pensylvanica), willow (Salix spp), wild rose (Rosa spp), wild red raspberry (Rubus strigosus), buckbrush (Symphoricarpos occidentalis), wolf willow (Elaeagnus commutata), native grass (various species), pasture sagewort (Artemisia frigida), foxtail barley (Hordeum jubatum), and sedge (Carex spp).

SOILS

Six maps units were recognized in Gooseberry Lake Park. The soils of two were classified in each of the Chernozemic and Gleysolic Orders, and one in each of the Solonetzic and Regosolic Orders of 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 coloured surface virgin (Ah and 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 measureable differences in colour 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 Chernozmic soils have A horizons that are lower in organic matter content, lighter in colour and thinner than those of the other Chernozemic Great Groups; and are found in southern and south-eastern Alberta. Black Chernozemic soils have A horizons that are higher in organic matter content, darker in colour 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 colours, 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 soils, 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

Table 1. Key to the Soils.

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
1	Orthic Dark Brown Chernozem	very coarse textured glaciofluvial sediments (sand)	loamy sand	c,D,d,e (> 2 to 15%)	0	rapid	(1) Soil profiles often gravelly. (2) Cca horizon occasionally within 50 to 75 cm of surface, but usually below 120 cm. Slight to severe limitations, good source of roadfill and sand, unsuitable as a source of gravel - sandy surface texture, excessive slopes, erosion hazard, rapid permeability (droughtiness), groundwater contamination hazard.
2	Orthic Dark Brown Chernozem	very coarse textured glaciofluvial sediments (gravelly sand), overlying moderately fine textured till	gravelly loamy sand	C,D (> 2 to 9%)	0 to 1	rapid	(1) Till usually deeper than 120 cm, but occasionally only 50 to 75 cm below surface. (2) Cca often deeper than 100 cm when complete soil profile developed in sand. When till occurs within control section, Cca is usually commensurate with the till. Slight to severe limitations, good source of roadfill, fair source of sand, unsuitable as a source of gravel - sandy surface texture, moderate shrink-swell potential and susceptibility to frost heave of till, rapid permeability (droughtiness), groundwater comtamination hazard.
3	Gleyed Dark Brown Solonetz, Carbonated	very coarse textured glaciolacustrine sediments (gravel), overlying fine textured till	gravel	C (> 2 to 5%)	5	imperfect	Water table often found 75 cm below surface. Moderate to very severe limitations, very poor source of roadfill, unsuitable as a source of sand or gravel - Solonetzic soil, slow permeability, seasonally high groundwater table, surface soil salinity, high lime content (soil nutrient imbalance), high shrink-swell potential, susceptibility to frost heave, flooding hazard (overflow), groundwater contamination hazard.
4	Rego Gelysol	very coarse textured glaciolacustrine	gravel	b,C (> 0.5 to 5%)	5	poor	Water table occurs 75 cm below surface. Severe to very severe limitations, very poor source

Table 1. Key to the Soils.

Map Unit	Classification	Parent Material	Surface Texture	Slope (class & gradient)	Surface Stoniness	Drainage	Comments and Limitations
4 contd							of roadfill, unsuitable as a source of sand, poor source of gravel - seasonally high groundwater tables, flooding hazard (overflow), lack of Ah horizon, high lime content (soil nutrient imbalance), rapid permeability, groundwater contamination hazard.
5	Rego Gleysol	very coarse textured glaciolacustrine sediments (sand)	sand	B,C (> 0.5 to 5%)	0	poor	Water table occurs 60 cm below surface. Severe to very severe limitations, poor source of roadfill and sand, unsuitable as a source of gravel - seasonally high groundwater tables, flooding hazard (overflow), sandy surface texture, lack of Ah horizon, rapid permeability, groundwater contamination hazard.
6	Gleyed Regosol	very coarse textured glaciofluvial sediments (gravelly sand)	sand	C,D (> 2 to 9%)	2 to 3	imperfect	Moderate to severe limitations, good to fair source of roadfill, good source of sand, unsuitable as a source of gravel - sandy surface texture, seasonally high groundwater table, lack of Ah horizon, rapid permeability, groundwater contamination hazard.

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.

Rapidly drained Dark Brown Chernozemic soils developed on very coarse textured glaciofluvial sediments (sand) overlying moderately fine textured till are found throughout most of the Park.

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 have hard to very hard consistence 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, and 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, due to 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 associated non-Solonetzic 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.

A narrow band of imperfectly drained Dark Brown Solonetzic soils developed on a very thin, very coarse textured glaciolacustrine veneer (gravel) overlying fine textured till occurs along most of the lake shore within the Park.

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.

A narrow band of imperfectly drained Regosolic soils developed on very coarse textured glaciofluvial sediments (gravelly sand) occurs paralleling and near the lake shore along the eastern edge of the Park. The gleyed soil profile indicates fluctuating water tables, and a lack of net downward leaching.

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

Narrow bands of Gleysolic soils developed on very coarse textured glaciofluvial sediments (gravel and sand) occur adjacent to the lake shore in the western portion 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 Dark Brown Chernozem
Parent material: very coarse textured glaciofluvial sediments (sand).
Landform: glaciofluvial blanket, overlying hummocky morainal (Fb/Mh); glaciofluvial blanket, overlying inclined morainal (Fb/Mi); glaciofluvial blanket, overlying undulating morainal (Fb/Mu)
Slope: undulating to moderately rolling (>2 to 15%).
Surface stoniness: nonstony (0)
Drainage: rapid
Vegetation: native grass, pasture sagewort.

Profile description: Orthic Dark Brown Chernozem

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ah	12-15	loamy sand	granular	soft to loose, dry
Bm	85-88+	sand	amorphous	loose, dry or moist

Comments: (1) These soil profiles are often gravelly
(2) A Cca horizon is occasionally found within 50 to 75 cm of the surface, but usually it is below 120 cm. It has the same description as the Bm horizon.
Limitations: Slight to severe-slight on suitable topography for buildings (with and without basements), and road location; moderate for campgrounds, picnic areas, paths, and trails; severe for lawns and landscaping, and septic tank absorption fields; good source of roadfill, and sand; unsuitable as a source of gravel because of unsuitable textures. Other limitations include sandy surface texture, excessive slopes, erosion hazard, rapid permeability (droughtiness), and groundwater contamination hazard.

Map Unit 2

Classification: Orthic Dark Brown Chernozem.
Parent material: very coarse textured glaciofluvial sediments (gravelly sand), overlying moderately fine textured till.
Landform: glaciofluvial veneer, overlying inclined morainal (FG/Mi)
Slope: gently to moderately sloping (>2 to 9%)
Surface stoniness: nonstony to slightly stony (0 to 1).
Drainage: rapid
Vegetation: aspen, saskatoon-berry, dogwood, wild rose, buckbrush; patches of choke cherry, pin cherry, wild red raspberry, and wild gooseberry.
Profile description: Orthic Dark Brown Chernozem

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	5-8	leaf and root litter		
Ah	12-15	gravelly loam sand	granular	loose, dry or moist
Bm	35-78	gravelly sand	amorphous	loose, dry
Cca or IICca (till)	10-25	gravelly sand	amorphous	loose, dry
	25-50	clay loam	amorphous	very firm, moist

Comments: (1) The till is usually found below the 120 cm depth, but occasionally only 50 to 75 cm below the surface.
(2) The Cca horizon is often deeper than 100 cm when the complete soil profile has developed in sand. When the till occurs within the control section of the soil profile (less than 100 cm below the surface), the Cca horizon is isually commensurate with the till.
Limitations: Slight to severe-slight for buildings without basements, and road location; moderate for campgrounds, picnic areas, paths, trails, and buildings with basements; severe for lawns and landscaping, and septic tank absorption fields; good source of roadfill; only a fair source of sand because of thin deposits; unsuitable as a source of gravel due to unsuitable textures. Other limitations include sandy surface texture, moderate shrink-swell potential and susceptibility to frost heave of till, rapid permeability (droughtiness), and groundwater contamination hazard.

Map Unit 3

Classification: Gleyed Dark Brown Solonetz, carbonated.
Parent material: very coarse textured glaciolacustrine sediments (gravel), overlying fine textured till.
Landform: glaciolacustrine veneer, overlying inclined morainal (Lv/Mi)
Slope: gently sloping (>2 to 5%)
Surface stoniness: excessively stony (5)
Drainage: imperfect
Vegetation: grass, sedge, foxtail barely; patches of willow, and wolf willow.
Profile description: Gleyed Dark Brown, Solonetz, carbonated

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ahk	7-8	gravel	amorphous	loose, dry
Bntkg	12-13	clay	columnar, breaking to blocky	very hard, dry; very dense
Ccag	79-81	clay	blocky	very hard, dry; very dense

Comment: A water table is often found 75 cm below the surface.
Limitations: Moderate to very severe - very severe for all uses due to surface stoniness; otherwise moderate for picnic areas; very severe for septic tank absorption fields; severe for all other uses; very poor source of roadfill due to surface stoniness, otherwise a poor source; unsuitable as a source of sand or gravel because of only a very thin surface overlay of gravel, and otherwise unsuitable textures. Other limitations include Solonetzic soil, slow permeability, seasonally high groundwater table, surface soil salinity, high lime content (soil nutrient imbalance), high shrink-swell potential, susceptibility to frost heave, flooding hazard (overflow), and groundwater contamination hazard.

Map Unit 4

Classification: Rego Gleysol
Parent material: very coarse textured glaciolacustrine sediments (gravel).
Landform: glaciolacustrine veneer, overlying inclined morainal (Lv/Mi); glaciolacustrine veneer, overlying level morainal (LV/MI).
Slope: gently undulating to gently sloping (>0.5 to 5%).
Surface stoniness: excessively stony (5)
Drainage: poor
Vegetation: balsam poplar, willow, sedge; patches of wolf willow.
Profile description: Rego Gleysol

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	2-3	leaf and root litter		
Ccag	at 0+	gravel	amorphous	loose, dry or moist

Comment: A water table occurs 75 cm below the surface.
Limitations: Severe to very severe - very severe for septic tank absorption fields; very severe for all other uses due to surface stoniness, otherwise severe for all other uses; very poor source of roadfill due to surface stoniness, otherwise only a poor source; unsuitable as a source of sand due to unsuitable textures; poor source of gravel because of seasonally high groundwater tables. Other limitations include flooding hazard (overflow), lack of an Ah horizon, high lime content (soil nutrient imbalance), rapid permeability, and groundwater contamination hazard.

Map Unit 5

Classification: Rego Gleysol
Parent material: very coarse textured glaciolacustrine sediments (sand).
Landform: glaciolacustrine veneer, overlying inclined morainal (Lv/Mi); glaciolacustrine veneer, overlying level morainal (Lv/MI).
Slope: very gently sloping to gently sloping (>0.5 to 5%)
Surface stoniness: nonstony (0).
Drainage: poor
Vegetation: sedge, grass, willow; some wolf willow, dogwood, and wild rose.
Profile description: Rego Gleysol

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
Ccag	100	sand	amorphous	loose, moist

Comment: A water table occurs 60 cm below the surface
Limitations: Severe to very severe - very severe for septic tank absorption fields; severe for all other uses; poor source of roadfill, and sand due to seasonally high groundwater tables; unsuitable as a source of gravel because of unsuitable textures. Other limitations include flooding hazard (overflow), sandy surface texture, lack of Ah horizon, rapid permeability, and groundwater contamination hazard.

Map Unit 6

Classification: Gleyed Regosol
Parent material: very coarse textured glaciofluvial sediments (gravelly sand).
Landform: glaciofluvial blanket, overlying inclined morainal (Fb/Mi)
Slope: gently to moderately sloping (>2 to 9%).
Surface stoniness: moderately to very stony (2 to 3)
Drainage: imperfect
Vegetation: aspen, dogwood, buckbrush
Profile description: Gleyed Regosol

Horizon	Thickness (cm)	Field Texture	Structure	Consistence
L-H	7-8	leaf and root litter		
Cg	100	sand	amorphous	loose, dry or moist

Limitations: Moderate to severe-moderate for picnic areas, and road location; moderate to severe due to surface stoniness but otherwise moderate for campgrounds, and buildings without basements; severe for lawns and landscaping, paths, trails, buildings with basements, and septic tank absorption fields; good to fair source of roadfill (surface stoniness); good source of sand; unsuitable as a source of gravel due to unsuitable textures. Other limitations include sandy surface texture, seasonally high groundwater table, lack of Ah horizon, rapid permeability, and groundwater contamination hazard.

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 boundary is a broad transitional belt, which can be many kilometres across. Topsoil colours reflect this gradual change. For example, in the centre of the Brown Soil Zone (annual precipitation about 30 to 33 cm), topsoil colours are brown. Similarly in the centre of the Dark Brown Soil Zone (annual precipitation about 38 cm), topsoil colours are dark brown. Between these two zones, topsoil colours are brown to dark brown, and annual precipitation is about 35 cm. The boundary between the

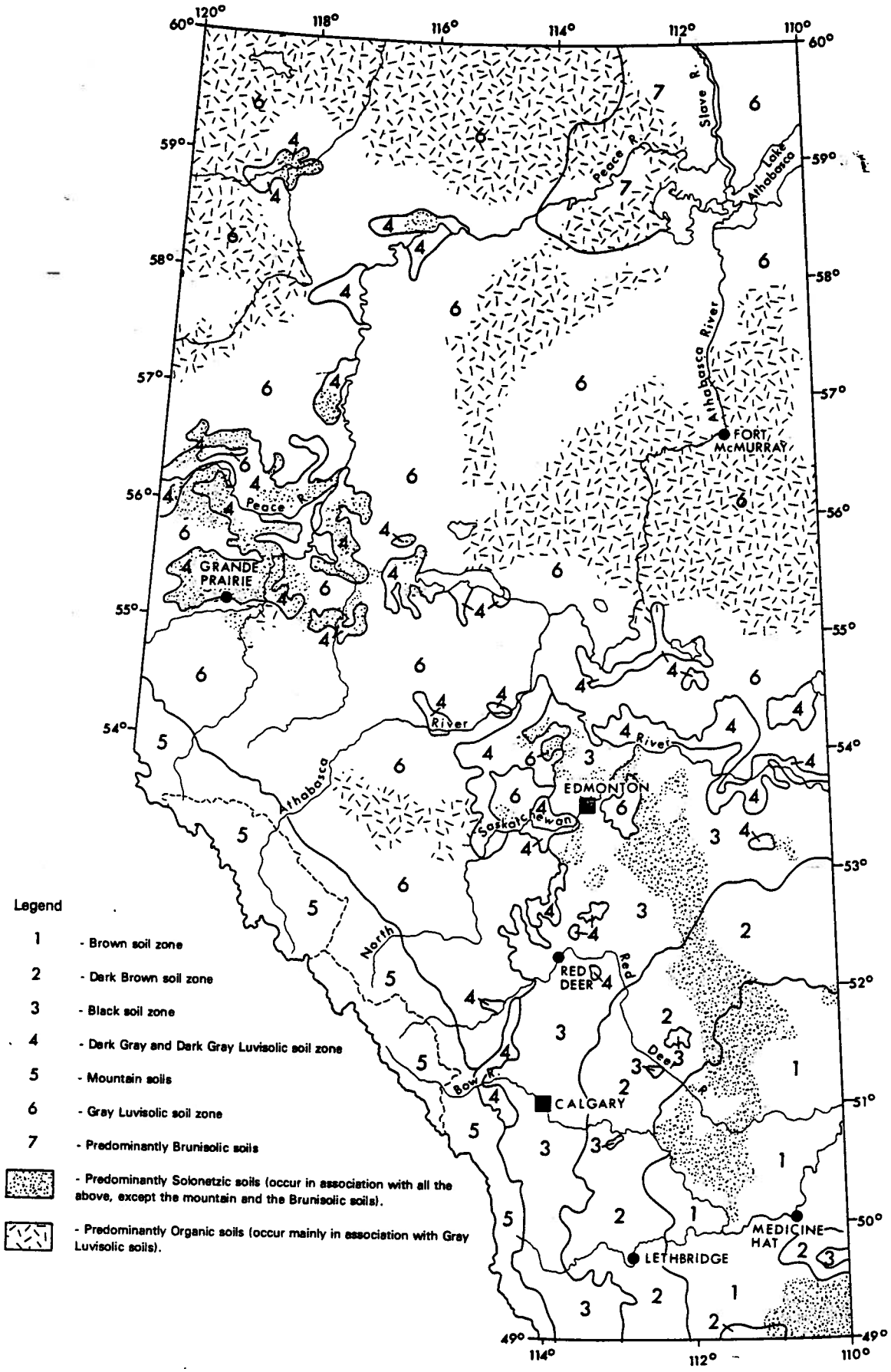


Figure 2. Map showing soil zones of Alberta (from Soil Group Map of Alberta, Alberta Institute of Pedology, undated).

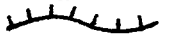
two soil zones has been placed approximately at that mid-point.

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 Regozolic soils in Canada. These occur across all the soil zones in the province.

Gooseberry Lake Park is situated in the dark brown soil zone (Figure 2), and zonally normal Dark Brown Chernozemic soils occur throughout most of the Park. Only narrow bands of intrazonal Solonetzic and Gleysolic soils occur adjacent to the lake shore; and also a narrow band of azonal Regosolic soils occurs near the lakeshore. Gleysolic soils occur across all the soil zones in the province. Soils in the Park can be considered typical, both locally and regionally (Wyatt et al., 1938; Kjearsgaard, 1976).

Special features of soils in the Park relate to their very coarse textures, and consequential very low moisture holding capacities. First they are rapidly drained, and droughty in nature. Second they have loose consistence, rendering them prone to rapid deterioration under human foot traffic. The narrow band of Regosols near the lake shore along the eastern edge of the Park is especially fragile, because these soils have thin or no Ah horizons. Thus surface horizons are very low in soil organic matter, an important soil binding agent.

MISCELLANEOUS SYMBOLS



This symbol indicates escarpments.

This symbol indicates a small drainage channel, or intermittent stream.

SR

This symbol indicates a location where the soil solum has been removed by construction activities, thus exposing the soil parent material at the surface. These patches are nearly devoid of vegetation, and properties are the same as adjacent soil parent materials.

This symbol indicates the location of wet or water-filled depressions, which are characterized by the growth of willows. These depressions have severe to very severe limitations for all uses; and are poor sources of roadfill and sand because of seasonally high groundwater tables or surface ponding. They are unsuitable as sources of gravel because of unsuitable textures.

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 analyses are given in Table 2.

The soils most suitable for recreational development in Gooseberry Lake Park are those of Map Units 1 and 2, when found on suitable topography, and they have moderate limitations due to sandy surface textures. Soils of these two map units cover almost the whole Park. Soils of most other map units adjacent to the lakeshore have severe to very severe limitations due to various factors, including Solonetzic soil, slow permeability, seasonally high groundwater tables, surface stoniness, and flooding hazard (overflow).

The soils best suited to road construction are those of the same two map units, and they have only slight limitations when found on suitable topography. Map Unit 6 soils have moderate limitations; and soils of other map units have severe to very severe limitations because of high shrink-swell potentials, susceptibility to frost heave, seasonally high groundwater tables, surface stoniness, and flooding hazard (overflow).

Map Unit 1 soils, which cover most of the Park, can provide a good source of sand; Map Unit 6 soils can also provide a good source, and Map Unit 2 soils constitute only a fair source because of thin deposits overlying till. Map Unit 5 soils constitute only a poor source of sand because of wetness. A good source of gravel was not found in the Park. Map Unit 4 soils can provide only a poor source because of wetness; and Map Unit 3 soils constitute a very poor source because of only a very thin deposit of gravel, otherwise unsuitable textures, and wetness.

Specific limitations and suitabilities of the various soils for selected uses are shown in Tables 3 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. In Tables 3 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 suitabilities 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 2. Chemical Analyses of Selected Map Units[1]

MAP UNIT	DEPTH cm	pH H20	EC[2]	Na[3]	SO_4[3]	OM[3]	$CaCO_3$[3]
1	0-15	6.6	0.2	L	nd[4]	M-	-
	15-30	6.3	0.1	L	nd	M-	-
2	0-15	7.5	0.9	H+	nd	M	L-
	15-30	6.6	0.2	L	nd	M	-
3	0-15	9.2	2.9	M-	M+	L+	M
	15-30	9.6	2.7	M-	M	L+	M-
6	0-15	6.4	0.1	L	nd	H	-
	15-30	7.6	0.7	L-	nd	M-	-

[1]Chemical Analyses done by Alberta Soil and Feed Testing Laboratory, [2]EC - electrical conductivity, millimhos/cm, [3]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 $CaCO_3$ (free lime) are visual estimates only. [4]nd - not determined.

TABLE 3. Soil Limitations for Fully Serviced Campgrounds

MAP SYMBOL [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/d0	M - Sandy	6/C2	M - Sandy, Wet, Stony
1/e0	M - Slope, Er, Sandy	6/D3	M - Sandy, Wet S - Stony
2/C0 2/D1	M - Sandy		
3/C5	S - Solz, Sl Perm, Wet VS - Stony		
4/b5 4/C5	S - Wet, Flood VS - Stony		
5/B0 5/C0	S - Wet, Flood, Sandy		

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 4. Soil Limitations for Picnic Areas

MAP SYMBOL [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0, 1/D0, 1/d0	M - Sandy	6/C2	M - Sandy, Wet
1/e0	M - Slope, Er, Sandy	6/D3	M - Sandy, Wet, Stony
2/C0, 2/D1	M - Sandy		
3/C5	M - Solz, Sl Perm, Wet VS - Stony		
4/b5, 4/C5	S - Wet VS - Stony		
5/B0, 5/C0	S - Wet, Sandy		

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 Lawns and Landscaping

MAP SYMBOL [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/do	S - R Perm, Sandy	6/C2	S - Sandy, Thin Ah, Stony
1/e0	S - R Perm, Slope, Sandy	6/D3	S - Sandy, Stony, Thin Ah
2/C0 2/D1	S - R Perm, Sandy		
3/C5	S - Solz, Saline, Lime		
4/b5 4/C5	S - Wet, Thin Ah, Lime VS - Stony		
5/B0 5/C0	S - Wet, Sandy, Thin Ah		

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 6. Soil Limitations for Paths

MAP SYMBOL [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/d0	M - Sandy	6/C2 6/D3	S - Sandy, Stony, Wet
1/e0	M - Slope, Er, Sandy		
2/C0 2/D1	M - Sandy		
3/C5	S - Solz, Wet, VS - Stony		
4/b5 4/C5	S - Wet, VS - Stony		
5/B0 5/C0	S - Wet, Sandy		

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 7. Soil Limitations for Trails

MAP SYMBOL [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/d0 1/e0	M - Sandy	6/C2	S - Sandy, Wet
		6/D3	S - Sandy, Stony, Wet
2/C0 2/D1	M - Sandy		
3/C5	VS - Stony, Solz, Wet		
3/C5	S - Solz, Wet VS - Stony		
4/b5 4/C5	S - Wet, VS - Stony		
5/B0 5/C0	S - Wet, Sandy		

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 [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/d0	SL	6/C2 6/D3	S - Wet, Stony
1/e0	M - Slope		
2/C0 2/D1	M - M Sh-Sw, Frost		
3/C5	S - Wet, Sh-Sw, Frost VS - Stony		
4/b5 4/C5	S - Wet, Flood VS - Stony		
5/B0 5/C0	S - Wet, Flood		

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 (soluble sulfate)
Wet - Seasonally high groundwater table or surface ponding

TABLE 9. Soil Limitations for Buildings Without Basements

MAP SYMBOL [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/d0	SL	6/C2	M - Wet, Stony
1/e0	M - Slope	6/D3	M - Wet S - Stony
2/C0 2/D1	SL		
3/C5	S - Wet, Flood VS - Stony		
4/b5 4/C5	S - Wet, Flood VS - Stony		
5/B0 5/C0	S - Wet, Flood		

1. For explanation, see Soil Map.
2. 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 SYMBOL [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/d0	S - R Perm, GW	6/C2 6/D3	S - Wet, R Perm, GW
1/e0	S - R Perm, GW, Slope		
2/C0 2/D1	S - R Perm, GW		
3/C5	VS - Sl Perm, Wet, GW		
4/b5 4/C5	VS - Wet, R Perm, GW		
5/B0 5/C0	VS - Wet, R Perm, 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 [1]	DEGREE OF LIMITATION [2]	MAP SYMBOL	DEGREE OF LIMITATION
1/c0 1/D0 1/d0	SL	6/C2	M - Wet
1/e0	M - Slope, Er	6/D3	M - Wet, Stony
2/C0 2/D1	SL		
3/C5	S - Sh-Sw, Frost, Wet VS - Stony		
4/b5 4/C5	S - Wet, Flood VS - Stony		
5/B0 5/C0	S - Wet, Flood		

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 [1]	DEGREE OF SUITABILITY [2]	MAP SYMBOL	DEGREE OF SUITABILITY
1/C0, 1/D0, 1/d0, 1/e0	G	6/C2	G
2/C0, 2/D1	G	6/D3	F - Stony
3/C5	P - Sh-Sw, Frost, Wet VP - Stony		
4/b5, 4/C5	P - Wet VP - Stony		
5/B0, 5/C0	P - Wet		

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 of Gravel

MAP SYMBOL [1]	DEGREE OF SUITABILITY [2]	MAP SYMBOL	DEGREE OF SUITABILITY
$\frac{1}{c0}$ $\frac{1}{D0}$ $\frac{1}{d0}$ $\frac{1}{e0}$	G		
$\frac{2}{C0}$ $\frac{2}{D1}$	F - Thin		
$\frac{3}{C5}$	VP - Text, Thin, Wet		
$\frac{4}{b5}$ $\frac{4}{C5}$	P - Wet		
$\frac{5}{B0}$ $\frac{5}{C0}$	P - Wet		
$\frac{6}{C2}$ $\frac{6}{D3}$	G		

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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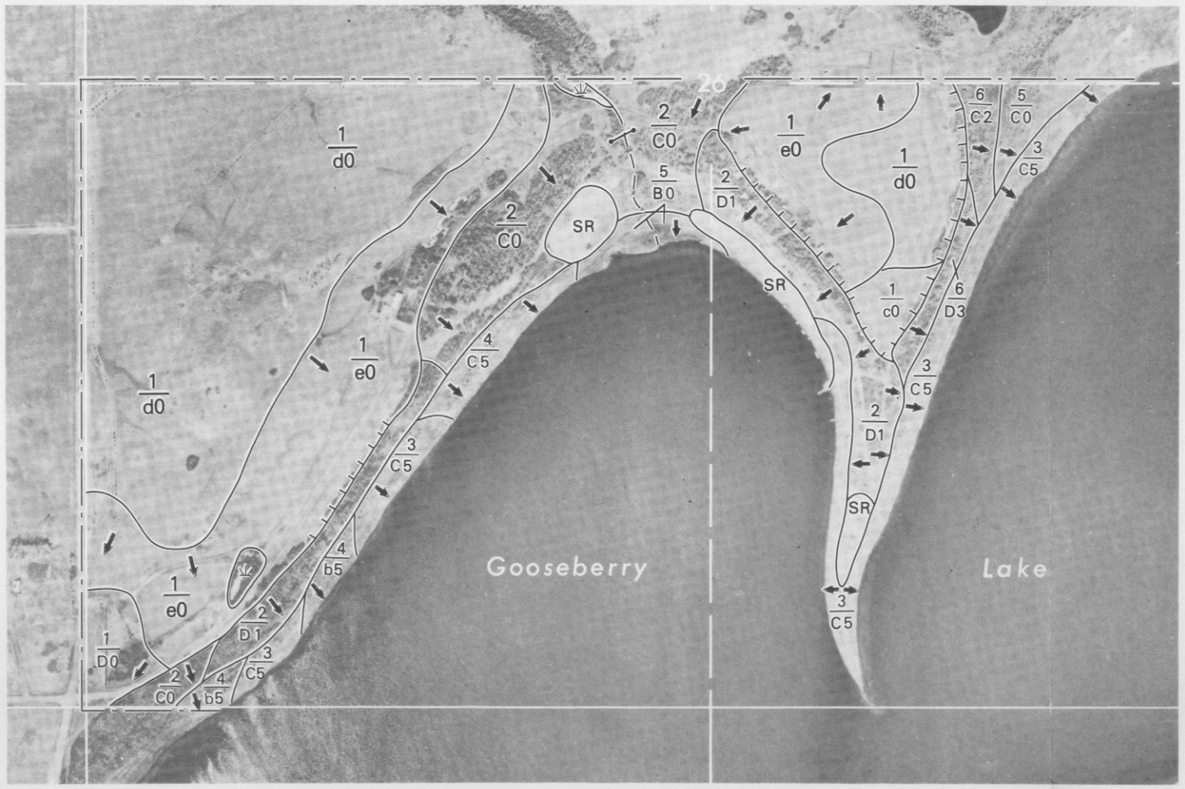

LEGEND:

Map Symbol:

1 ← map unit
d0 ← surface stoniness rating
topographic class

- soil line
- boundary of mapped area
- direction of slope
- escarpment
- small drainage channel

SR - surface removed

- wet or water filled depression

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

SOIL CLASSIFICATION			
MAP UNIT	SOIL ORDER	SOIL SUBGROUP	SOIL PARENT MATERIAL
1	Chernozemic	Orthic Dark Brown	very coarse textured glaciofluvial sediments (sand)
2	Chernozemic	Orthic Dark Brown	very coarse textured glaciofluvial sediments (gravelly sand), overlying moderately fine textrured till.
3	Solonetzic	Gleyed Dark Brown Solonetz, carbonated	very coarse textured glaciolacustrine sediments (gravel), overlying fine textured till
4	Gleysolic	Rego Gleysol	very coarse textured glaciolacustrine sediments (gravel)
5	Gleysolic	Rego Gleysol	very coarse textured glaciolacustrine sediments (sand)
6	Regosolic	Gleyed Regosol	very coarse textured glaciofluvial sediments (gravelly sand)

Soil Map, Gooseberry Lake Provincial Park

Tp 36, R 6, W4M

G.M. Greenlee

Published 1984
Fieldwork conducted in 1975

Cartography by Alberta Research Council, Graphic Services, J. Dlask

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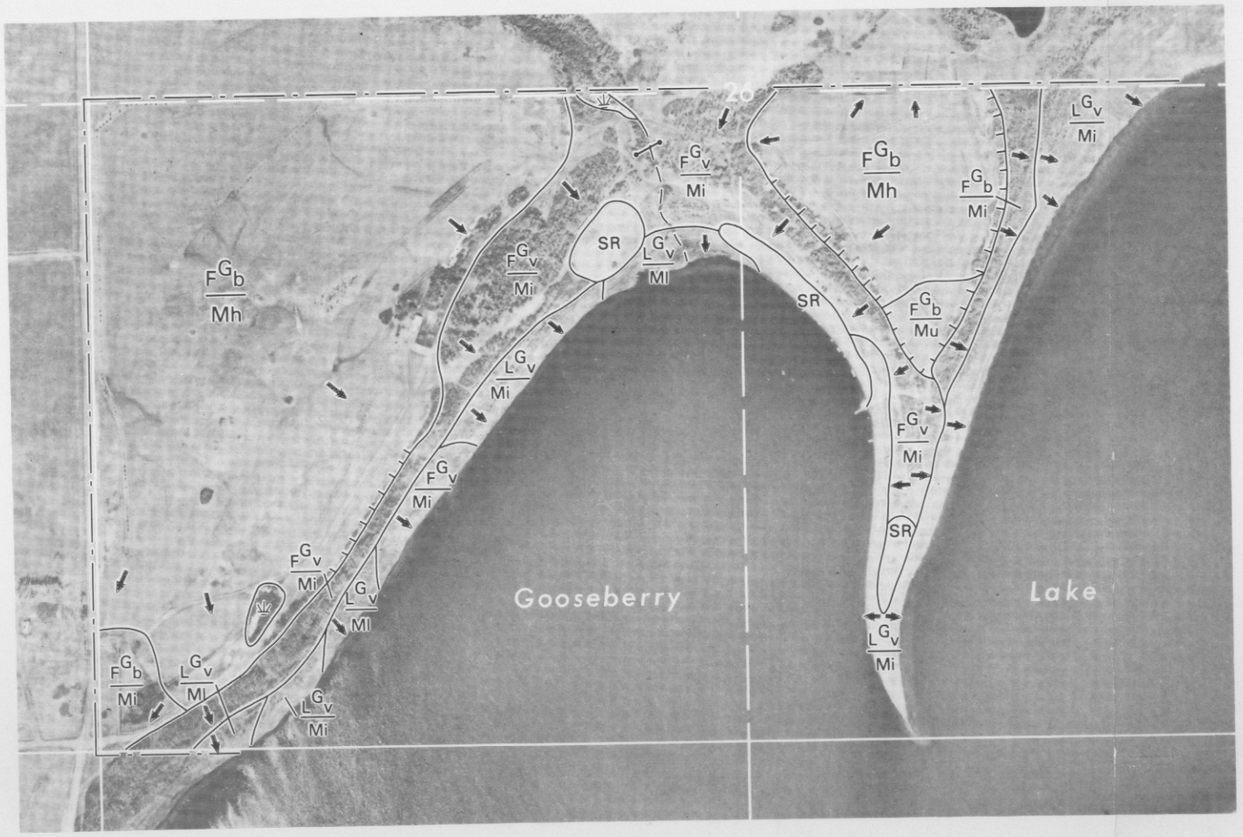

LEGEND:

- landform line
- boundary of mapped area
- direction of slope
- escarpment
- small drainage channel

SR - surface removed

- wet or water filled depression

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

LEGEND:

F - Fluvial

$\frac{F^{G_b}}{Mh}$ - galciofluvial blanket, overlying hummocky morainal

$\frac{F^{G_b}}{Mi}$ - glaciofluvial blanket, overlying inclined morainal

$\frac{F^{G_b}}{Mu}$ - glaciofluvial blanket, overlying undulating morainal

$\frac{F^{G_v}}{Mi}$ - glaciofluvial veneer, overlying inclined morainal

L - Lacustrine

$\frac{L^{G_v}}{Mi}$ - glaciolacustrine veneer, overlying inclined morainal

$\frac{L^{G_v}}{Ml}$ - glaciolacustrine veneer, overlying level morainal

Landform Map, Gooseberry Lake Provincial Park

Tp 36, R 6, W4M

G.M. Greenlee

Published 1984
Fieldwork conducted in 1975

Cartography by Alberta Research Council, Graphic Services, J. Dlask

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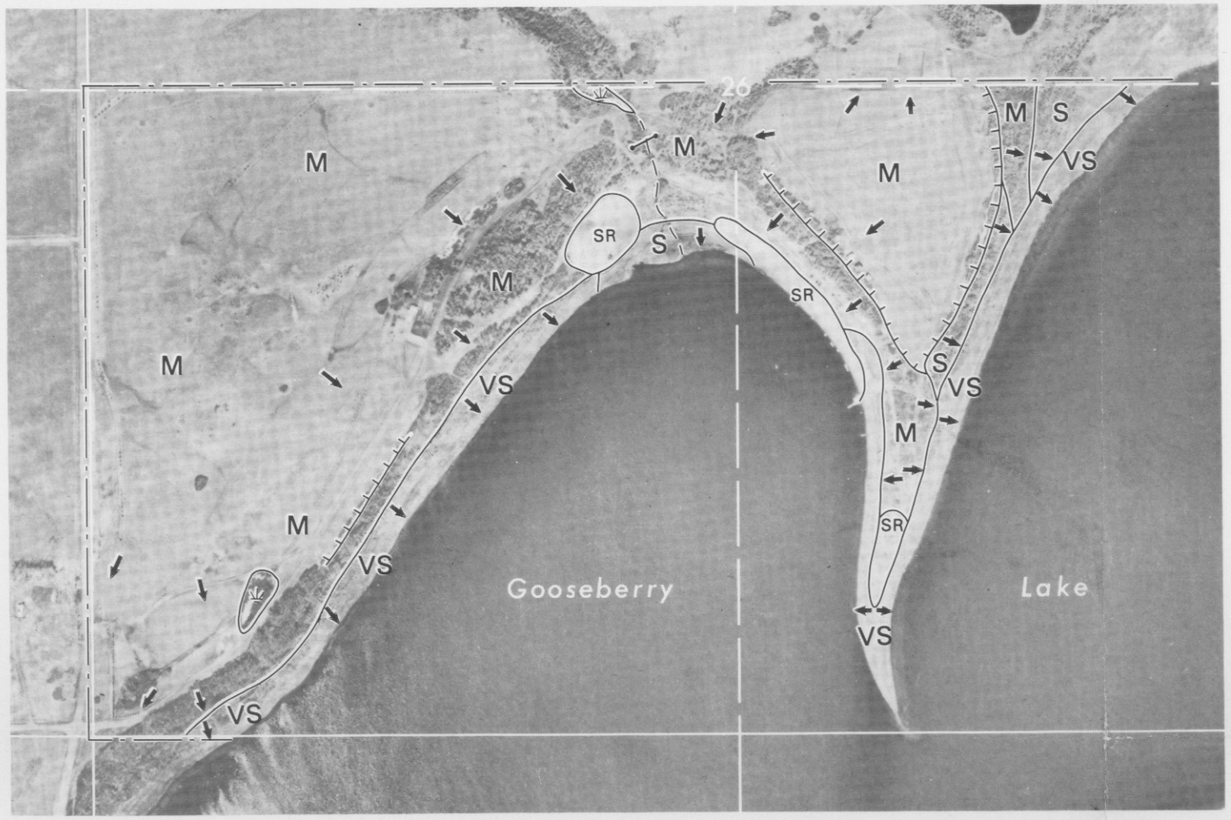

LEGEND:

- soil limitation line
- boundary of mapped area
- direction of slope
- escarpment
- small drainage channel

SR - surface removed

- wet or water filled depression

APPROXIMATE SCALE 1:8000

666 0 666 1332 1998 Feet

160 0 160 320 480 Metres

LEGEND:

SL - none to slight soil limitations

M - moderate soil limitations

S - severe soil limitations

VS - very severe soil limitations

Soil Limitations for Recreation, Gooseberry Lake Provincial Park

Tp 36, R 6, W4M

G.M. Greenlee

Published 1984
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