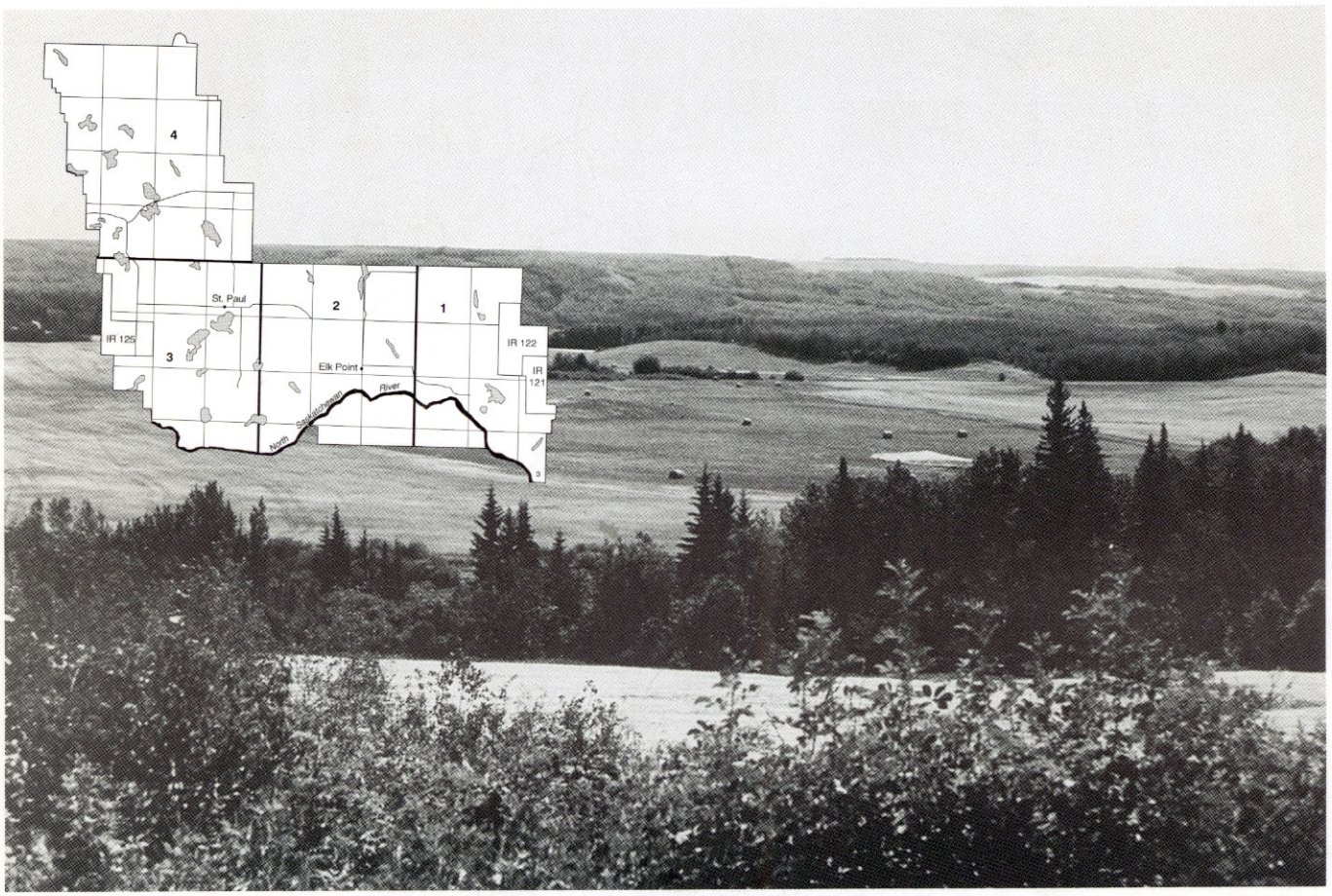
Soil survey of the

County of St. Paul, Alberta

Alberta Soil Survey Report No. 52



Agriculture Canada

ALBERTA RESEARCH COUNCIL

Soil Survey of the

County of St. Paul, Alberta

J.A. Brierley, L.D. Andriashek and W.L. Nikiforuk

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1993

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ALBERTA RESEARCH COUNCIL, ENVIRONMENTAL RESEARCH AND ENGINEERING

How to use this soil survey report

The soil survey report for the County of St. Paul consists of three chapters, five appendices and four 1:50 000 scale (1cm = 1/2km) planimetric base soil maps. A legend, specific to each map sheet, describes the components of each soil map unit symbol.

The three chapters contain the following information:

Chapter 1 provides a general overview of the survey area in terms of climatic, ecological and geologic characteristics.

Chapter 2 provides a general description of the soil types and associated landforms by subdividing the County into sixteen land systems. Each land system is described individually.

Chapter 3 documents the methodology and assumptions used to rate the soil map units for arable agriculture and range productivity. Generalized maps illustrating the areal extent of these interpretive class ratings are included.

The five appendices include:

A. A brief explanation of soil forming processes and soil classification, as well as a description of the mapping procedures, field and office activities.

B. Documentation of the analytical methods used for analyzing soil samples. Descriptions of the major soil series, in terms of physical and chemical characteristics.

C. Detailed descriptions of the soil units and associated soil map units.

D. A table listing the specific interpretive ratings for each soil map unit.

E. A glossary of terms used in this report.

Experience has shown that the following step by step procedure assists users of the report:

1. Locate the specific area on the appropiate map sheet.

- an index to the four map sheets is on page 3 (a small scale, index map is included on each map sheet)
- generally using the section, township and range grid, identify soil map delineation and the associated map symbol for the specific area.

2. Explanation of map symbol.

- find the map symbol and accompanying description of associciated soil and landscape characteristics within the soil map unit legend, alphabetically and numerically arranged
- soil map unit descriptions in the legend are described in terms of the intregral components.

3. Detailed description of the individual soil map units.

- refer to Appendix C for the description of the soil map units
- refer to Appendix B for description of soil series, (the building blocks of soil map units)
- soil map units and soil series are listed alphabetically, by symbol.

4. Interpretations.

- each soil map unit is interpreted for specified land use practices in Appendix D
- a brief explanation describing the rationale and methodology used to determine these ratings is given in Chapter 3.

Preface

Soil surveys have been an ongoing endeavour in Alberta since the 1920's. Their purpose is to provide basic information on the provincial soil resources. Most of the settled portions of Alberta are covered by reconnaissance soil surveys. Many areas require resurvey and updating to current standards, particularly the areas covered by earlier surveys.

The previously existing available soil information for the County of St. Paul was variable. Majority of the area was included on the Soil Survey of the Wainwright and Vermillion Sheets (Wyatt et al. 1944) and the Soil Survey of the Sand River Area (73L) (Kocaoglu 1975). Soil information was not available for a seven mile wide strip across the County and east to the Alberta-Saskatchewan border. This project (which included the Soil Survey of the County of St. Paul as well as the Frog Lake Indian Reserve and Fishing Lake Metis Settlement) rectified this defiency of the provincial soil data base.

In 1987 the County of St. Paul soil survey project was initiated. The survey information complies with semi-detailed level (Soil Intensity Level 3) specifications (E.C.S.S. 1987a). Field work for this project was completed in 1989.

Acknowledgements

The soil survey of the County of St. Paul was a project conducted by Alberta Soil Survey. The Alberta Soil Survey is a cooperative research body which includes representatives of Agriculture Canada, Center of Land and Biological Resources Research and Alberta Research Council (ARC), Environmental Research and Engineering Department. Additional funding for the project was provided by Alberta Agriculture.

The following people and organizations are recognized for providing assistance, support and cooperation during the course of the survey:

- Field mapping - L.D. Andriashek[2], J.A. Brierley[1], W.L.Nikiforuk[2], C.M. Richter[1] and I.R. Whitson[1,2].
- Field assistants - J. Burke, J. Christiansen, R. Delorme, K. King, T. Messier, B. Munroe, R.Penny, and S. Prauner.
- Soil correlation - G.M. Coen and J.A. Shields.
- L.W. Turchenek provided advice and assistance in mapping and describing the organic soil landscapes within the County.
- J. Lutz and M. Huemmert digitized the maps. J. Lutz compiled, checked and plotted the final digitized maps, as well as producing the generalized interpretation maps of the County.
- J. Beres, W.C. McKean and A. Schwarzer conducted the physical and chemical analysis on the collected soil samples.
- L. Bradley and J. Matthie, Drafting and Publications, ARC for cartographic production of maps.
- G.M. Coen, J.A. Shields and R.W. Howitt provided the scientific review of the manuscript.
- Landowners throughout the study area allowed access to their land and offered friendly advice.

1. Agriculture Canada
2. Alberta Research Council

Summary

The County of St. Paul is situated in east-central Alberta, approximately 300 kilometers northeast of Edmonton. The County is approximately 354 200 hectares in size. Agriculture is the principal land use. Roughly 40% of the County is crop land and 35% is used for forage production and grazing. Activities related to energy exploration and production are other major land use practices impacting on the land resource within the County.

The County is within the Eastern Alberta Plain physiographic region. The geographic and geologic characteristics of this region are varied. The contintental climate associated with east-central Alberta is divided into three agroclimatic zones. Two distinct vegetation zones (Aspen Parkland and Boreal Mixedwood) and three large groupings of soils (grassland soils, forest soils and wet soils) characterize the environmental features of this portion of physiographic region.

The dominant surficial material is till. Fluvial and lacustrine materials occur sporadically throughout the area. These surficial materials overlie shale and sandstone bedrock of the Lea Park and Belly River Formations.

Sixteen landscapes with similar geographic, geologic and surface features are recognized within the County. These landscape segments are called land systems. Land systems, described in terms of climate, soil, and landforms, provide a suitable basis for conservation and land use planning decisions, at the municipal scale.

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Chapter 1. General description of the area

1.1 Introduction

Soil surveys have been an ongoing endeavor in Alberta since the 1920s. Although soil maps have varied in presentation over that time, soil surveys have a common purpose, to provide basic information on the province's soil resources. Soil information is gathered and evaluated in order to predict the agricultural capability and manageability of soil landscapes. Since the late 1970s the Alberta Soil Survey personnel have produced 1:50 000 scale survey products, using municipal boundaries.

The soil survey of the County of St. Paul was initiated in April, 1987. The survey addressed a concern of the Alberta Coordinating Committee of Soil and Land Inventory that the existing soils information was not adequate for land use planning in the County. With the expansion of the heavy oil industry (well sites and pipelines) in the County, an updated soil survey was deemed a high priority. Other agencies expressed interest with regard to land use practices related to the distribution of soils present within the County. These requests ranged from interest in the potential of organic soils for agricultural productivity and peat moss extraction suitability to qualitative determination of agricultural and grazing capability of the entire soils resource within the County. As well, there existed a 7 1/2 mile wide stretch of land (township 57 and southern 1 1/2 miles of township 58) where the soils had never been mapped. Further, the soil survey information for the southern half of the County, previously mapped at a scale of 1:190 000 in the 1940s, required updating.

Previous surveys within and neighboring the County provided background information for this survey project. Surveys within the County include: the Soil Survey of the Wainwright and Vermilion Sheets (Wyatt et al. 1944) and the Soil Survey of the Sand River Area (73L) (Kocaoglu 1975). Soil surveys, adjacent to the County of St. Paul include: the Soil Survey of the Tawatinaw Map Sheet (83I) (Kjearsgaard 1972), and Soil Survey of the County of Two Hills (Macyk et al. 1985). Because the scales of the soil survey maps are different, soil delineations between maps do not necessarily correspond. However, the broad mapping concepts and classification of the soils are similar between map sheets, including the County of St. Paul soil maps.

As an extension of the County of St. Paul survey project, the soil resource of the adjacent Frog Lake Indian Reserve and a part of the Fishing Lake Metis Settlement was also mapped. These areas lie to the east of the County. Maps of these areas are published individually: Soil Survey of the Frog Lake Indian Reserve (Brierley & Nikiforuk 1989) and Soil Survey of the Fishing Lake Metis Settlement (Brierley & Nikiforuk 1989).

1.2 Location and geographic features

The County of St. Paul covers approximately 354 200 ha in east central Alberta (Figure 1). The area is bounded by latitude 53°43′ to 54°27′N and longitude 110°22′ to 111°50′W.

The County is bordered by other administrative areas: the County of Two Hills to the south; the County of Smoky Lake to the northwest; Improvement District #18 to the north; and the Municipal District of Bonnyville to the northeast. The Saddle Lake Indian Reserve and Frog Lake Indian Reserve are situated to the west and east of the County, respectively.

The County population in 1989 was 13 127 (Alberta Bureau of Statistics 1990, pers. comm); this excludes the population of the neighboring Indian reserves. The main towns, which service a dominantly agricultural based community, are St. Paul (pop. 5128) and Elk Point (pop. 1391). The principal hamlets in the area include Ashmont, Heinsberg, Lindberg, Mallaig, and St. Vincent.

Road access in the County is good. There is a regular and systematic network of range and township roads covering the majority of the study area, the Moose Hills area being an exception. Provincial highways #36 and #41 are the principal north-south corridors, whereas Highway #28 provides east-west access.

Water bodies, relict and existing water ways, are significant geographic feaures of the County. There are 66 lakes within the area (Alberta Municipal Affairs 1984). The major lakes include: Bunder, Garner, Floatingstone, Kehiwin, Laurier, Upper and Lower Mann, Upper and Lower Therien, and Vincent. The majority of these lakes have a high recreational potential. Provincial parks are established in the vicinity of many of them.

Major rivers within the County are not numerous, but are significant. The North Saskatchewan River runs the breadth of the southern portion of the area. In places the width of the river valley exceeds 1 kilometer. The Beaver River provides the northern most boundary of the County, in township 63. Present day creeks occupy the Kehiwin and Atimoswe glacial meltwater spillways. These channels are major relict channels which ultimately join the North Saskatchewan River.

1.3 Climate

Climate is a crucial factor determining the characteristics of different ecosystems within the County. Variability of precipitation and temperature values, at the macro and micro scale, affect soil development processes. Climatic variables are also crucial for interpreting the agricultural potential of soils.

East-central Alberta, (defined herein as the area from Lloydminster to Cold Lake, west to Lac La Biche and south

to Vegreville) is characterized by a continental climate. The mean summer temperature values range from 12 to 14°C, while the mean winter temperature varies from -14 to -17°C (Table 1). Annual precipitation is between 450-550 mm, most falling as rain during the summer.

Within the County of St. Paul, there is a dearth of long term climate stations. Even the two long term climatic stations (Elk Point and St. Lina) show apparent inconsistencies with respect to other climatic stations in the region (Table 1). These abnormalities are attributed in part to microtopographical effects. For example, the frost-free period of Cold Lake is greater than at Elk Point, even though Cold Lake is 80 km further north. The Elk Point, as well as the St. Lina station, are situated in local lowlands relative to the regional landscape. Cold air drainage may be responsible for the apparent short frost-free period. Conversely, the high frost-free period for the Cold Lake station may reflect the warming influence of a nearby large body of water – Cold Lake. Due to the apparent atypical nature of the data, the climatic station information is of limited value for characterizing the climate within the study area.

Due to the regional climatic variability, the provincial scale climatic maps from the Land Capability Classification for Arable Agriculture in Alberta (A.S.A.C.1987) have been modified with respect to recognition of the three agroclimatic zones within the County. Modification of the zonal lines and associated characteristics are based upon local interpretation of land use, soil and vegetation features.

1.3.1 Agroclimatic zones

The distribution of the three agroclimatic zones recognized within the County of St. Paul are shown in Figure 2. The rationale for recognizing these zones and their associated characteristics are described in this section.

The climatic features of agroclimatic zones provide the basis for the assessment of land capability for arable agriculture in Alberta (A.S.A.C. 1987). Agroclimate is classified on the basis of an energy index value (energy growing degree days, EGDD) and a moisture component (precipitation minus potential evapotranspiration during the growing season, P-PE). EGDD and P-PE (seasonal moisture) values for some of the climatic stations within east central Alberta are also listed in Table 1.

Moisture limitations are considered to be non-limiting and relatively similar throughout the County (A.S.A.C. 1987). During the late 1980s, drought conditions occurred within the County, as reported in the Edmonton Journal (March 2, 1988). However, as noted in the article and substantiated with precipitation data obtained from Alberta Agriculture (P. Dzikowski pers. comm. 1990), stations within east-central Alberta generally did not exhibit significantly drier conditions. The density of climatic stations in east-central Alberta was not sufficient to detect local "dry pockets" within the study area.

In the County of St. Paul EGDD values affect land use practices, more-so than the deficiencies in precipitation. The three recognized agroclimatic zones are described on the basis of present land use (cropping) characteristics in conjunction with the climatic parameters documented by A.S.A.C. (1987). A specific suite of soils is recognized within each agroclimatic zone.

Agroclimatic zone 2-3H

The southern part of the County is within the 2-3H agroclimatic zone. The frost-free period of this region is greater than 100 days. Barley and wheat are the dominant grain crops. The 2-3H zone is unique to the St. Paul study area. It represents a broad transitional zone where climatic characteristics and cropping practices of the 2H and 3H

Table 1. Summary of Data from Climatic Stations in East-Central Alberta.

Station	Elevation (m)	Mean[1] Summer Temp. (°C)	Mean[1] Winter Temp. (°C)	Mean[1] Daily Temp. (°C)	Precip[1] as rain (mm)	Total[1] precip. (mm)	Frost[1] free period (days)	Energy[2] Index Values	Seasonal[2] Moisture
Cold Lake	541	13.4	-15.6	1.2	337.4	459.9	105	1277	-197
Elk Point	594	13.0	-16.0	0.7	335.6	453.5	88	1195	-246
Lac La Biche	559	13.4	-14.8	1.4	365.1	562.1	104	—	—
Lac La Biche A	565	12.9	-15.2	1.1	367.6	513.5	105	—	—
Lac La Biche (AUT)	568	12.7	-15.3	1.0	356.9	476.1	101	1210	-156
La Corey	579	12.6	-17.4	-0.1	320.9	435.6	88	—	—
Lloydminster	646	13.9	-14.6	1.6	330.6	425.1	120	1370	-225
Marwayne	594	13.3	-15.3	1.1	318.2	435.4	81	1194	-304
St. Lina	632	12.5	-14.9	0.8	370.1	484.3	78	—	—
Sand River	732	12.5	—	—	—	—	111	—	—
Tulliby Lake	602	13.6	-16.1	1.0	323.6	431.0	109	1336	-279
Vegreville	635	14.0	—	—	—	—	108	1330	-277
Vegreville CDA	636	13.1	-15.2	1.1	319.8	404.3	83	1174	-274
Vermilion A	619	13.2	-15.7	1.2	313.2	415.0	100	1262	-263

Data from:
1. Atmospheric Environment - Canadian Climate Normals 1951-1980.
2. A.A.A.C. 1987.

zones overlap. Class 2H climate is characterized by energy index values ranging from 1180-1340. Class 3H values range from 1050-1180. For the determination of land capability ratings (Chapter 3), energy index values are assigned to soils reflecting these class boundaries. The energy index values for the Chernozemic and Luvisolic soils within this agroclimatic zone, are 1200 and 1150, respectively.

Soil names specific to this zone include Luvisolic soils such as COA (Cooking Lake), and UCS (Uncas); and Chernozemic soils such as AGS (Angus Ridge), NTV (Northern Valley), GBL (Gabriel), and PIB (Pibroch).

Agroclimatic zone 3H

The 3H agroclimatic zone is defined by the areas where canola, barley and forage crops are extensively grown. The frost-free period is between 90-100 days, thus wheat production is limited due to the increased risk of frost. The energy index values for the 3H zone range from 1050-1180. Chernozemic and Luvisolic soils within this zone are assigned an energy index value of 1100. Locally, wheat may be grown in the "warmer" parts of the landscape, such as south facing slopes.

Soil names specific to this zone include Luvisolic soils such as LCY (La Corey), and SDN (Spedden); and Chernozemic soils such as FRY (Fergy), KHW (Kehiwin), and VIL (Vilna).

Agroclimatic zone 4H

The 4H agroclimatic zone is characterized by forage production and grazing land use practices. Barley is grown for green feed. Within this study area, the 4H zone line is generally associated with the 660 m, or higher, elevation contour. The frost-free period is assumed to be less than 90 days and the energy index values are less than 1050.

Soil names specific to this zone include Luvisolic soils such as ABC (Athabasca), GMT (Grosmont), WST (Winston), and MHL (Moose Hills).

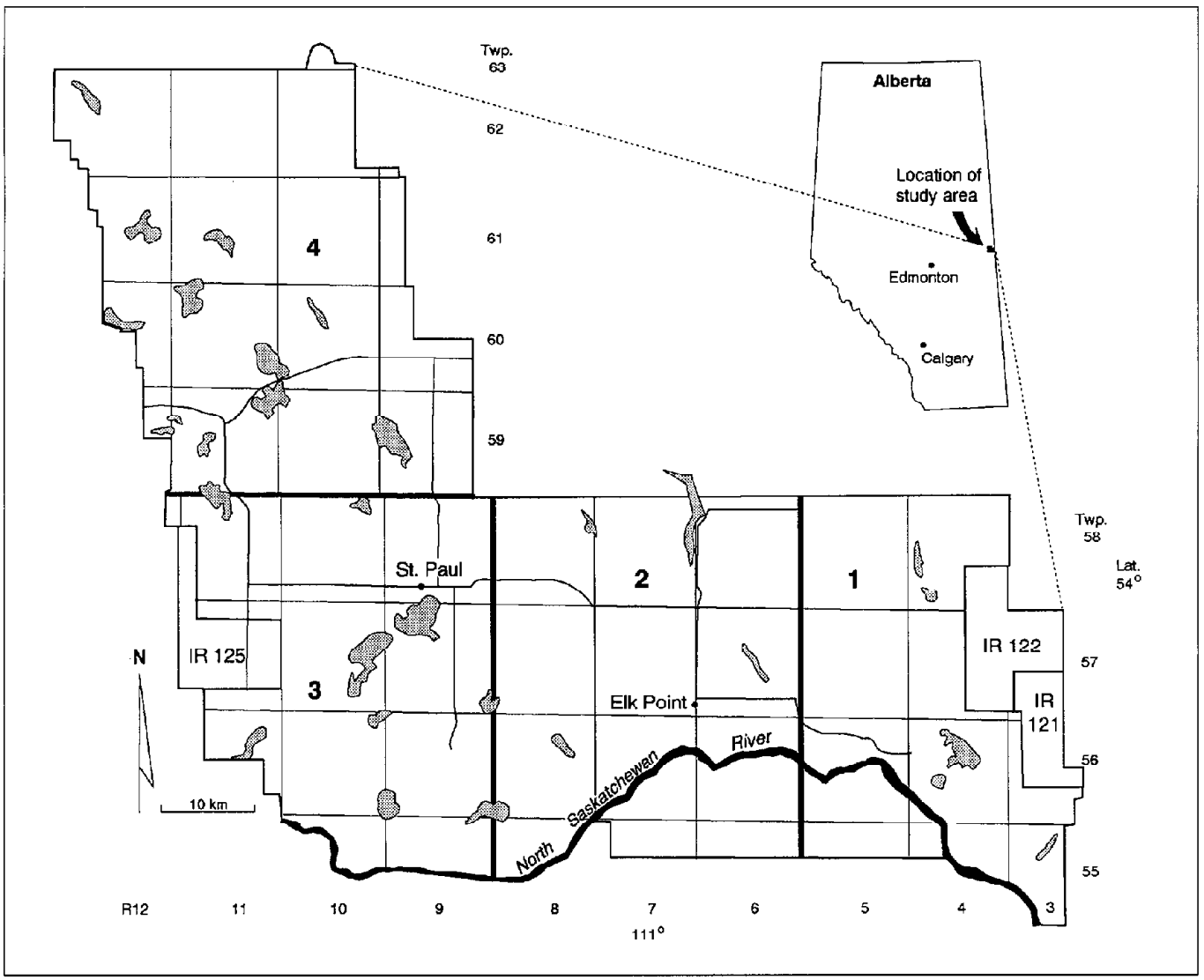


Figure 1. Key map showing the location of the County of St. Paul within Alberta and the subdivision of the County into the four soil map sheets (1,2,3,4).

1.4 Vegetation

Soil development and vegetation ecoregions are interrelated, with specific types of soils being associated with specific regions. An overview of the distribution of soils within the county may be achieved through understanding the major vegetative characteristics of the ecoregions. This section decribes ecoregions in terms of the dominant types of vegetation and associated soils.

Two ecological regions, the Aspen Parkland and the Boreal Mixedwood are recognized in the County of St. Paul (Figure 3) (Strong & Legatt 1981). In this study the boundaries were modified from Strong & Legatt (1981), based upon information collected during this survey and on guidelines used by Resource Information Branch, Alberta Forests, Lands and Wildlife (H. Archibald pers. comm. 1990). The boundaries between the two zones are transitional and subtle. The groves of aspen intermixed with grasslands grade into mixedwood forest, from south to north and with increasing elevation.

Within east-central Alberta the Aspen Parkland Ecoregion is a transitional area occurring between the boreal forests to the north and the extensive grasslands to the south. The characteristic feature of this ecoregion is the mosaic pattern of the landscape caused by the interspersed distribution of aspen forest and grassland. Chernozemic soils and Dark Gray Luvisolic soils characterize the pedologic development on the surficial materials in this ecoregion (Strong & Legatt 1981, H. Archibald pers. comm. 1990). This ecoregion is subdivided into three subregions: Groveland, Aspen, and Willow. This subdivision is based on the proportion of aspen trees to grasslands and the presence of willow species.

Within the County of St. Paul only the Aspen Subregion of the Aspen Parkland ecoregion is recognized. This subregion is dominated by aspen with patches of grassland interspersed throughout. The undergrowth beneath the aspen forest consists of wild rose, saskatoon, chokecherry, dogwood, bedstraw, vetches and wild strawberry.

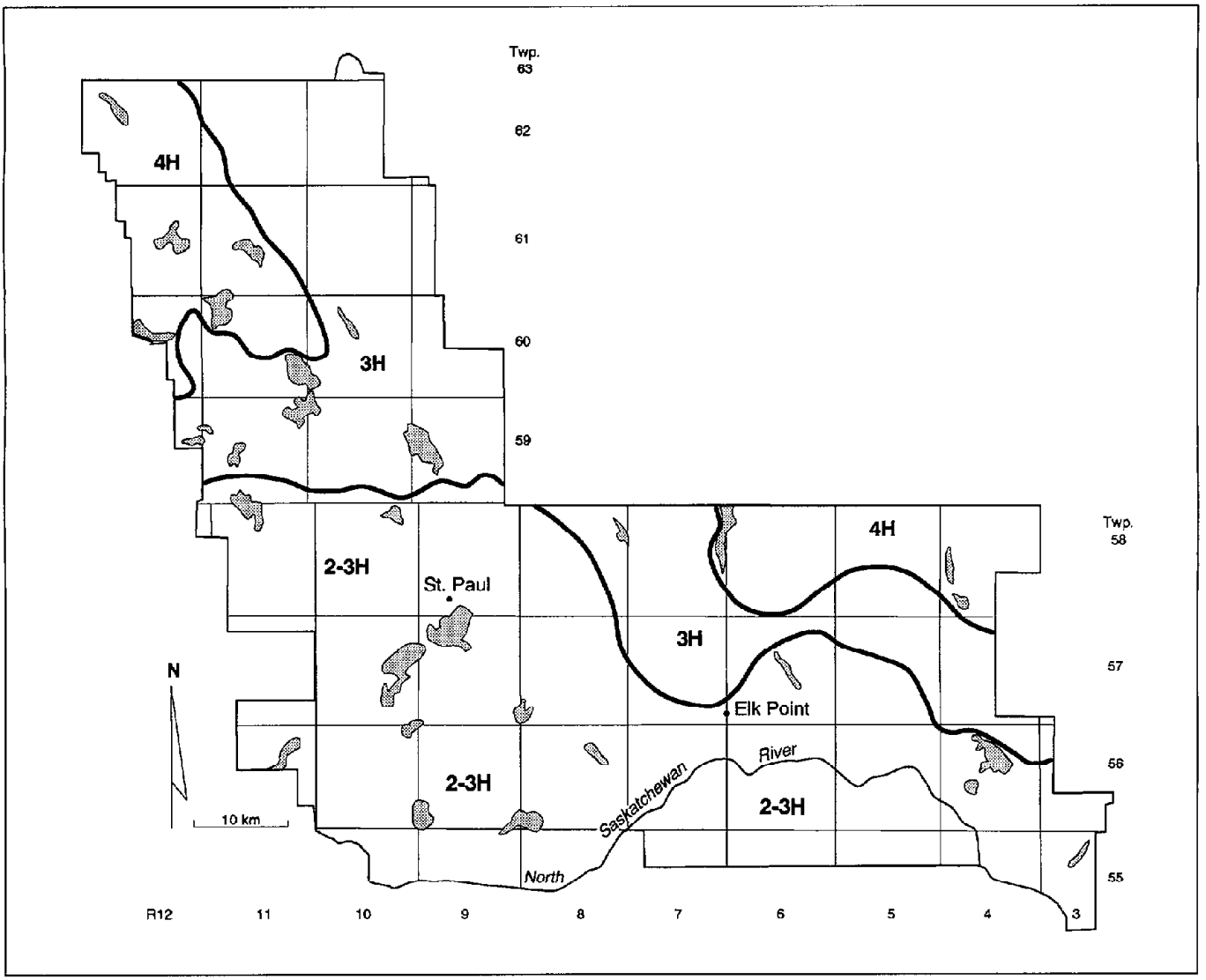


Figure 2. Recognized agroclimatic zones within the County of St. Paul (modified from A.S.A.C., 1987).

Black and Dark Gray Chernozemic soils are prevalent within this subregion. Strong (1977, as noted in Strong and Legatt 1981) believes that the presence of these soils indicate grasslands were originally the dominant vegetation. Since settlement of the area by Europeans, the occurrence of wild fires have been limited, allowing tree encroachment on the original grasslands.

The Boreal Mixedwood Ecoregion is characterized by the presence of white spruce and balsam fir as climax species in association with aspen trees. The proportion of conifers is variable, depending upon fire history. This ecoregion is distinguished from the Aspen Parkland by the dominance of Luvisolic soils, the spruce/fir climax species, and the lack of grasslands. Three subregions of the Boreal Mixedwood Ecoregion are recognized on the basis of summer precipitation: Dry, Moist, and Wet Mixedwood. The Dry Subregion, which borders the Aspen Parkland, is the only subregion recognized within this County (Strong & Legatt 1981).

The Dry Subregion vegetation type of the Boreal Mixedwood is similar to that of the Aspen Parkland, with the addition of coniferous trees. Ecologists have disputed the separation of these two zones because of their many similarities. However, Strong and Legatt (1981) defined the difference on the basis of climatic variability. The Dry subzone climate being characterized as having a cooler, shorter growing season and receiving less precipitation than the Aspen Parkland (Strong & Legatt 1981).

The predominance of Luvisolic soils within the Boreal Mixedwood Ecoregion reflects the influence of the cooler temperatures on soil development. The delineation of the Boreal Mixedwood outlier in Tp 56, Rg 8 & 9, (Figure 3) is based upon the occurrence of dominantly Luvisolic soils, and is corroborated by findings of Alberta Forests, Lands and Wildlife (H. Archibald pers. comm. 1990).

Within the Dry Subregion, Jack pine vegetation types are associated with Brunisolic soils developed on sandy parent materials. Jack pine, with the occasional stunted aspen, dominate the tree cover, while the sparse under-

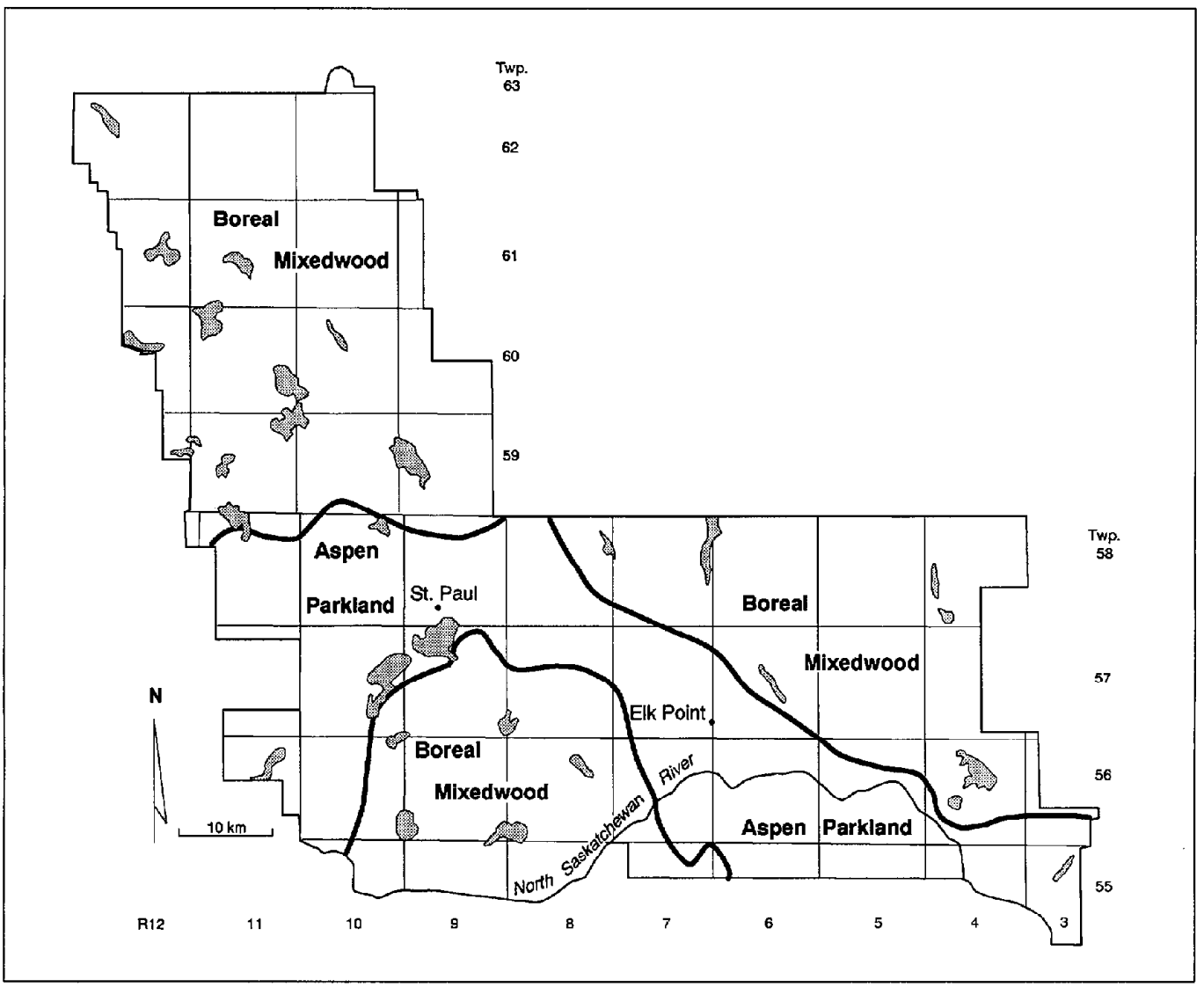


Figure 3. Recognized ecoregions within the County of St. Paul (modified from Strong and Legatt, 1981).

growth consists of bearberry and blueberry and some grasses. Areas of these soils and vegetation type occur in Tp 56, Rg 4 & 5 and Tp 63, Rg 10.

1.5 Bedrock geology

The regional characteristics of soil parent material are strongly influenced by the composition of the underlying bedrock geology. For example, in Alberta the clay rich till reflects the fine textured nature of the underlying Cretaceous, marine bedrock units. The composition of till closely resembles that of the underlying bedrock in areas where bedrock is at or near the surface. This dependent relationship between till composition and underlying bedrock type decreases as the thickness of drift increases.

Within the County of St. Paul study area two Upper Cretaceous aged geologic formations are recognized; the Lea Park and Belly River. The Lea Park Formation, the older of the two, is exposed in the eastern third of the County. The Belly River Formation is found in the western two-thirds of the study area (Figure 4). Both formations dip to the southwest at a rate of 4 meters per kilometer.

The Lea Park Formation is characterized as gray marine claystone containing minor amounts of silt and fine grained sand. Concretionary ironstone beds and layers of bentonite are also present in minor amounts (Hume and Hage 1941; Shaw and Harding 1949). The formation is exposed along the banks of the North Saskatchewan River as well as along the eastern flank of the Kehiwin Channel.

The Belly River Formation is characterized as gray, brownish gray, to greenish gray deltaic sandstone, interbedded with brownish gray to gray carbonaceous shale and siltstone (Shaw and Harding 1949). The contact of this formation with the Lea Park is described as stair-stepped to interfingered. Outcrops of the Belly River Formation are visible along Atimoswe Creek, where the weathered sandstone has a characteristic rusty-yellow color.

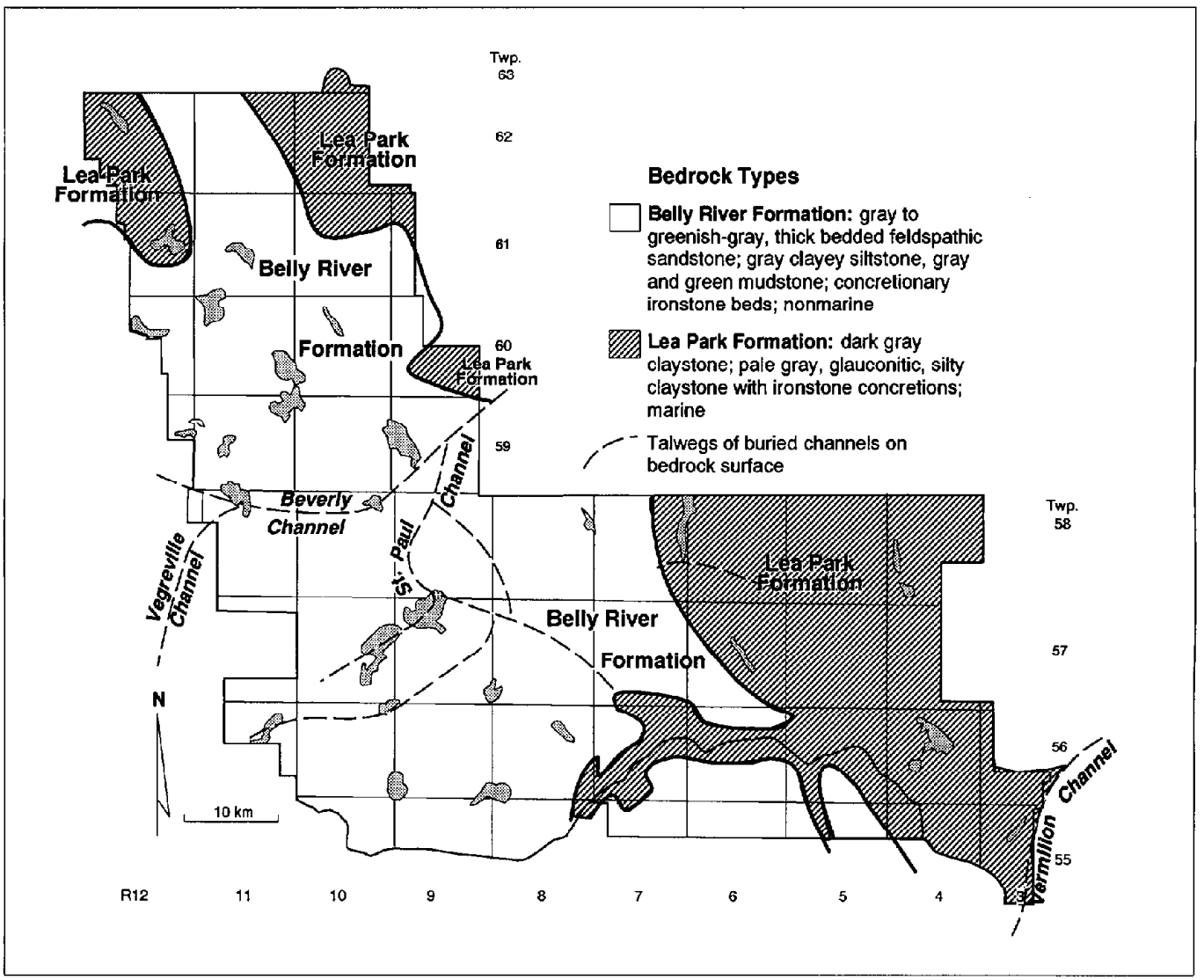


Figure 4. Bedrock geology map for the County of St. Paul, and location of buried bedrock channels (modified from Green 1972; Carlson and Currie 1973; Gold et al 1983).

1.6 Surficial geology

Soil characteristics and landforms are intimately linked to the distribution of surficial geologic materials and land features (Figure 5). Surficial geology provides the baseline information about the land surface. From this information soil texture variability, steepness, slope length, and internal drainage can be derived. This type of information is critical not only for the purposes of classifying and mapping soils and landscapes, but ultimately may influence landuse practices within a region.

The surficial geology in the County of St. Paul area is complex, compared to other regions of central Alberta. During the early Quaternary, preglacial fluvial processes modified the surface of the bedrock. Subsequent glaciations in the late Quaternary further influenced the character of the landscape with a cover of glacial drift. The complexity of present-day landforms in the County is the result of both active ice and stagnant ice processes related to several advances during the last (late Wisconsin) glaciation.

1.6.1 Preglacial bedrock topography

Fluvial erosion during the late Tertiary and early Quaternary carved a number of channels on the bedrock surface in the study area. These bedrock channels are disguised on the present-day surface, having been infilled with till and fluvial sediment during multiple glacial events. However, the presence of buried bedrock channels can be a key to explaining the character and variability of both materials within the County. Bedrock channels were focal areas for the deposition of thick drift and glacial thrusting of bedrock. Aquifers, which are commonly found in buried channels, have economic significance to the County. They are potential sources of groundwater for domestic, livestock, and local industrial use.

Two major preglacial channels, the Beverly Channel and the Vermilion Channel, as well as their associated tributaries, dominate the bedrock topography in the County of St. Paul (Farvolden 1963; Carlson and Currie 1973; Carlson 1967, 1977; Gold et al. 1983) (Figure 4). The Beverly Channel, which is the larger of the two, is the

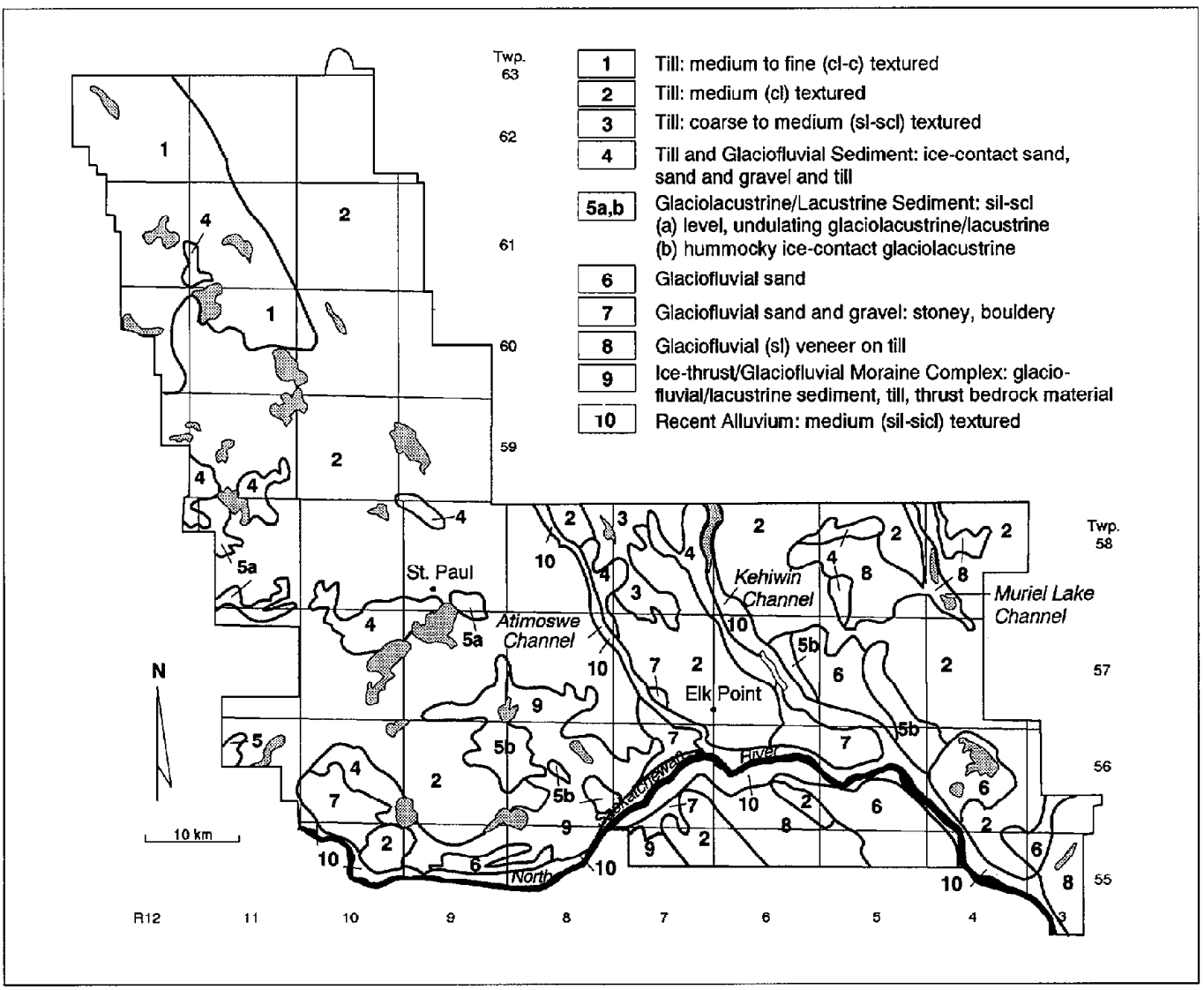


Figure 5. Distribution of surficial geologic materials and location of major meltwater channels within the County of St. Paul.

ancestral course for the North Saskatchewan River. Within the St. Paul study area, a segment of the Beverly Channel is found directly west of Lottie Lake (Tp 58, Rg 11), extending east to St. Vincent (Tp 59, Rg 9). This segment of the channel is estimated to range from 5 to 8 kilometers in width, and contain as much 125 to 175 meters of glacial drift.

Two tributary systems, the Vegreville Channel (Carlson and Currie 1973) and the St. Paul Channel, join the Beverly Channel in the west-central part of the study area (Figure 4). The Vegreville Channel enters from the southwest and meets with the main Beverly Channel directly beneath Lottie Lake. The St. Paul Channel system consists of a number of smaller tributary channels that all originate within the confines of the County. The main segment of the St. Paul channel trends northeast from Lac Sante (Tp 56, Rg 11), to the Upper Therien Lake area (Tp 57, Rg 9), and north joining the Beverly Channel, east of Vincent Lake (Tp 59, Rg 9).

The Vermilion Channel, the other major preglacial drainage system, has its headwaters in the plains region, south of the County. This channel enters the study area in Tp 55, Rg 3, trends north along the eastern boundary of the County, and exits south of Frog Lake (Tp 56, Rg 3). The channel is estimated to range from 3 to 5 kilometers in width and is infilled with as much as 75 to 100 meters of glacial drift (Carlson and Currie 1973; Andriashek and Fenton 1989).

1.6.2 Glacial landforms

During the last glaciation, the Cold Lake Glaciation, three distinct ice lobes advanced through the County of St. Paul study area. The three ice lobes are named; Primrose, Siebert and Lac LaBiche (Andriashek and Fenton 1989) (Figure 6). The landforms of the area are products of active-ice and stagnant-ice processes associated with these ice lobes.

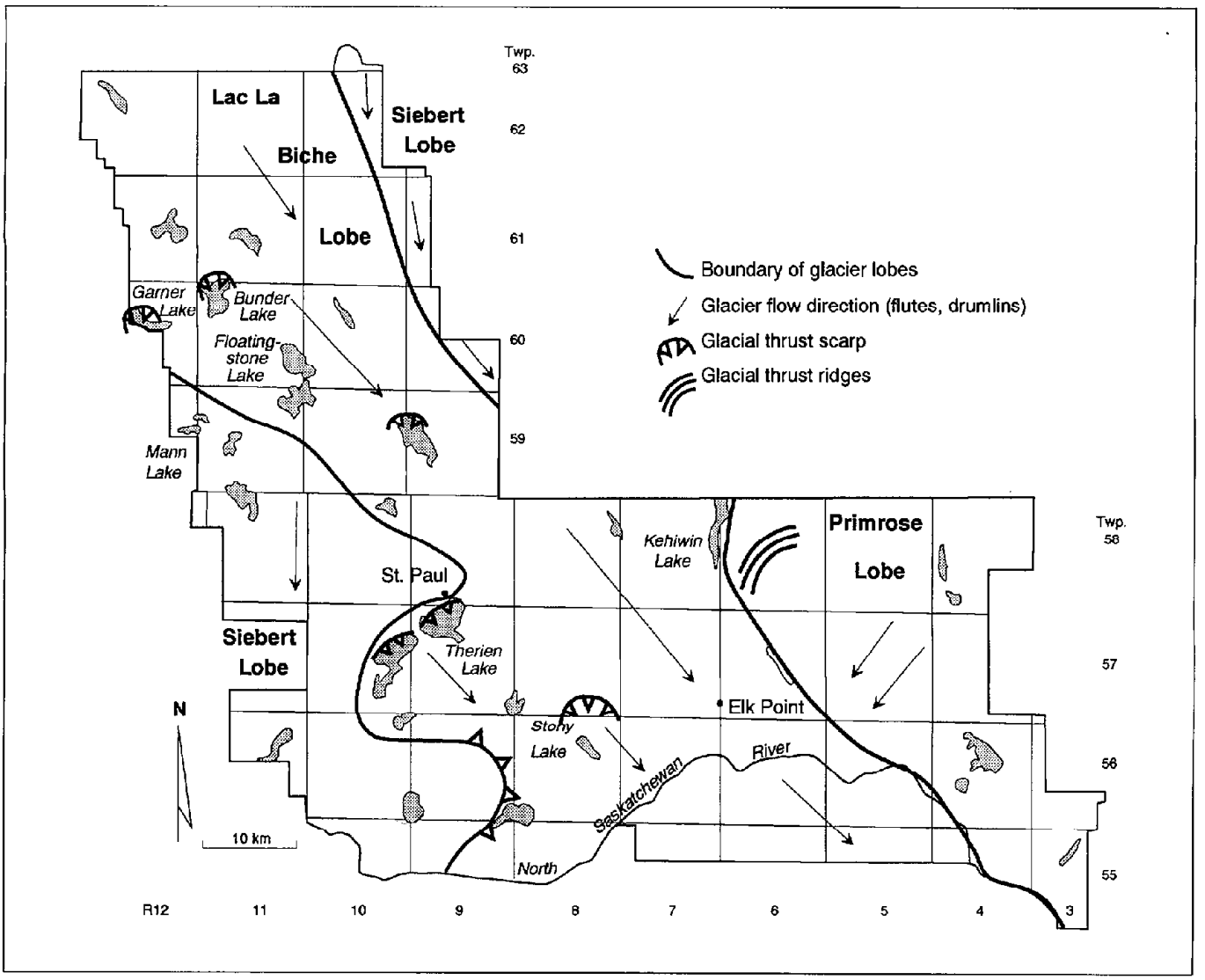


Figure 6. Direction of active-ice flow features associated with the Primrose, Siebert and Lac LaBiche glacial lobes, of the Cold Lake Glaciation (modified from Andriashek and Fenton, 1989).

Active-ice lobe landforms

The first ice lobe, termed the Primrose Lobe, advanced across the area from the northeast (Figure 6). Subsequent advances included the Seibert Lobe from the north, followed by the Lac LaBiche Lobe from the northwest. The passage of all three lobes, particularly the Lac LaBiche Lobe, was marked by large scale modification of the pre-existing landscape as a result of glacial ice-thrust processes. Large depressions, some showing fault scarps along their upglacier margins, were excavated during the advance phases of each of the lobes. Many of these thrust-depressions were subsequently filled with water during deglaciation, forming the major lakes in the region. Examples include: the Muriel Lake basin (Tp 59 Rgs 4 & 5), excavated by the Primrose Lobe; the Saddle Lake basin (Tp 58, Rg 12), excavated by the Seibert Lobe; and the Garner, Floatingstone, Bunder, Mann, Therien and Stony Lakes, excavated by the Lac LaBiche Lobe. Intact beds of pre-existing sediment, including older tills and stratified glacial sediment, as well as sandstone, mudstone and ironstone bedrock, were glacially thrust and transported from these source areas. In many places the thrust sediment was deposited directly down glacier from the source area, forming high relief knobs and ridges of deformed sediment. Examples of this include: the complex of subparallel thrust ridges on the Moose Hills, south of Muriel Lake (Tp 58, Rg 6); the hummocky to knobby thrust-bedrock landforms located southeast of the major lakes in the northwest part of the study area (Tps 58 to 61, Rgs 10 to 12); and the large-scale thrust-bedrock knobs and hummocks northeast of Stony Lake (Tp 56-57, Rg 8) (Andriashek and Fenton 1989).

Subsequent glacial over-riding reworked the displaced sediment, producing glacially streamlined landforms such as flutes, drumlins and drumlin-like features. Streamlined features are predominantly associated with the Lac LaBiche Lobe, which produced a field of southeast trending fluted ridges throughout the County.

Stagnant-ice lobe landforms

The end of the Cold Lake Glaciation was marked by glacial retreat dominantly in the form of mass wasting of stagnant ice. Many of the land features in the southern part of the study area show evidence of meltwater erosion and deposition of fluvial sediment in contact with wasting dead ice.

At the onset of glacial retreat from the study area, the Kehiwin Channel was the first major fluvial system to develop (Figure 5). Within the St. Paul study area, the Kehiwin Channel developed as an ice-walled channel along the contact of the Primrose and Seibert ice lobes. Melting of the channel ice-walls and subsequent collapse of ice-contact fluvial sediment produced high relief, hummocky glaciofluvial landforms in the southern segment of the Kehiwin Channel (Tp 56, Rg 5 and Tp 55, Rg 5). A major ice-walled meltwater channel system also developed along the coalesced Seibert and Lac LaBiche ice margins west of the Kehiwin Channel, in Tp 58, Rg 8 to Tp 56 Rg 7. The Atimoswe–Crooked Heel meltwater channel complex (Figure 5) was eroded by this system. The development of the northern part of the Kehiwin Channel segment, as part of the Sand River drainage system, is discussed by Andriashek and Fenton (1989).

A catastrophic release of meltwater during the late stages of deglaciation further deepened the Kehiwin Channel. A new segment of the channel was created, in which meltwater flow was diverted southeast along the Primrose ice margin (Tp 57, Rg 6, to Tp 55, Rg 3). As the Primrose lobe ice margin retreated northward, the ice-marginal channel migrated northeastward, sequentially carving a series of large-scale meanders into the Primrose glacial ice, and into the pre-existing sediment beneath the glacier. Much of the eroded material was transported southeast and deposited as outwash in the Laurier Lakes region. Large-scale erosional remnants of this catastrophic meltwater release remain as knob-like features in the area north of Mitchell Lake (Tp 57, Rg 5).

After the formation of the Kehiwin Channel, the present-day North Saskatchewan River began to establish its drainage course on the land surface. Drainage northeastward was impeded by stagnant-ice margins of the glacial ice lobes. Ponding along these ice margins provided an additional influx of both water and sediment to the study area. Subsequent melting of the ice dams and rapid drainage of the ponded water produced large deep meander scars and erosional remnants along the northern flank of of the drainage system in the area between Lac Sante (Tp 56, Rg 11) and Lake Eliza (Tp 55, Rg 8).

The newly eroded North Saskatchewan River Valley was modified by one or more minor glacial readvances of the Cold Lake glacier. Hummocky glaciofluvial landforms draped on the floodplains of the large-scale meanders, and on top of the ridged-to-terraced erosional remnants north of the present-day North Saskatchewan River, are evidence of a glacial readvance. Ice from this glacial readvance was subsequently buried by sediment deposited from meltwater flowing on top of, on in contact with, stagnant ice. Kettles and pits developed on the melting ice surface and were in-filled with poorly stratified sediment. Topographic inversion, resulting from the melt and collapse of the underlying ice, produced high-relief hummocks composed of sand, gravel and poorly sorted debris-flow sediment (till). These ice-contact depositional features characterize a region about 3 to 5 kilometers wide along the north side of the present-day North Saskatchewan River, (Tp 56, Rg 10, to the middle of Tp 56, Rg7). One particularly large ice-collapse hole in the central part of Tp 56 Rg 7, was filled with 30 meters of sand and gravel, providing a major source of aggregate for the area.

A similar sequence of events occurred along the east flank of the Kehiwin Channel. A minor readvance of the Primrose ice-lobe filled the newly-eroded lowland with glacial ice. Meltwater from both the Kehiwin Channel and the early North Saskatchewan River deposited glaciofluvial sediment on top of, or in contact with the decaying ice mass. Additional sediment was deposited on the ice-filled

lowland near Laurier Lakes by meltwater flowing south off the Primrose Lobe. This influx of meltwater and sediment from the north formed an ice-floored glacial meltwater channel, (now occupied by Middle Creek in Tp 57, Rg 4), that graded into an esker along the western shore of present-day Borden Lake (Tp 56 Rg 4). Localized ponding and channel development in this decayng ice mass produced great variation in the composition and distribution of the sediment, ranging from loam textured lacustrine sediment to sand and gravel deposits. In places, the catastrophic release of meltwater scoured the pre-existing glacial landscape and deposited coarse sediment such as sand and gravel on top of previously deposited lacustrine silt and clay (Plate 1). Subsequent melting and collapse of these ice-contact fluvial and glacial sediments produced moderate to high relief hummocks, characteristic of the topography of the area (Tp 56, Rg 5).

Retreat of the coalesced Seibert and Lac LaBiche lobes, north of Elk Point, was characterized by the mass wasting of relatively clean glacial ice. A series of radial fractures or crevasses developed on the surface of the glacier. These crevasses provided the focus for the deposition of fluvial and debris-flow sediment on the surface of the melting ice. Subsequent let-down of the crevasse sediment formed a sporadic drape of isolated hummocks or sharp-crested ridges superimposed on the underlying flutes.

1.6.3 Complex glacial landform models

Relating active and stagnant ice erosional and depositional processes to the origin of present-day landforms within the County, is sometimes a difficult exercise. The following examples illustrate the possible relationships between surface features and the nature of the associated geologic materials. An awareness and understanding of the possible mechanisms which produced these complex landscapes helps predict the distribution of materials in other similarly complex areas within the County.

The Lac Sante–Lake Eliza region (Tp 55, Rg 8 to Tp 56, Rg 11) is one of the most geologically complex areas within the County. Geologic complexity in this area is the result of both glacial-ice thrusting during the Lac LaBiche ice lobe advance and mass-wasting of dead ice during deglaciation. Debris-rich ice (including displaced blocks of bedrock) in the glacially thrust area north and east of Lake Eliza (Tp 56, Rg 8 & 9) was later reworked by local meltwater systems flowing on the surface of the ablating ice mass. The infilling of deep kettles and pits on the stagnant ice surface with glaciofluvial and glaciolacustrine sediment, produced a complex present-day assemblage of hummocky landforms. Subsequent melting and collapse of the underlying supporting ice produced high relief (>25 meter) hummocks composed of varied geologic materials of glaciotectonic and glaciofluvial origins. These hummocks consist of one or more of the following units; clay, silt, sand, gravel, displaced bedrock, and till.

Fluted moraines within the County of St. Paul can exhibit great differences in composition. This is illustrated by the composition of the moraine within glacially streamlined features associated with the Lac LaBiche ice flute field. This fluted moraine extends from the Bunder Upland (Tp 61, Rg 11) in the northwest, to the Dolo Upland (Tp 58, Rg 9) in the central part of the study area. There are significant differences in the composition and texture of the till within the flute field. In the Vincent Lake area (Tp 59, Rg 9), bedrock claystone was plucked by the glacier and molded into flutes. Near the source area of the plucked bedrock, the till is fine textured (clay and heavy clay) (site 1, Figure 7). Down-glacier from the source area, the texture of the till is coarser (clay loam to loam) as the claystone material becomes progressively diluted with sand and silt, (sites 2 to 5, Figure 7). Conversely, at Bentley Lake (approximately 10 kilometers east of Vincent Lake) the till is coarse textured (sandy loam). At this location, the Lac LaBiche ice lobe readvanced over its own outwash sand and gravelly sand. The resulting till reflects the sandier composition of the underlying fluvial sediment (sites 6 to 8, Figure 7). The GOG (Goodridge) soils are developed on this coarser textured till.

Undulating moraine in the region south of Elk Point and along the North Saskatchewan River valley (Tp 56 and 57, Rg 6 and 7) exhibits features characteristic of deposition in a proglacial lacustrine environment. The landscape has a smooth, subdued appearance lacking any of the high relief features characteristic of hummocky dead-ice or ice-thrust moraine. The till in this landscape has a gradational to interbedded contact with coarse textured glaciolacustrine sediment. The origin of this stratified sequence is interpreted to be debris-flow sediment slumping off the glacier and into ice-dammed lakes at the toe of the retreating ice sheet. This depositional environment produced a sequence of sediments characterized by supraglacial mud (till) interbedded with discontinuous lenses of glaciolacustrine sediment. The texture of these lenses ranges from sandy loam to loamy sand (Plate 2). As the ice margin and proglacial lake receded northwards, a thin veneer of similar textured glaciolacustrine material was deposited on the till surface in the lower parts of the landscape. NTV (Northern Valley) soils are developed on this latter sequence of sediments.

Plate 1. Outcrop of coarse textured sediment overlying fine textured lacustrine sediment within a hummocky landscape. Road exposure located NE 25, Tp 56, Rg 5, W4.

Plate 2. Layer of coarse stratified sediment within a medium textured till matrix, in the area south of Elk Point. Borrow-pit exposure located C7, Tp 56, Rg 6, W4.

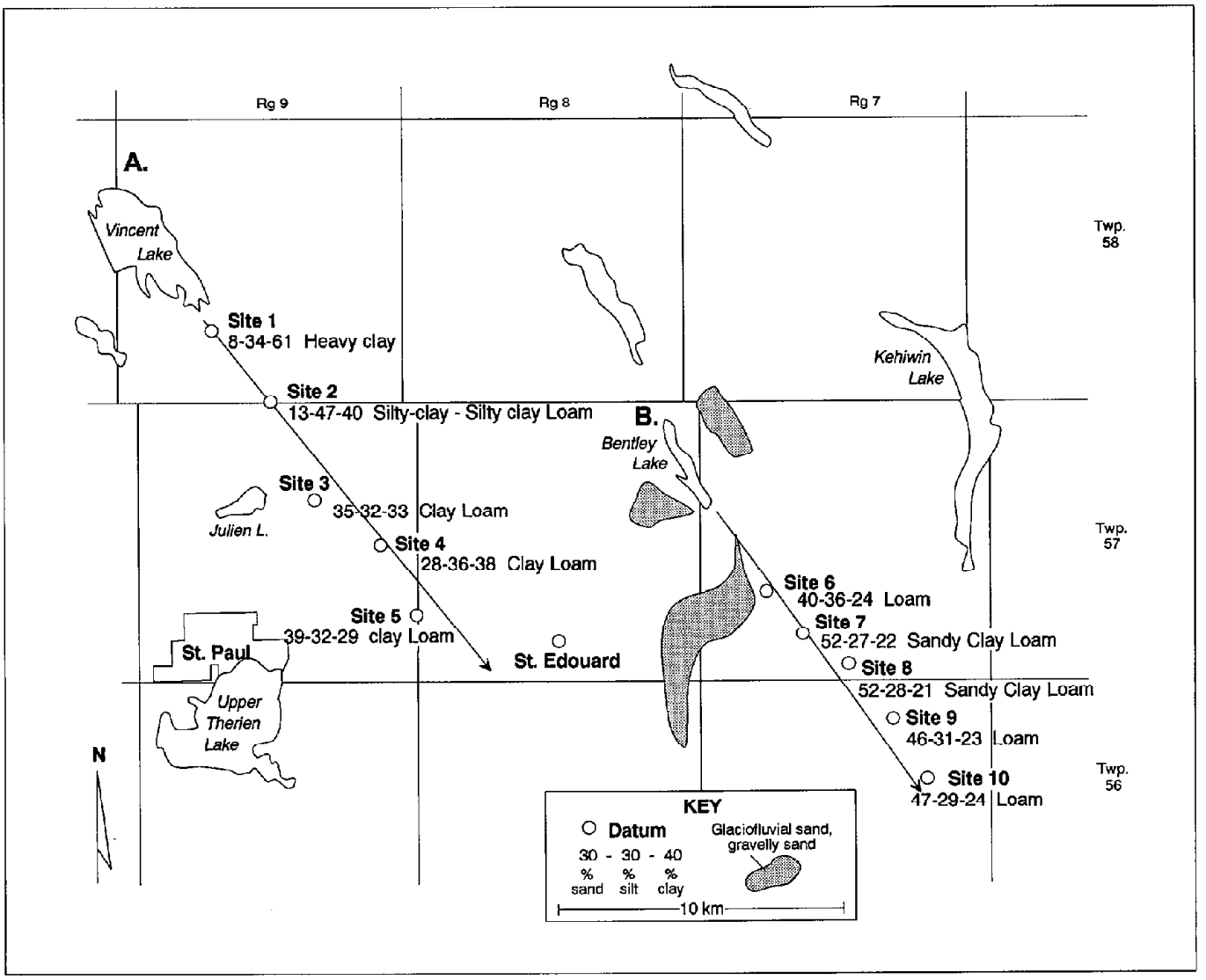


Figure 7. Composition of till within glacial flutes - a reflection of type and distance from source material: i) Transect A - texture of the till ranges from heavy clay (site 1) to clay loam (site 5) as distance from claystone bedrock source (Vincent Lake) increases. ii) Transect B - coarse textured (sl-ls) till reflects incorporation and reworking of glaciofluvial sediment by the overriding glacier.

Chapter 2. Land systems within the County of St. Paul

2.1 Introduction

Land systems provide a general framework for describing the distribution of soils and associated landscape characteristics. These systems are designed to group common natural features that may be applied to land use planning decisions, such as the development of municipal conservation plans. Land systems in the County of St. Paul are modelled after Lacate (1969) and the modified approach used by MacMillan et al. (1988) in the County of Flagstaff. They are defined on the basis of: (i) agroclimatic zone; (ii) dominant surface form and parent material; (iii) soil types and associated common soil series. Sixteen land systems are recognized in the County of St. Paul study area (Figure 8, table 2).

The County of St. Paul occurs within the Eastern Alberta Plains, a region of the Interior Plains of Canada (Bostock 1964). The Eastern Alberta Plains physiographic unit is defined in terms of elevation, which ranges from 450 to 950 meters above sea level. Pettapiece (1986), divided the Eastern Alberta Plains region into a number of physiographic districts on the basis of surficial geology, surface expression, and topography. Five of these districts, the Frog Lake Upland, Myrnam Upland, Whitefish Upland, Whitford Plain, and Elk Point Plain occur within the St. Paul study area.

Due to differences in map scale between the Physiographic Map of Alberta (Pettapiece 1986) and land systems mapped in this study, terms with the same name in both classification systems do not necessarily convey the same concept. For example, landscapes defined as "Plains" on the provincial 1:1 500 000 scale map may contain local, high relief elements that are too small be to mapped, but which can be recognized at the 1:500 000 map scale and be delineated as "Uplands". Consequently, the boundaries of some land systems do not necessarily coincide with the boundaries of Pettapiece's 1986 Physiographic Map because of inherent differences in map scale.

Table 2. Differentiating characteristics of the recognized land systems within the County of St. Paul.

Land System	Agroclimatic Zone	Physiographic District[1]	Surface form & Parent Material(s)	Soil Types	Soil Series
Alma Plain	2-3H	Elk Point Plain	Undulating till & glaciofluvial	Chernozemics & Luvisolics	AGS, UCS, MSW, HLW
Bunder Upland	4H	Whitefish Upland	Hummocky till & organic	Luvisolics & Organics	ABC, GDI, CTW, MNT
Dolo Upland	2-3H	Elk Point Plain	Ridged till	Luvisolics & Chernozemics	UCS, COA, AGS
Gadois Plain	3H	Frog Lake Upland	Hummocky to undulating till	Luvisolics	LCY
Kehiwin Plain	3H	Elk Point Plain	Ridged till	Luvisolics	SDN, LCY
Mann Lake Plain	3H	Whitefish Upland	Hummocky till	Luvisolics	LCY, SDN
Muriel Highland	4H	Frog Lake Upland	Hummocky till & organic	Luvisolics & Organics	ABC, CTW, MNT
Northern Valley Plain	2-3H	Elk Point Plain	Undulating and ridged till & glaciofluvial	Chernozemics & Luvisolics	AGS, UCS, NTV, MSW
Poitras Plain	2-3H	Myrnam Upland	Hummocky glaciofluvial	Chernozemics	TWH, MGS, FTH
St. Edouard Plain	2-3H	Elk Point Plain	Undulating till	Chernozemics & Luvisolics	AGS, UCS, PIB, BOB
St. Paul Plain	2-3H	Whitford Plain	Undulating till	Chernozemics	AGS, BVH
Sugden Plain	3H	Elk Point Plain	Undulating till & organic	Chernozemics, Luvisolics & Organics	SDN, VIL, SBN
Therien Upland	2-3H	Myrnam Upland	Hummocky till & glaciofluvial, lacustrine	Luvisolics & Chernozemics	COA, UCS, MSW, POK
Vilna Plain	3H	Whitefish Upland	Hummocky till	Luvisolics	SDN, LCY
Vincent Upland	3H	Elk Point Plain	Ridged till	Luvisolics	SDN, LCY
Whitney Plain	2-3H	Elk Point Plain	Hummocky glaciofluvial	Brunisolics & Chernozemics	NIT, MGS, MSW

1. from Pettapiece 1986.

2.2 Description of land systems

2.2.1 Alma Plain

The Alma Plain is a low relief, undulating glaciofluvial and morainal plain. This land system lies within the 2-3H agroclimatic zone, and Black Chernozemic and Dark Gray Luvisolic soils dominate the landscape. Most of the area is presently cultivated with clumps of aspen forest vegetation interspersed throughout.

The Alma Plain occurs within the eastern part of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The northern limit of this plain is defined by the southeastern edge of the Gadois Plain, and the climatic line that separates the 2-3H and 3H climatic zones. The eastern margin of this plain is defined by the east boundary of the County of St. Paul. This boundary is also coincidental with a high relief, hummocky moraine. The northwest margin of the Alma Plain is defined by the scarp along the northeast edge of the Whitney Plain. The southwest and south boundary is gradational to the steep, high relief glaciofluvial landforms of the Whitney Plain.

Black Chernozemic and Dark Gray Luvisolic soils developed on medium textured (clay loam) till, and coarse textured (sandy loam to sand) glaciofluvial sediments are dominant within this land system. Common soil series associated with the cultivated areas are AGS (Angus Ridge) (Plate 3), BVH (Beaverhills) and MSW (Mooswa). HLW (Helliwell) and UCS (Uncas) soils occur in minor amounts and are commonly associated with the areas of native vegetation or those which have been recently cleared.

Elevation within this land system ranges from 565 to 610 meters. Most of the area lies within the 585 to 610 metre contour interval. Differences in relief of the individual landforms are generally less than 3 meters, with slopes averaging about 2 to 5%.

Medium textured till is the dominant surficial material within the Plain. Coarse textured (sand and sandy loam) glaciofluvial sediment occurs as a thick blanket along the margins of two glacial meltwater channels, presently occu-

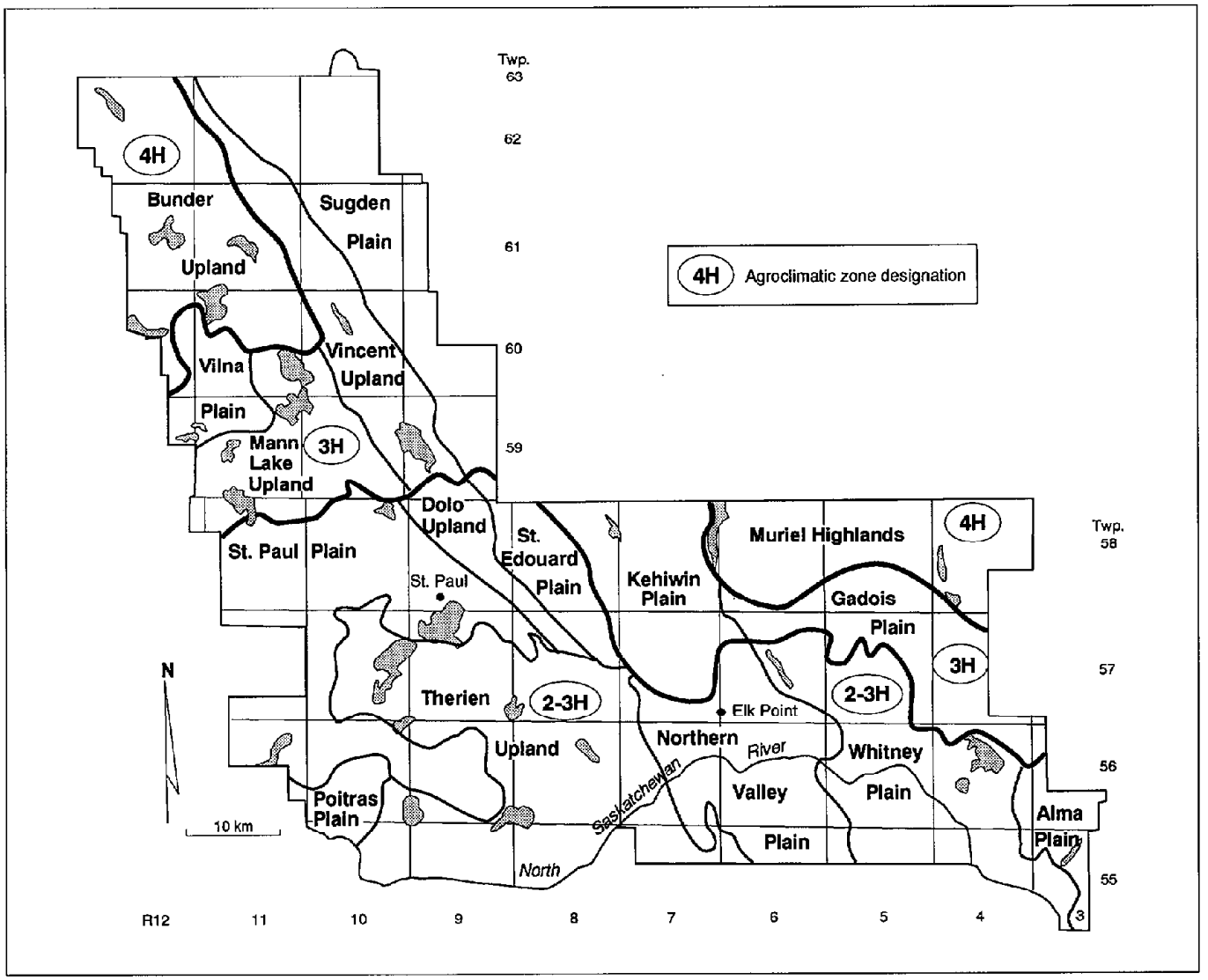


Figure 8. Recognized Land Systems within the County of St. Paul. Agroclimatic zonal boundaries indicated by bold lines.

pied by Frog Creek and Alma Lake. The thickness of the glaciofluvial sediment decreases as the distance from these channels increases.

2.2.2 Bunder Upland

The Bunder Upland, is a high relief hummocky and fluted morainal landscape. The upland lies within the 4H agroclimatic zone and Luvisolic and Organic soils dominate the landscape. Most of the upland is covered with native mixedwood forest vegetation. The minor portion of cleared land is used for the production of forage crops and for grazing.

The Bunder Upland is located in the northwest corner of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The fluted surface forms that are present in the northeast part of the upland are transitional in form and scale with flutes in the neighbouring land system, the Vincent Upland, to the east. The 3H to 4H agroclimatic zone line coincides with this eastern boundary. Knob and hummocky surface forms along the southern boundary of the Bunder Upland form a continuum with the "rubble moraine" complex of the Mann Lake Upland (Andriashek and Fenton 1989). The clayey texture of the parent material within the Bunder Upland is the differentiating characteristic of these two land systems. The 3H to 4H agroclimatic zone line also coincides with this southern boundary. The County border forms the western and northern boundary of the Bunder Upland.

Plate 3. Soil profile of an Eluviated Black developed on till showing a 15 cm thick black coloured surface layer over a lighter coloured layer (Angus Ridge soil series).

Orthic and Dark Gray Luvisols developed on medium and fine textured till are the dominant soils of this upland. ABC (Athabasca) and GDI (Grandin) are the Orthic Gray Luvisols developed on medium and fine textured till, respectively. The distribution of these soils is associated with areas of native mixedwood forest vegetation. GMT (Grosmont) and WST (Winston) are the Dark Gray Luvisol equivalents and are associated with cleared areas. Organic soils developed on fen or forest fen peat, occupy large depressional areas associated with present-day lake margins or recently dried sloughs. CTW (Chatwin) and MNT (Manatokan) are typical soils in these areas. Organic soils developed on bog sphagnum are more abundant in the northeast part of the upland, (Tp 62, Rgs 11 to 12). TCK (Tucker), SBN (Stebbing), and BLA (Birkland) soils are associated with these bog deposits.

The regional elevation within the Bunder Upland ranges from 590 to 715 meters. The local relief of the surface forms ranges from 10 to 20 meters, with 10 to 20% slopes. Some large scale (2-3 km^2 area) knolls are present around Garner Lake (Tp. 60, Rg 12). The difference in elevation between the top and the base is as great as 100 meters.

Medium and fine textured tills are the dominant surficial material of the Bunder Upland. The fine textured variant of till is the product of local reworking of glacially ice-thrusted claystone bedrock. Numerous lakes within this upland, (eg. Garner, Floatingstone, Bunder and Norberg Lakes) occupy large scours and depressions that were glacially excavated by the Lac LaBiche ice-stream as it advanced in a southeast direction. (Andriashek and Fenton 1989).

2.2.3 Dolo Upland

The Dolo Upland is a morainal landscape characterized by high relief, glacially streamlined knobs and ridges (flutes, drumlins). The land system is within the 2-3H agroclimatic zone and Luvisolic and Chernozemic soils dominate the landscape. Most of the Dolo Upland is annually cultivated. Land-use practices are strongly influenced by the linear pattern of streamlined ridges. The ridges are well drained and cultivated whereas the more poorly drained inter-ridge furrows are pasture or wetland areas.

The Dolo Upland occurs in the central part of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The St. Paul Plain and Therien Upland defines the western boundary of this upland. The eastern boundary of the upland is defined by the contact with the lower relief flutes of the St. Edouard Plain. Streamlined landforms of the Dolo Upland are continuous with the fluted features in the Vincent Upland to the northwest. However, the two uplands are separated by the 3H agroclimatic zone line (Figure 8). The southeast boundary of the upland is prominent and defined by Crookedheel

Creek, the northwest branch of the Atimoswe meltwater channel.

Dark Gray Luvisolic soils developed on medium textured till, UCS (Uncas), are the dominant soils in the area. Black Chernozemic soils developed on till, AGS (Angus Ridge), are found in the southern part of the unit. In the northern part Orthic Gray Luvisolic soils, COA (Cooking Lake), are prevalent. Gleysolic soils are common in the furrows at the base of the steeply-ridged flutes.

The Dolo Upland contains high relief (5 to 10 meters) features at the local scale, but the difference in regional elevation of the landscape is comparatively minor, ranging from 640 to 670 meters above sea level. Slopes commonly range from 10 to 15%.

Fluted and drumlinized landforms in the Dolo Upland form a continuum with glacially streamlined landforms that extend from the Town of Lac LaBiche in the northwest, to the City of Lloydminster in the southeast. Medium textured till comprises most of the geologic material within the unit, although fine-textured variations occur within individual streamlined features. An example is the strongly fluted terrain directly southeast of Vincent Lake, illustrated in Figure 7. The fine textured nature of the till in these flutes is a result of glacial erosion and reworking of displaced claystone bedrock, possibly from beneath the depression presently occupied by Vincent Lake. Reworking of this displaced claystone, as it was transported southeastward from the source area, produced till that characteristically is very clayey near the source depression (Figure 7, site 1).

2.2.4 Gadois Plain

The Gadois Plain is a low relief hummocky to undulating morainal plain incised with numerous north-south orientated meltwater channels. The plain lies within the 3H agroclimatic zone and Luvisolic soils dominate the landscape. Land use within this area represents the transition from the predominance of cultivation in the south to improved pastures in the north.

The Gadois Plain occupies the east central part of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The southern boundary of the plain is defined by an edge of a scarp that slopes into the low-lying Whitney Plain. The northern boundary of the Gadois Plain is defined by high relief, hummocky landforms of the Muriel Highlands. The Kehiwin Channel defines the western boundary of the plain, whereas the eastern limit is the County boundary.

Dark Gray Luvisols developed on medium textured till, SDN (Spedden), dominate the cultivated portions of this landscape. Orthic Gray Luvisols on till, LCY (LaCorey), are dominant in the areas that have been recently cleared or under native Aspen forest vegetation. Other significant soil types include MHL (Moosehills), an Orthic Gray Luvisol developed on a veneer of glaciofluvial sand on till. Gleysolic and Organic soils, specifically KSY (Kerensky) and MNT (Manatokan), are present in the poorly drained areas at the base of the Muriel Highland, along the northern edge of the plain.

The regional elevation of the Gadois Plain decreases from west to east, ranging from 685 meters near the Kehiwin Channel, to 640 meters along the eastern border. Hummocky surface features, 5 to 10 meters in relief and with slopes from 5 to 15%, are found in the western part of the plain (Tp 57 Rg 6) and along the southeast border, adjacent to Laurier Lake (Tp 57 Rg 4). Elsewhere, surface features are more subdued. The surface form is undulating, with relief in the range of 2 to 5 meters, and slopes 3 to 9%.

Till is the dominant surficial geologic material of this land system. In the northwest part of the plain, directly south of the Muriel Highland, glaciofluvial sediment occurs as a veneer over till and/or as beds within the till. Elsewhere, glaciofluvial sediments are associated with the numerous meltwater channels. These channels flowed south from the Gadois Plain onto glacial ice that once occupied the lowlands of the Whitney Plain. Presently, these meltwater channels remain as hanging valleys along the scarp that separates these two land systems.

2.2.5 Kehiwin Plain

The Kehiwin Plain is a low to moderate relief morainal plain. The plain lies within the 3H agroclimatic zone and Luvisolic soils dominate the landscape. Most of the plain is cultivated.

The Kehiwin Plain occupies the north-central part of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The western margin of the plain is defined by a meltwater channel, the Atimoswe Channel. The channel also denotes the 2-3H agroclimatic zone from the 3H zone. The eastern boundary of the Kehiwin Plain is similarly defined by a major meltwater channel, the Kehiwin Channel. The southern boundary of the Kehiwin Plain is defined by the integration and subsequent disappearance of well developed flutes, with the subdued surface features of the Northern Valley Plain. The northern limit of the Kehiwin Plain is defined by the County boundary.

Dark Gray and Orthic Gray Luvisolic soils, developed on till are the dominant soils of this land system. SDN (Spedden) and LCY (LaCorey) are the corresponding soil names. Gleyed variants of these two soil types commonly occur in the furrows between the flute ridges. GOG (Goodridge), an Orthic Gray Luvisol developed on coarse-textured (sandy loam) till, is a significant soil in the northern part of the unit where the till appears to have been derived from glacially thrust and reworked glaciofluvial sediment. Brunisolic and Chernozemic soils developed on coarse textured glaciofluvial material, NIT (Nicot), RDW (Redwater), and MSW (Mooswa), commonly occur in minor amounts.

Regional elevations of the land system range from 700 meters in the central part of the Kehiwin Plain, to 640 meters, along the flanks of the Atimoswe and Kehiwin channels. The average local relief of the flutes range from 1 to 2 meters, and associated slopes are in the range of 2 to 5%. To the west, flutes are better defined, ranging from

2 to 5 meters in relief, and slopes from 3 to 9%. Associated with the flanks of the Atimoswe and Kehiwin channels are long inclined slopes that range from 5 to 10%. High relief, (5 to 10 meters) hummocky ice-contact glaciofluvial landforms are located along the eastern flank of the Atimoswe Channel in Tp 58, Rg 8. Slopes range from 10 to 15% in this terrain.

Till within the Kehiwin Plain is dominantly medium textured (loam to clay loam), although along the western edge of the Plain the texture is coarser (sandy clay loam to sandy loam). The coarse texture of the till in this area results from glacial over-riding and incorporation of pre-existing glaciofluvial sediment. Evidence that supports this interpretation is in the area southeast of Bentley Lake (Tp 58, Rg 8). At this location the Lac LaBiche ice-lobe advanced over previously deposited meltwater sediment along the eastern margin of the Atimoswe Channel. This thrusted and eroded sediment was subsequently reworked and molded into large flutes directly down-ice of the source area.

Hummocky ridges, oriented orthogonal to the flutes, are found sporadically throughout the land system. These ridges are interpreted to be crevasse fillings that were draped on the surface of the flutes during the final stages of deglaciation. They are generally composed of sandy clay loam till, and/or interbedded till and poorly sorted sandy fluvial sediment.

Varied thicknesses of glaciofluvial sediment, consisting mainly of loamy sand or sand, occur as discontinuous deposits along the flanks of both the Atimoswe and Kehiwin Channels (Figure 6). The hummocky to drumlinoid topography of the fluvial sediment along the east flank of the Atimoswe Channel in Tp 58, Rgs 7-8, indicates ice-contact sediment that likely was overridden and disturbed by glacial overriding.

2.2.6 Mann Lake Upland

The Mann Lake Upland is a high relief, hummocky to knobby morainal upland. This upland lies within the 3H agroclimatic zone and Luvisolic soils dominate the landscape. Cultivated areas are randomly interspersed among extensive areas of native mixed forest vegetation.

The Mann Lake Upland is located in the west central part of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. High relief hummocks of the Mann Lake Upland are transitional with: the hummocks and knobs associated with the northern part of the St. Paul Plain to the south; and hummocks in the eastern part of the Vilna Plain, directly west. Along the eastern edge of this Mann Lake Upland hummocky landforms become more elongated and form a transitional boundary with the streamlined landforms of the Vincent Upland. Similarly elongated landforms along the northern edge of the Mann Lake Upland have a continuum with streamlined features in the Bunder Upland. However, glacially streamlined features are more prevalent within the Bunder Upland, and their composition is finer textured. The 3H to 4H agroclimatic zone line also coincides with the boundary between these two land systems.

Orthic and Dark Gray Luvisols developed on medium textured till are the dominant soils of this land system. LCY (LaCorey) and SDN (Spedden) are the respective soil series. Gleysolic (KSY, Kerensky) and Organic (MNT, Manatokan) soils are common in association with the poorly drained, depressional areas within the landscape.

The regional elevation within the Mann Lake Upland ranges from approximately 660 meters in the hummocky areas, to 620 meters in areas adjacent to Mann Lakes. High relief (10 to 15 meter) hummocks are characteristic of the Mann Lake Upland. Slopes generally range from 5 to 15%. Significant areas of lower relief terrain (2 to 4 meter relief, and 2 to 5% slopes) are found scattered throughout the land system, particularly in the east central part of Tp 59, Rg 11 extending east into Tp 59, Rg 10.

Hummocky and knobby surface forms of this upland have been referred to as a "rubble moraine" by Andriashek and Fenton (1983). Such a moraine is interpreted to be the result of the combined effects of glacial ice-thrust and stagnant-ice collapse processes (Plate 4). Therefore, the medium textured till, which is the dominant surficial material of this upland, exhibits some variability in texture as a result of inclusions of glacially ice-thrust and displaced pre-existing sediments (Plate 5). For example, individual hummocks north of Owlseye Lake (Tp 59, Rg 11) contain thick deposits of glaciofluvial sand and gravel.

2.2.7 Muriel Highland

The Muriel Highland is a high relief, ice-thrust and compositional morainal upland. This highland lies within the 4H agroclimatic zone and Luvisolic and Organic soils dominate the landscape. Most of the land system is covered with native mixedwood forest, however some areas have been cleared for the grazing of cattle.

The Muriel Highland, locally referred to as the Moose Hills in the County of St. Paul, is a major regional landmark in the north-east corner of the study area (Figure 8). Several factors distinguish this landscape from the neighbouring areas. The southern boundary of this highland is defined by wet, organic areas which are present at the base of these hills. The 3H to 4H agroclimatic zone line also coincides with this land system boundary. The western edge of the Muriel Highland is defined by the Kehiwin Channel. The northern and eastern margins of the Muriel Highland are defined by the County geographic boundary.

Orthic Gray Luvisols developed on medium textured till (ABC, Athabasca) are the dominant soils within this land system. Organic soils, CTW (Chatwin) and MNT (Manatokan), developed on fen or forest fen peat deposits are common randomly throughout the area as well as along the southern border of this highland. In Tp 58, Rgs 4 and 5, within the Muriel Highlands, Orthic Gray Luvisols developed on a sandy glaciofluvial veneer over till, MHL (Moosehills) are common.

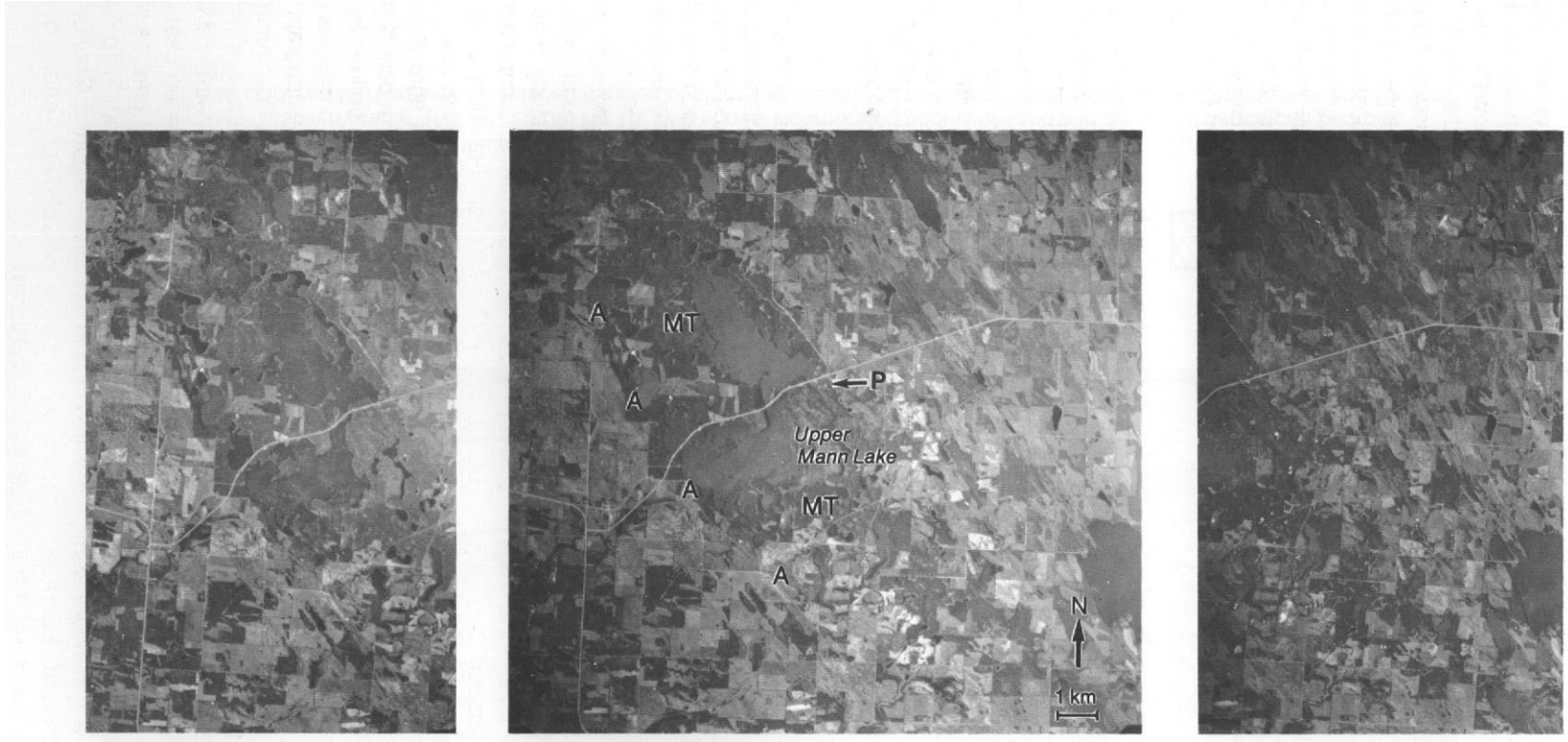


Plate 4. Stereo aerial photographs showing glacially thrust landforms (label MT) and stagnant-ice hummocks in the "rubble moraine" complex near Mann Lakes. The alignment of "A" symbols denotes the southwest edge of the thrusted terrain. Arrow "P" marks the location of the exposure illustrated in Plate 5, which shows the variability in the composition of the "rubble moraine" (modified from Plate 16c, p.127, Andriashek and Fenton 1989).

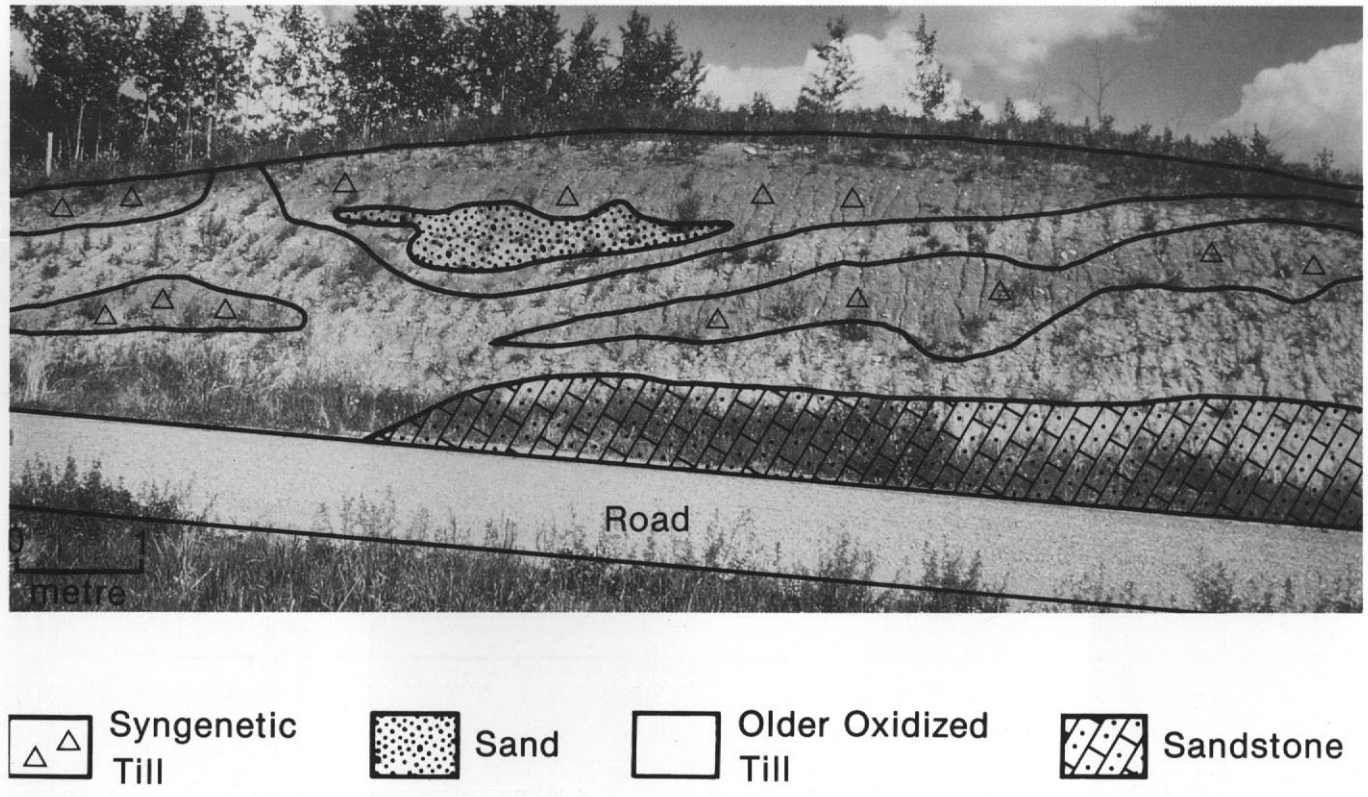


Plate 5. Variability of parent material in the Mann Lakes Upland as a result of glacial thrusting and displacement. Roadcut through "rubble moraine" (NE 24, Tp 59, Rg 10, W4) shows incorporated bodies of sand and displaced sandstone bedrock. Lighter coloured till represents displaced masses of older, pre-existing till (modified from Plate 6b, p.95, Andriashek and Fenton, 1989).

The regional elevation within the Muriel Highlands ranges from 800 meters in the west, to 640 meters in the south and east. The local relief of surface features also differs from west to east. For example, the southwestern part of the highland is characterized by curvilinear thrust ridges, which range from 10 to 30 meters in relief, with slopes that commonly exceed 15%. The eastern part of the highland is characterized by low relief hummocks (1 to 3 meters high and with slopes less than 5%).

Medium textured till is the dominant surficial material. The Muriel Lake Channel (Andriashek and Fenton 1989), an abandoned meltwater channel which presently is occupied by Garner and Bluet Lakes, separates high relief, thrust ridges in the west part of the unit, from low relief, doughnut-like hummocks in the east. Geologic material within the thrust and end-moraine ridges in the west part of the highland is interpreted to be, in part, glacial ice-thrust sediment derived from the source depression presently occupied by Muriel Lake. This lake lies directly north of this highland. The composition of the moraine is inferred to be older tills that were deposited in past glaciations, and glacially displaced mudstone of the Lea Park Formation (Andriashek and Fenton 1989).

Low relief hummocks in the eastern part of the highland are a portion of the prominent northwest-southeast trending morainal ridge that parallels the eastern margin of the Garner and Bluet Lakes. This ridge is interpreted to be a segment of an end moraine, along which glacial meltwater eroded the Muriel Lake Channel.

Drainage of surface waters within the Muriel Highland is not well integrated. Numerous, poorly drained depressions are nested between the thrust morainal ridges in the west part of the highland. Similarly closed depressions associated the 'doughnut' hummocks in the eastern part readily collect and store surface runoff. Ultimately, drainage is directed toward the Kehiwin Channel along the western margin of the highland, and in the Muriel Lake Channel into the eastern part of the land system.

2.2.8 Northern Valley Plain

The Northern Valley Plain is a low relief undulating, glacially streamlined moraine consisting of till and glaciofluvial materials. This plain lies within the 2-3H agroclimatic zone and Black Chernozemic and Dark Gray Luvisolic soils dominate the landscape. Most of the Northern Valley Plain is annually cultivated.

This plain is incised by the present-day North Saskatchewan River (Figure 8). Several factors distinguish this landscape from the neighbouring areas. The eastern margin of the plain is defined by the Kehiwin Channel. The southern margin of the plain is defined by the County border line. The western margin is defined by high relief morainal landforms of the Therien Upland. The northern boundary of the Northern Valley Plain is defined by more prominent glacially fluted landforms within the Kehiwin Plain. This northern boundary also coincides with the 3H agroclimatic zonal line.

AGS (Angus Ridge) and UCS (Uncas) soils dominate the upper slope positions of the landscape. Soils that are developed on a veneer or a blanket of glaciofluvial sandy loam to sandy gravel overlying till are associated with the lower slope positions. This includes the following soil series: NTV (Northern Valley), MSW (Mooswa), MGS (Morningside), FTH (Ferintosh) and GBL (Gabriel). Other significant soils include Humic Regosolics, mainly GRZ (Gratz), and Black Chernozemics, mainly POK (Ponoka). These soils are developed on medium textured fluvial sediment within the lower terraces of the present-day North Saskatchewan River.

The average elevation within the Northern Valley Plain ranges from about 685 meters in the southwest to about 595 meters near Elk Point, with the lowest value at 530 meters along the river-bottom land. Individual features generally have low relief, ranging from 2 to 4 meters, with slopes ranging from 2 to 5%.

Glaciofluvial processes have influenced the deposition of the moraine, and syngenetic beds of sandy loam to loamy sand are common either as a veneer, or within the till throughout much of the area (Plate 2). The southern part of the Northern Valley Plain is characterized by broadly undulating, glacially streamlined, fluted landforms which have a preferred northwest-southeast orientation. The flutes have a generally subdued appearance, mainly because they are draped by a veneer of loamy sand to sandy loam textured glaciofluvial sediment. The part of the Plain that lies north of the North Saskatchewan River, is dominated by glaciofluvial landforms. Discontinuous deposits of gravel, sand, coarse and medium textured sediment occur along the flanks of the Atimoswe and Kehiwin meltwater channels, as well as the North Saskatchewan River. These deposits were laid down during the final stages of deglaciation within the area. The outwash deposits along the eastern edge of the system are mined for aggregate (Tp 57, Rg 6, to Tp 56, Rg 6, and southwest of Elk Point in Tp 56, Rg 7).

2.2.9 Poitras Plain

The Poitras Plain is a moderate relief hummocky outwash plain consisting of dominantly glaciofluvial materials. This plain lies within the 2-3H agroclimatic zone and Dark Gray and Black Chernozemic soils dominate the landscape. Most of the area has been cleared of native vegetation and is now improved pasture for grazing, primarily within the St. Paul Grazing Reserve.

The Poitras Plain is located in the southwest corner of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The plain is bounded by the North Saskatchewan River to the south, the Therien Upland to the east, and the St. Paul Plain to the north. The County boundary provides the imposed western limit of the plain.

Dark Gray and Black Chernozemic soils developed primarily on bouldery to gravelly, medium to coarse textured glaciofluvial sediment are the dominant soils in the area. TWH (Two Hills), MGS (Morningside) and FTH (Fer-

intosh) are the common soil names. Luvisolic soils developed on medium textured till occur in the southwest corner of the plain. COA (Cooking Lake) and UCS (Uncas) soil names are associated with this area.

The elevation within the Poitras Plain ranges from about 695 meters in the southwest to about 650 meters in the northeast corner of the plain. The lowest elevation is about 540 meters, above the valley bottom of North Saskatchewan River. Individual features in the unit have moderate relief, ranging from 3 to 6 meters in height, with slopes from 5 to 10%.

Hummocks within the Poitras Plain are composed mainly of bouldery and gravelly, medium to coarse textured glaciofluvial sediment (Figure 6). This landform resulted from the deposition of glaciofluvial sediment in contact with, or on top of, stagnant glacial ice which once filled a large, pre-existing river meander in the southern half of Tp 56, Rg 10.

2.2.10 St. Edouard Plain

The St. Edouard Plain (Figure 8) is a morainal landscape characterized by undulating, very low relief glacial streamlined features draped by sparsely populated stagnant-ice crevasse fillings (Andriashek and Fenton 1989). The plain lies within the 2-3H agroclimatic zone, and Chernozemic and Luvisolic soils dominate the landscape. Almost the entire plain is annually cultivated.

The St. Edouard Plain occurs in the central portion of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The western extent of the plain is defined by a distinct topographic contact with the Dolo Upland. The 3H agroclimatic line defines the northern boundary of the unit, although land features are similar in both relief and form to those in the Kehiwin Plain to the north and east. The valley associated with Atimoswe Creek defines the south and east boundary of the St. Edouard Plain with the Kehiwin Plain to the east.

A significant amount of imperfectly drained Chernozemic and Luvisolic soils characterize the St. Edouard Plain. An accumulation of water occurs on the surface of this plain due to poor development of a natural drainage network on this low relief landscape. Black Chernozemic and Dark Gray Luvisolic soils developed on medium textured till, mainly AGS (Angus Ridge) and UCS (Uncas), are the dominant soils in the well drained areas. Their gleyed counterparts, PIB (Pibroch) and BOB (Boscombe) form the dominant soils in the lower, more poorly drained parts of the landscape. Lesser amounts of Rego Humic Gleysols, mainly KSY (Kerensky), are developed on fine-textured lake sediment associated with sloughs.

Local surface forms in the St. Edouard Plain have low relief (1 to 3 meters) with slopes ranging from 1-5%. Moderate relief hummocks (3 to 5 meters) occur sporadically throughout the land system. The regional surface of the plain has a northeast aspect, with elevations ranging from 685 meters in the southwest, to 650 meters along the western flank of the Atimoswe Creek, in the northeast. The lowest elevation within the plain is approximately 600 meters at the bottom of Atimoswe Creek.

Till within the St. Edouard Plain was deposited by the Lac LaBiche lobe which advanced from the northwest. Consequently, glacially streamlined features on the surface of the plain have a northwest-southeast orientation. The lower relief and more subdued nature of the flutes in the St. Edouard Plain, compared to those in the neighboring Dolo Upland, is attributed to less glacial-ice thrusting and hence less incorporation of underlying bedrock material. Subsequent stagnation and melting of this relatively debris-free ice released minor amounts of englacial sediment. Debris that was present in the ice, was subsequently concentrated within crevasses in the glacier surface. As a result, the expression of the underlying flutes were preserved, with the exception of some areas where crevasse fillings, composed of till and poorly sorted fluvial sediment, were draped on the surface of the underlying flutes.

2.2.11 St. Paul Plain

The St. Paul Plain is a level to undulating morainal plain. This plain lies within the 2-3H agroclimatic zone and Black Chernozemic soils dominate the landscape. Most of the plain is annually cultivated.

The St. Paul Plain occurs in the western portion of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The plain is bounded by the County boundary in the west, the Poitras Plain in the southwest, and the Mann Lake, Dolo, and Therien uplands to the north and east. High relief landforms (5 to 10 meters high, with slopes from 10 to 15%) are found along all fringe areas of this plain. For example, the hummocks along the southeast boundary grade into high relief flutes of the Dolo Upland. Similarly, moderate relief morainal ridges to the north and west of the town of St. Paul, and along the northern boundary, are gradational in form and relief with hummocky landforms in the Mann Lake Upland.

Black Chernozemic soils developed on medium textured till, mainly AGS (Angus Ridge) and BVH (Beaverhills), are dominant. Dark Gray Luvisolic soils developed on till, UCS (Uncas), are present in the northern part of the plain. Gleyed soils such as PIB (Pibroch), a Gleyed Black Chernozemic soil developed on till, and Gleysolic soils are common with the level areas around the town of St. Paul. The presence of HYL (Hairy Hill), a moderately saline and calcareous Gleysolic soil, in Tp 58, Rg 10, is indicative of groundwater discharge within the western part of the plain.

The St. Paul Plain dips gently to the southwest. Elevations range from 685 meters in the area north of Lac Bellevue, to 625 meters, in the area north and east of Saddle Lake. Landforms typically range from 1 to 3 meters in relief, with slopes between 2 to 5%.

Medium textured till is the dominant surface material on the plain. Coarse textured ice-contact glaciofluvial sediments occur in minor amounts. These sandier materials

are found within moderate relief hummocks that are scattered throughout the land system, particularly in: the morainal ridges west of St. Paul; near Owlseye Lake to the north; and, north of Lac Bellevue in the southern part of the area (Figure 6).

2.2.12 Sugden Plain

The Sugden Plain is a low relief morainal plain. This plain lies within the 3H agroclimatic zone and Chernozemic and Luvisolic soils dominate the landscape. Organic soils occur in significant amounts within the northern part of this land system. Most of the plain is cultivated.

The Sugden Plain occurs in the north west corner of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The south and west boundaries of the plain are defined by high-relief flutes of the neighboring Vincent Upland. The northern and eastern boundaries are defined by the County borders.

Dark Gray Luvisols and Gleyed Black Chernozemic soils developed on medium textured till are the dominant soils within the southern two-thirds of the land system. SDN (Spedden) and VIL (Vilna) are the respective soil names. LCY (LaCorey) soils, an Orthic Gray Luvisols developed on till, are associated with areas of native vegetation, usually in combination with areas of steep topography. Extensive deposits of Typic and Terric Fibrisols, SBN (Stebbing) and BLA (Birkland) respectively, are present within the organic deposits in the northern part of this plain. Some of these soils are currently being mined for peat moss (Plates 6 & 7).

The regional elevation within this land system ranges from 640 to 610 meters. The majority of the plain consists of level to undulating surface forms and the relief ranges from 0.5 to 1 metre with slopes ranging from 1 to 3%. Ridged and rolling landforms of higher relief (2 to 4 meters) and steeper slopes (5 to 9%) are present in the northern parts of this land system.

Medium textured till is the dominant surficial material of the Sugden Plain. Various active- and stagnant-ice processes have occurred to produce the present surface features of this plain. For example, in the St. Lina area (Tp.61, Rg 10), low relief till hummocks are superimposed upon the shallow flutes. This association of features indicates that stagnant-ice processes deposited material on top of morainal flutes which formed at the base of the actively flowing Lac LaBiche ice lobe. During deglaciation, periglacial features such as sand-filled, ice-wedge casts developed within the surface of this moraine.

In the northern parts of the plain, fine textured (clay) glacial and recent lacustrine sediment are found within shallow depressional areas of the landscape. Eutrophication and infilling of these depressions has occurred since deglaciation, and deep (greater than 1 metre thick) organic deposits (fens and bogs) are the present-day product.

2.2.13 Therien Upland

The Therien Upland is a morainal upland characterized by high relief hummocks consisting of till, glaciofluvial and lacustrine materials. This upland lies within the 2-3H agroclimatic zone and Luvisolic and Black Chernozemic soils dominate the landscape. Land use within the area is variable. Annual cultivation is extensive in the northwest portion and along the southern and eastern fringes of the upland. The remainder of the system consists of domains of improved pasture and extensive areas of native forest vegetation, where grazing is the dominant land use.

The Therien Upland occurs within the south-central part of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The southern boundary of the upland is defined by the North Saskatchewan River. The west and northwest boundary has an abrupt contact with undulating surface forms associated with the St. Paul Plain. Similarly along the eastern part of the upland, high relief landforms have an abrupt contact with low-relief surface features of the Kehiwin and Northern Valley plains.

Luvisolic and Chernozemic soils are the dominant soil types present within this land system. Orthic and Dark Gray Luvisolics developed on medium textured till are associated with areas of native Aspen forest vegetation.

Plate 6. Native vegetative cover associated with organic areas.

Plate 7. Drained and cleared organic deposit prepared for the extraction of peat moss.

Black Chernozemics are found under open grassland vegetation and in cultivated fields. COA (Cooking Lake), UCS (Uncas), and AGS (Angus Ridge) are the common soil series mapped in these respective areas. In the central and southern part of the Therien Upland, fluvial and lacustrine sediments are interspersed with till. Chernozemic soils developed on these materials include the POK (Ponoka), FWT (Fawcett) and MSW (Mooswa) soil series.

The regional elevation within the Therien Upland ranges from about 685 meters in the central and northeast part of the unit to about 580 meters in the south. The lowest elevation is at 535 meters along the North Saskatchewan River. Landforms within the upland characteristically range from 5 to 15 m in relief, with slopes commonly from 10-15%.

The Therien Upland (Figure 8) is a geologically complex morainal landscape characterized by high relief hummocks and knobs. This land system is a product of the combined effects of glacial ice-thrust and stagnant ice-collapse processes. Large-scale collapse hummocks and high relief, ridged-to-terraced fluvial erosional remnants along the northern flank of the North Saskatchewan River (Tps 55-56, Rgs 8-9), are evidence of glacial meltwater flowing in contact with, or on the surface of, a stagnant-ice mass. Fine to coarse textured fluvial and lacustrine sediment were deposited by meltwater ponding on the ice surface as well as by the early North Saskatchewan River flowing along the stagnant-ice margin (Figure 6, units 5,6,&7). Meltwater flowing in one such ice-walled channel deposited a thick (>30 m) sequence of sand and gravel presently being quarried in the central part of Tp 56, Rg 7 (Edwards et al. 1985, pg. 28) (Plate 8).

Medium-textured till is the dominant surficial material found in the remainder of Therien Upland. However, inclusions of coarser and finer textured sediment are common. For example, beds of sand and gravel are found within the till in the northern part of the system, near the Therien Lakes (Plate 9). Glacial thrusting, associated with the southeast trending Lac LaBiche ice stream, formed the large tear fault and scarp located in the area north and east of Stony Lake (Figure 5, NE corner Tp 56, Rg 8, SE corner Tp 57, Rg 8). The fault extended to the underlying bedrock and large, intact blocks of Belly River sandstone and shale were glacially plucked and displaced southeast of the scarp (Plate 10). These masses of transported bedrock were subsequently molded and streamlined by the ice, forming hummocky to drumlinized morainal landforms in the southeast corner of the upland.

Plate 9. Bodies of sand and gravel incorporated within hummocky till. Groundwater discharge from these sand bodies causes problems for road construction due to slope instability (slump in foreground).

2.2.14 Vilna Plain

The Vilna Plain is a morainal landscape, consisting of approximately equal proportions of a low relief, undulating surface form and high relief, hummocky to rolling landforms. This plain lies within the 3H agroclimatic zone and Luvisolic soils dominate the landscape. Most of the plain is cultivated, with approximately 30% remaining as native mixed forest vegetation.

The Vilna Plain is located in the west central part of the County (Figure 8) and several factors distinguish this land-

Plate 8. Sand pit exposure in hummocky terrain (Tp 56, Rg 7, W4) – an example of glaciofluvial sediment deposited in contact with stagnant ice.

Plate 10. Exposure of glacially thrust and displaced Belly River sandstone mantled with till. Contorted bedding within the bedrock block is evidence of deformation by glacial action.

scape from neighbouring areas. The term "plain" is somewhat of a misnomer in that the land system contains landforms which are transitional with both high relief hummocks, found in the Bunder and Mann Lake uplands to the north, east, and south; as well as the low relief, undulating surface forms which lie to the west.

Dark Gray and Orthic Gray Luvisols developed on medium textured till are the dominant soils of this plain. SDN (Spedden) soils, Dark Gray Luvisols are associated with portions of the plain that are cultivated. LCY (LaCorey) soils, Orthic Gray Luvisols, occur under native aspen forest vegetation.

Differences in the regional elevation within the Vilna Plain are relatively small, ranging from about 650 to 610 meters. Local relief of the hummocky surface forms associated with this plain range from 5 to 15 meters, and slopes range from 10 to 15%. Relief of features in the undulating part of the plain ranges from 2 to 5 meters, with slopes from 2 to 5%.

Medium textured till is the dominant surficial material of this land system. An exception is the hummocky "rubble moraine" (Andriashek and Fenton 1989) complex found in the central part of the plain. This rubble moraine consists of blocks of glacially displaced sediment derived from Garner Lake thrust-source area to the northwest. These displaced thrust blocks were deposited as isolated features within this undulating till plain, by slow moving ice associated with the edge of the advancing Lac LaBiche ice lobe. The displaced blocks were not subjected to the same intense glacial shearing and streamlining processes that produced the high relief fluted features in the Vincent and Dolo uplands to the east. Consequently, the thrust remnants have retained a hummocky to rolling form, more akin to features produced by stagnant-ice collapse processes.

2.2.15 Vincent Upland

The Vincent Upland is a morainal landscape characterized by moderate to high relief, glacially streamlined features (flutes, drumlins, drumlinoids) (Plate 11). This upland lies within the 3H agroclimatic zone and Luvisolic and Organic soils dominate this land system. Approximately two-thirds of the area is cultivated, the remainder is uncleared and covered with mixed forest vegetation.

The Vincent Upland is located in the northern part of the County (Figure 8) and several factors distinguish this landscape from neighbouring areas. The level-surfaced Sugden Plain lies to the east whereas the knob and kettle features of the Bunder and Mann Lake uplands are the distinguishing landscape features of the systems to the west. The southern boundary of the Vincent Upland is defined by the 2-3H and 3H agroclimatic zone line.

Luvisolic soils developed on medium textured till are the dominant soils of this upland. The distribution of Dark Gray SDN (Spedden) and Orthic Gray Luvisolic LCY (LaCorey) soils is related to land use. The Dark Grays are associated with cultivated areas whereas the Orthic Grays are found under native vegetation. Organic soils are present in significant amounts within the northern half of the land system. These soils are developed on fen peat and forest fen peat deposits. CTW (Chatwin) and MNT (Manatokan) are the common soil series names.

The regional difference in elevation within the Vincent Upland is about 40 meters. Vincent Lake in the southern part of the area is at 680 meters. The lowest areas are along the shorelines of the lakes in the central portion of the area which are at 640 meters. Local relief of the landforms within the Vincent Upland range from 5 to 15 meters with slopes from 5 to 15%. The flutes are highest (up to 15 meters) and steepest (>15%) along the southwestern edge of area, near Vincent Lake. The size and scale of the landforms decrease toward the eastern boundary, where the relief ranges from 5 to 10 meters and slopes are between 5 to 10%.

Medium textured till is the dominant surficial material of this upland. The till was molded into fluted surface forms by the same glacial ice thrust and streamlining processes that produced streamlined features within the Dolo Upland to the south. Till within the southwest portion of the upland, contains inclusions of fine textured (clay) material. These inclusions are the product glacial ice thrusting, where chunks of claystone bedrock were plucked from the the underlying bedrock and incorporated within the till matrix.

2.2.16 Whitney Plain

The Whitney Plain is a moderate relief, hummocky glaciofluvial plain. This plain lies within the 2-3H agroclimatic zone and Brunisolic and Chernozemic soils dominate the landscape. Land use within this land system is diverse, ranging from cropland and grazing to recreational development. The dominantly sandy areas are commonly used as grazing land, though one large area of native vegetation, including Jackpine and Aspen, has been allocated for recreational use – Whitney Lakes Provincial Park.

The present-day North Saskatchewan River separates the Whitney Plain into two parts (Figure 8). Several factors distinguish this landscape from the neighbouring areas. The northern boundary of this land system is defined by a prominent south-facing scarp, which corresponds to the southern edge of the Gadois Plain (Plate 12). The 3H agroclimatic zonal line is also associated with this scarp feature. The western boundary is defined by the Kehiwin meltwater channel. That part of the Whitney Plain which lies south of the North Saskatchewan River, exhibits lower relief, more undulating landforms. The southern boundary is defined by the County border line.

The distribution of Brunisolic and Chernozemic soils within the Whitney Plain is related to parent materials and land use practices. Eutric Brunisolic soils are confined to the coarse textured glaciofluvial materials. Black Chernozemic soils are developed on coarse to medium textured glaciofluviolacustrine sediment, and medium textured till. NIT (Nicot) is common in the native forest and grassland vegetated areas. MSW (Mooswa), MGS (Morn-

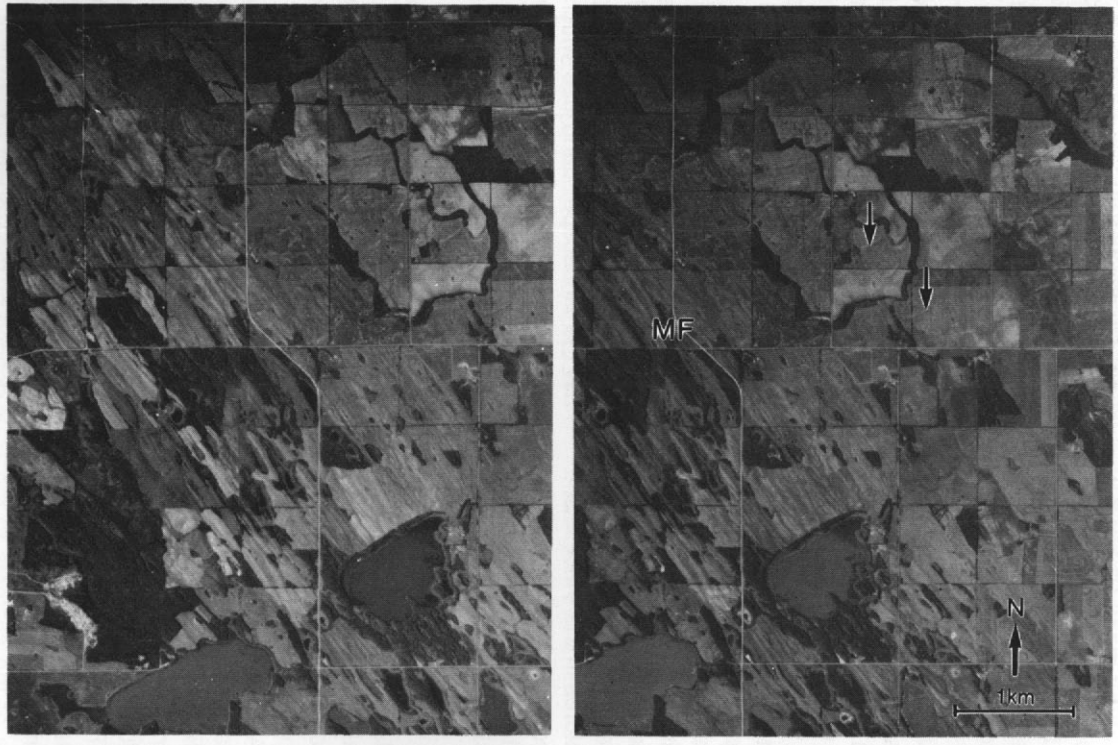


Plate 11. Stereo aerial photographs showing high-relief fluted landforms (label MF) in the Vincent Upland (Tp 58, Rg 9, W4). South pointing arrows denote crevasse fillings draped on the surface of flutes during deglaciation. The boundary separating the Vincent Upland from the Sugden Plain is shown in the northeast corner (modified from Plate 9, p.116, Andriashek and Fenton, 1989).

ingside), AGS (Angus Ridge), BVH (Beaverhills), NTV (Northern Valley), and POK (Ponoka) are the common soil series associated with the cultivated areas.

Regional relief within this land system is significant. Elevations range from 640 meters along the northwestern boundary to 565 m in the bottom lands near Mitchell Lake (Tp.57, Rge 5). Individual landform features within the land system consist of hummocks ranging from 3 to 6 meters in height, with slopes from 5 to 10%.

Landforms within the northern part of the plain consist of low to high relief hummocks. Low relief hummocks are composed of a complex of glaciofluvial and glaciolacustrine materials, are associated with the northern flank of the North Saskatchewan River. These landforms are the product of an ice-contact fluvial environment characterized by localized ponding and rapidly fluctuating channel development within a decaying ice mass. High relief hummocks are the result of both erosional and depositional processes. They were created by large volumes of glacial meltwater, from numerous sources in the region. Water from the Kehiwin meltwater channel to the northwest; the early stages of the North Saskatchewan River to the west; and numerous small supraglacial meltwater channels, flowing south off a glacier ice margin situated to the north of this land system all contributed to the deposition of glaciofluvial in the northern half of the Whitney Plain.

Glaciofluvial landforms in the southern part of the Whitney Plain, south of the North Saskatchewan River, were formed in an unconfined, ice-free environment, and these are subdued and undulating. The southwest margin of this plain is defined by an ice-contact meltwater channel, interpreted to be the southern extension of an early stage of the

Plate 12. The break in cultivation at the base of the distant scarp marks the northern extent of the Whitney Plain. The upper slope of the scarp defines the southern edge of the Gadois Plain (approximately 50-80 meters higher in elevation).

Kehiwin meltwater channel. The sediment deposited in association with this channel is generally sand to loamy sand in texture. Following deposition, these fluvial deposits were subsequently reworked by wind, forming aeolian dunes in the southern part of the plain.

Since deglaciation, recent alluvial, lacustrine, and organic deposits have partially infilled the bottom of the Kehiwin Channel. In the area between Simmo Lake and the settlement of Lindbergh, (Tp 56-57, Rg 5), thick (>1 m), economically viable marl deposits have accumulated in association with the alluvium (Macdonald 1982).

Chapter 3. Interpretations

The first two sections of this chapter describe the process of rating soil map units for two agricultural interpretations, land capability for arable agriculture and land capability for range productivity. The last section details some engineering parameters of selected soil parent materials.

The generalized ratings or capability classes listed in Appendix D and summarized on the interpretation maps, are intended as guidelines for land use planners and regional managers. Interpreting soil map units requires making general assumptions about the characteristics of landscapes. To rate specific quarter sections, on-site examinations are necessary to determine the specific landscape characteristics unique of the area. For example, the distribution of soil types, topographic irregularities and number of sloughs, are factors that can affect the agricultural interpretative rating with respect to the quarter section. Therefore, ratings for specific areas may differ from the generic soil map unit interpretive ratings (Appendix D). Interpretative ratings for individual parcels of land may be determined using background information provided in this section, in conjunction with the guidelines outlined in the suggested references.

Similarly, the engineering section of this chapter provides data for estimating the mechanical properties of the dominant soil parent materials present in the County. These values should be considered as guideline, subjective estimates. Site specific interpretations requires site specific data.

3.1 Land Capability Classification for Arable Agriculture

The agricultural capability for soil map units in the County of St. Paul was determined using the Land Capability Classification for Arable Agriculture in Alberta – 1987 manual (Alberta Soil Advisory Committee (ASAC) 1987). This system replaces the Canada Land Inventory (CLI): Soil Capability for Agriculture (Environment Canada 1972, Brocke 1977). The following assumptions are the premise of the Land Capability Classification for Arable Agriculture in Alberta system:

1. This interpretive system for rating the agricultural potential of a portion of land, considers the characteristics of the climate and landscape. Good land management practices are assumed to be applied in order to conserve the natural resource and preserve the predicted rating.
2. The present dryland agriculture management practices are not necessarily diagnostic of optimal land use. New technological advances or major changes in management practices (irrigation, drainage) may alter agriculture capability ratings. Similarly, potential climatic change may affect the viability of agricultural crops in the future.
3. Economic factors, such as distance to market or crop values, are not considered in the determination of the ratings.

Agricultural capability is an assessment of the nature and degree of limitations imposed by the environmental characteristics of an area. The Land Capability Classification system uses a class/index rating framework to evaluate these environmental characteristics. This approach provides a more systematic evaluation of the individual limitations than is feasible with the CLI methodology. The intent of the Land Capability Classification method is to remove subjectivity inherent within the CLI system. Therefore, agricultural capability rating interpretations, using the Land Capability Classification System, are considered to be more accountable and reproduceable.

Under the Land Capability Classification system climate, soil and landscape characteristics are individually assessed and assigned an index value. Each of these components are assessed by factors specific to that component. For example, soil characteristics (topsoil depth, texture and drainage) are considered in determining the index value of the soil component. Similarly, climatic variables (moisture and/or energy), and landscape features (slope and surface stoniness) are considered independently. Each component is assigned an initial value of 100 index points. Points are then deducted based on limiting factors. The component with the lowest value determines the class rating of an area for arable agriculture. The final rating of the soil map unit is expressed as a class number with up to three constraint factors identified.

There are seven capability classes, with Class 1 having the highest capability and Class 7 the lowest. Description of these classes are as follows:

Class 1 – no significant limitations for crop production (index value 80-100).

Class 2 – slight limitations that restrict the range of crops or require modified management practices (index value 60-79).

Class 3 – moderate limitations that restrict the range of crops or require special management practices (index value 45-59).

Class 4 – severe limitations that restrict the range of crops or require special management practices or both (index value 30-44).

Class 5 – very severe limitations for sustained arable agriculture and annual cultivation using common cropping practices not recommended (index value 20-29).

Class 6 – such severe limitations for arable agriculture that cropping is not feasible even on an occasional basis (index value 10-19).

Class 7 – no capability for arable agriculture (index value 0-9). (Environment Canada 1972, Brocke 1977, ASAC 1987)

In the determination of the capability class, the most limiting factor(s) are considered. Twenty-one recognized factors are associated with the three major components (climate, soils and landscape) (ASAC 1987). The factors

and appropriate symbol, that are applicable to the County of St. Paul soil map units, are defined as follows:

1. Climate
- temperature limiting factor (H)

2. Soils
- texture (M)
- structure and consistence (D)
- organic matter content of surface horizon (F)
- depth of surface horizon, specifically Ap or Ah (E)
- salinity (N)
- calcareousness (K)
- depth to nonconforming layer (R) (D) (M)
- drainage (W)
- depth of organic deposit (X)
- degree of decomposition of organic material (B)
- wood content of organic material (I)

3. Landscape
- slope (T)
- surface stoniness (P)
- pattern of obstacles (J)

The criteria and point deduction tables for these factors are listed in detail in the Land Capability Classification manual (ASAC 1987).

The procedure for rating soil map units within the County involves several steps:

1. Climatic factors are initially determined before the soil and landscape components because some soil and landscape features are climatic dependent.
2. For complex map units the major soil series of each soil map unit are assessed individually, then an average index value of the soil component(s) is determined for the map unit.
3. Where the soil types differ with respect to drainage, the soil component ratings are indicated separately. For example, the soil map unit ABNW1/3-4 has a rating of $4HME^{6}$ $6W^{4}$ because the two major soils are strongly dissimilar. ABC (Athabasca) soils are moderately well drained Luvisolics and have a rating of 4HME, due to climatic, texture and depth of topsoil limitations. NWB (Newbrook) soils are poorly drained Gleysolics and have a 6W rating, due to the presence of a high water table. The superscript 6 and 4, refer to the estimated areal percentage of these two soils where 6 equals 60% and 4 equals 40%. These percentages are obtained from the description in the map unit legend.

Climatic factors, principally the energy index (EI) values, require additional explanation since modifications are made to the broad small scale (1:3M) climatic maps in the manual. These small scale maps are used as an initial guide to determine climatic classes present within the County. The range of EI values for the corresponding agroclimatic classes are as follows: 2H=1180-1340; 3H=1050-1180; 4H=<1050. Because more than one climatic class occurs between the EI isolines depicted on the 1:3M scale map, arbitrary agroclimatic zonal lines are assigned on the basis of the distribution of soil types. The areal extent of the three recognized agroclimatic zones (2-3H, 3H, 4H) is depicted in Figure 2.

The process of allocating the specific EI values to the types of soils within each agroclimatic zone is outlined below:

1. Within the 2-3H agroclimatic zone several energy index (EI) values are assigned on the basis of the occurrence of major soils in the map units. Chernozemic soils, such as AGS (Angus Ridge), BVH (Beaverhills) and FLU (Falun) have an EI value of 1200, whereas Luvisolic soils, such as COA (Cooking Lake) and UCS (Uncas) have an EI value of 1150. In map units containing Chernozemic and Luvisolic soils, such as an AGUC map unit, an EI value of 1175 is assumed.
2. The 3H and 4H agroclimatic zones are characterized by single EI values. Because these zones have a single climatic class rating, all associated soils have the same rating, irrespective of soil classification. The assumed EI values are 1100 and 1000 for the 3H and 4H zones, respectively.

A generalized 1:500 000 scale land capability map for the County is displayed in Figure 9. The land capability ratings for each soil map unit are listed in Appendix D. These ratings are to be considered as the median or average value for the particular landscape described by each soil map unit designation. The capability rating of a map unit may differ following site inspection of a 1/4 section due to local variations of soil and landscape. Climatic variables are generally not site specific and are therefore less likely to change.

3.2 System for predicting range productivity

The ability to predict the natural potential of a landscape to produce forage for grazing domestic animals is the premise of this range productivity rating system. This system utilizes soil and inferred environmental factors as the basis for estimating dry matter yield and corresponding stocking rates. The major factors influencing the production of palatable range vegetation are climate, and texture of the soil parent materials. The proportion of native forest cover, wet soils and excessively steep topography are other components considered in the final evaluation.

The principle of range management is to obtain efficient animal production from grazing the pasture land, while maintaining a sustainable environment (Wroe et al. 1988). In order to utilize the range pasture and maintain optimum sustained use of the forage crop, the carrying capacity of the area must not be exceeded. The carrying capacity is defined as "the maximum stocking rate possible without causing damage to vegetation or related resources" (p.2 Smoliak et al. 1988). As the productivity of the land increases the carrying capacity increases. To maintain the range pasture in good condition a 45% carry-over of the current years vegetative growth is required.

The potential vegetative productivity of a landscape is related to the annual precipitation and type of soils in a particular area. Regression equations have been developed which relate precipitation and depth of surface horizons to vegetative production of rangeland (Cannon & Nielsen 1984). However, these productivity equations are not applicable to forested rangeland. Carrying capacities for these latter areas are estimated from guidelines outlined in the "Range Pastures in Alberta" (Smoliak et al. 1988). The rangeland productivity ratings for the County of St. Paul soil map units are based on these two approaches.

A seven class system for rating range productivity, somewhat similar to the Land Classification System, has evolved from experience applied in other soil survey reports (Kjearsgaard et al. 1986; Brierley et al. 1991; Walker et al 1991). Carrying capacity (stocking rate) and dry matter yield values (vegetative production) are the definitive characteristics, and are subdivided into seven classes. The class definitions are listed in Table 3.

Due to climate limitations, 2C is the highest range productivity class rating possible for soil map units within the County of St. Paul. The most productive soils, well to moderately well drained Black Chernozemics on medium textured materials, (ie. AGS, FRY) have this 2C rating. Additional factors such as; coarse textured materials (M), tree and bush cover (B), topography (T), excessive standing water (W), and salinity (N), limit range production. The presence of any one of these factors decrease the potential carrying capacity of Chernozemic soil landscapes. Therefore, the range productivity class of a specific soil map unit impacted by any of these limiting factors is rated lower than 2C.

Luvisolic soil map units (COA, LCY, ABC) are rated differently. These soils are associated with forest vegetation and lack a fertile Ah horizon. Because of the absence of a thick Ah horizon the natural forage productivity potential of Luvisols is inherently less than that of Chernozemic soils. Also the tree cover reduces the potential amount of forage available for grazing, due to the denseness of the canopy layer. The mixed wood vegetation (conifers and aspen) has the lowest carrying capacity – class 5. As the proportion of aspen trees within forested areas decreases, and the area of open grassland increases, the rating improves accordingly. Conversely, where excessive standing water or topography reduce animal accessibility, Luvisolic soil map units have a lower rating than class 5.

Table 3. Range productivity classes with corresponding stocking rates and average dry matter yield.

Range Productivity Class	Stocking Rate (ha/AUY)	Dry Matter Yield (kg/ha)
1	<5	>1550
2	5-10	1550-775
3	10-16	775-500
4	16-24	500-325
5	24-36	325-220
6	36-60	220-130
7	>60	<130

A generalized 1:500 000 scale grazing productivity map is displayed in Figure 10. The grazing productivity ratings for the individual soil map units are listed in Appendix D. These ratings are to be used as a guideline; the values are only estimates. With management practices such as the clearing of trees and brush or drainage of sloughs, the carrying capacities may be underestimated. Site inspections or aerial photo interpretation is advised for determining the grazing suitability of specific delineations. Ratings may vary by a class or more.

3.3 Engineering Interpretations

Soil information compiled in this report may be used for purposes other than agriculture. Geo-technical and agricultural engineers, and land use planners are interested in soil properties which can affect the construction and maintenance of a variety of infrastructures (pipelines, roads and trails, sewage disposal systems etc.). To provide some pertinent data, Atterberg limits and grain size sieve analyses are listed for the dominant parent materials within the study area (Table 4). The data have limitations related to the regional scale of mapping, the low density of sampling and the small number of samples analyzed. Therefore, on site investigations, additional samples and analysis are required before specific interpretations can be determined.

For guidelines in assessing soil limitations for a wide variety of non agricultural interpretations, refer to the manual "Guide book for use with Soil Survey Reports of Alberta Provincial Parks and Recreation Areas" (Greenlee 1981).

Table 4. Selected Engineering Data.

Series Symbol	Percent Passing Sieve			LL[1]	PI[2]	Unified Soil Classification
	#10	#40	#200			
Fine textured till						
WST				59	33	CH-MH
Medium textured till						
ABC**	99	95	74	35	15	CL
AGS*		91	62	29	11	CL
COA*		92	62	28	12	CL
LCY	99	91	62	31	16	CL
Coarse textured till						
GOG		–	–	NL	–	GM (est.)
Glaciofluvial sediments						
EDW (gravelly)	98	97	41	NL	–	SP
NIT* (sands)		61	4	NL	–	SW

1. Liquid limit expressed as % water on an oven dry basis. NL means non liquid.
2. Plasticity index determined by subtracting plastic limit (% water) from liquid limit.
* Values from Macyk et al. (1985)
** Values from Kocaglu (1975)

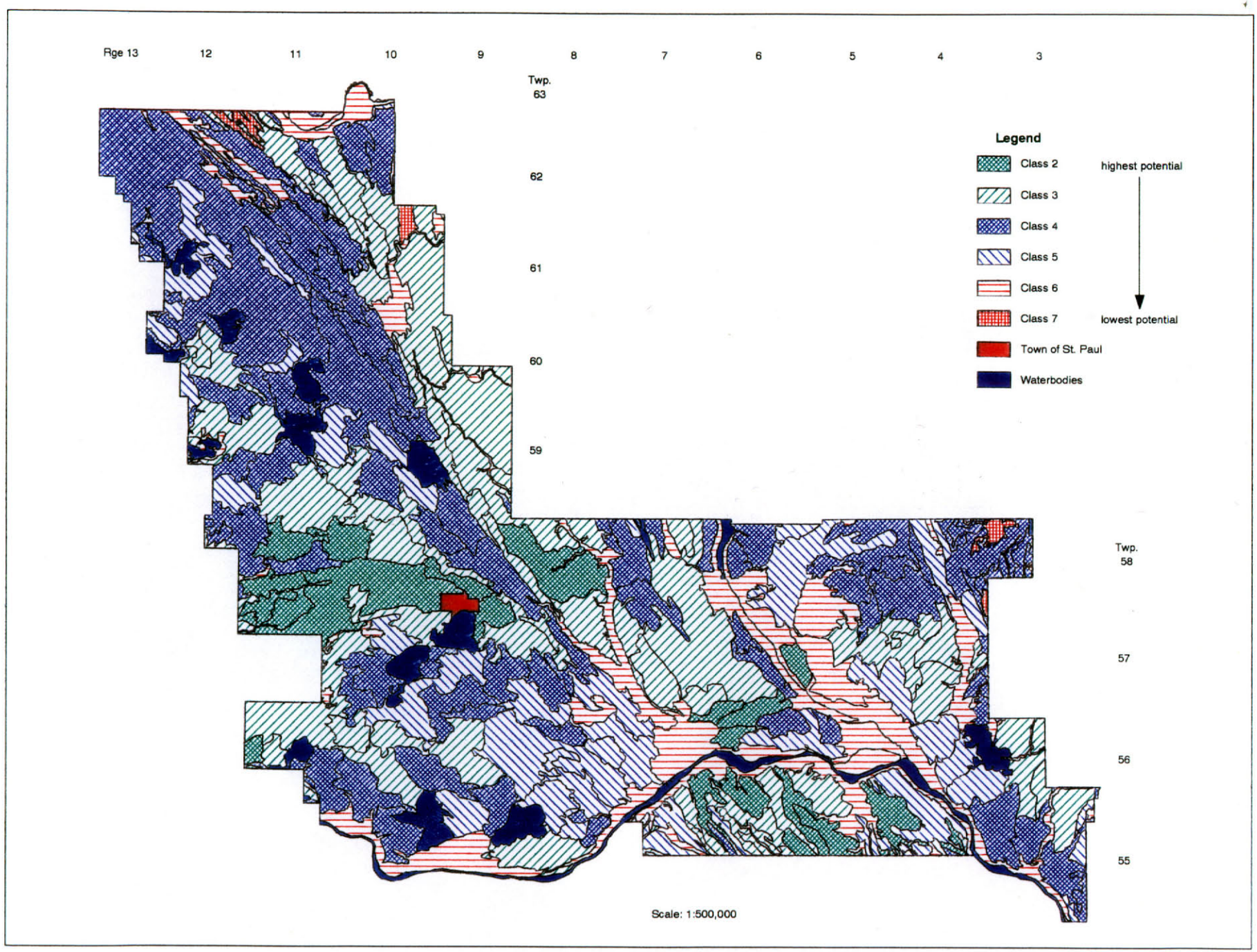


Figure 9. Generalized land capability classification for arable agriculture map of the County of St. Paul.

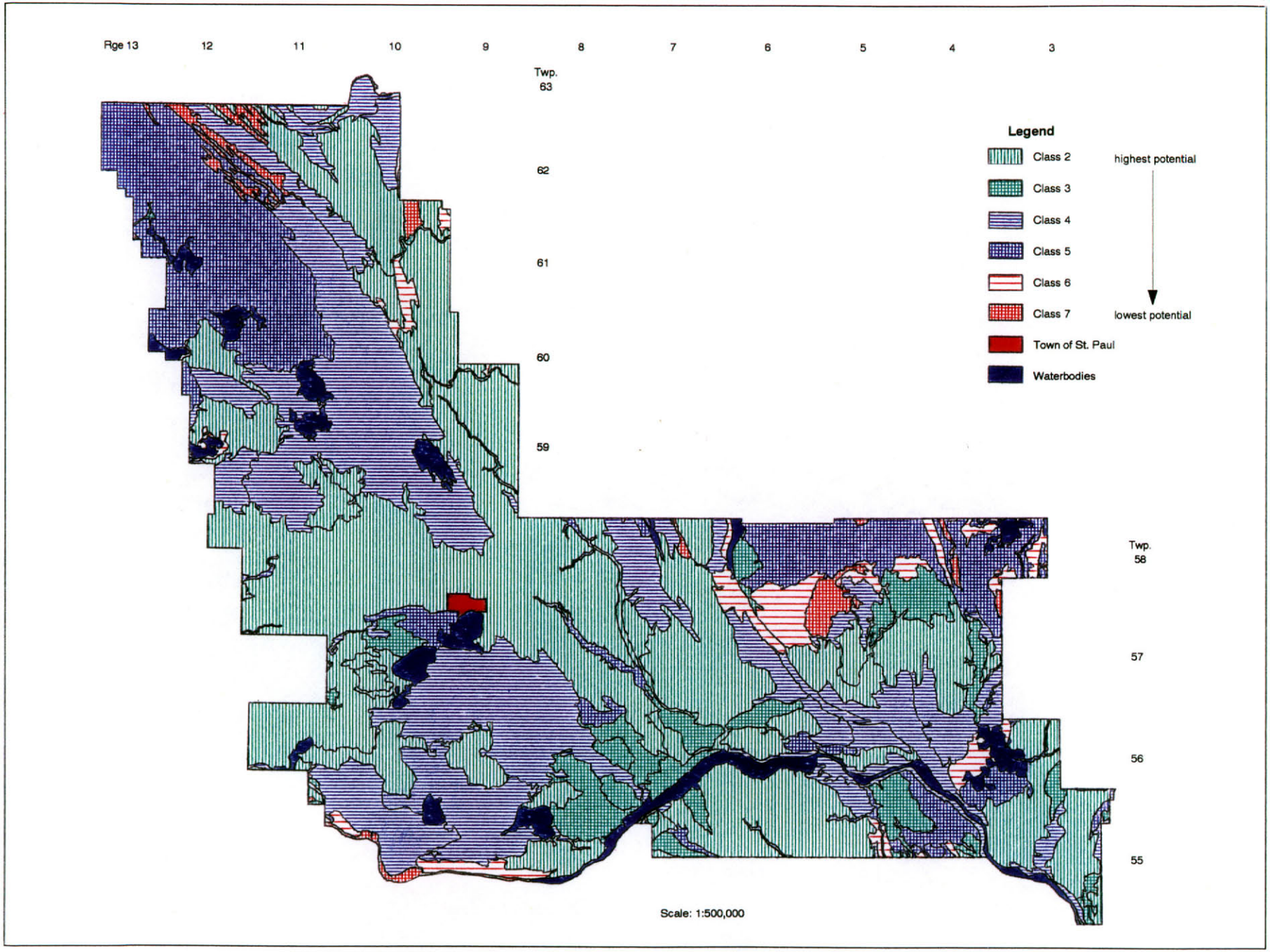


Figure 10. Generalized grazing productivity capability map of the County of St. Paul.

References

A.A.A.C. (Alberta Agrometeorology Advisory Committee, Ag-ratings Working Group). 1987. Climate rating for arable agriculture in Alberta. Alberta Agric. 36 pp. and maps.

Agriculture Canada. 1976. Glossary of terms in soil science. Agric. Can., Research Br., Ottawa. Publication 1459, revised. 44 pp.

Alberta Municipal Affairs. 1984. County of St.Paul #19 Lake Planning Framework. Prepared by Planning Branch, Municipal Affairs. 48 pp. and maps.

Allison, L.E., W.B. Bollen and C.D. Moodie. 1965. Total Carbon. *In* Black *et al.* (eds.), Methods of soil analysis. Am. Soc. Agron. Mongr.9: 1345-1378.

Andriashek, L.D. and M.M. Fenton. 1989. Quaternary stratigraphy and surficial geology of the Sand River area, 73L. Bull. 57, Alberta Research Council. 154 pp. and 3 maps.

A.O.A.C. (Association of Official Agricultural Chemists). 1955. Official methods of analysis. Eighth ed. Washington, D.C.

A.S.A.C. (Alberta Soils Advisory Committee). 1987. Land capability classification for arable agriculture in Alberta, 1987. W.W. Pettapiece (ed.). Alberta Agric., 103 pp. and maps.

Atmospheric Environment. No date. Canadian climate normals. Temperature and precipitation. 1951-1980. Prairie provinces. Env. Can., Atmos. Env. Ser., 429 pp.

Bascombe, C.L. 1961. Calcimeter for routine use on soil samples. Chem. Ind., Part II: 1826-1827.

Bostock, H.S. 1964. A provisional physiographic map of Canada. Geological Survey of Canada, 64-35. 24pp. and 1 map.

Brierley, J.A. and W.L. Nikiforuk. 1989. Soil survey of the Frog Lake Indian Reserve, Alberta. Research Branch, Agriculture Canada and Terrain Sciences Dept. Alberta Research Council. Open file report No. 1989-11.

Brierley, J.A. and W.L. Nikiforuk. 1989. Soil survey of the Fishing Lake Indian Reserve, Alberta. Research Branch, Agriculture Canada and Terrain Sciences Dept. Alberta Research Council. Open file report No. 1989-12.

Brierley, J.A., A.T. Rodvang and W.W. Pettapiece. 1991. Soil survey of the M.D. of Cardston, Alberta. Research Branch, Agriculture Canada. Alberta Soil Survey Report No.48, 86 pp. and maps.

Brocke, L.K. 1977. Soil capability for agriculture in Alberta. Report prepared for Alberta Environment, Edmonton. 24 pp.

Cannon, M.E. and G.A. Nielsen. 1984. Estimating production of range vegetation from easily measured soil characteristics. Soil Sci. Soc. Am. J. 48:1393-1397.

Carlson, V.A. and D.V. Currie. 1967. Bedrock topography and surficial aquifers of the Edmonton district, Alberta. Alberta Research Council, report 66-3, 21 pp.

Carlson, V.A. and D.V. Currie. 1973. Bedrock topography of the Vermilion map area, NTS 73E, Alberta. Alberta Research Council, 1:250 000 scale map.

Carlson, V.A. 1977. Bedrock topography of the Tawatinaw map area, NTS 83I, Alberta. Alberta Research Council, 1:250 000 scale map.

Chapman, H.D. 1965. Cation exchange capacity. *In* Black *et al.* (eds.) Methods of soil analysis. Am. Soc. Agron. Mongr. 9: 891-901.

E.C.S.S. (Expert Committee on Soil Survey). 1983. The Canada soil information system (CanSIS). Manual for describing soils in the field. J.H. Day (ed.), 1982 revised ed. Agric. Can., Research Br., LRRI Contribution No. 82-52, 97 pp. and appendices.

E.C.S.S. (Expert Committee on Soil Survey). 1987a. Soil survey handbook. Volume 1. G.M. Coen (ed.). Agric. Can., Research Br., L.R.R.C. Contribution No. 85-30, Tech. Bull. 1987-9E, 120 pp.

E.C.S.S. (Expert Committee on Soil Survey). 1987b. The Canadian system of soil classification. 2nd ed. Agric. Can. Publ. 1646, 164 pp.

Edwards, W.A.D., R.B. Hudson and D.W. Scafe. 1985. Aggregate resources of the Edmonton/Lloydminster region. Alberta Geological Survey, Alberta Research Council Bulletin 47, 64 pp.

Environment Canada. 1972. Soil capability classification for agriculture. The Canada Land Inventory report No. 2. Environment Canada, Ottawa, Ontario. 16pp.

Farvolden, R.N. 1963. Bedrock topography Edmonton-Red Deer map area, Alberta. Alberta Research Council Bulletin 12, p. 57-62.

Flint, R.F. 1971. Glacial and Quaternary Geology. John Wiley and Sons, Inc., Toronto. 892 pp.

Gary, M.R. McAfee and C.L. Wolf (eds.). 1972. Glossary of geology. Am. Geol. Inst., Washington, D.C., 805 pp.

Gee, G.W. and J.W. Bauder. 1979. Particle size analysis by hydrometer: A simplified method for routine textural analysis and a sensitivity test of measurement parameters. Soil Sci. Soc. Am. J. 43:1004-1007.

Gold, C.M., L.D. Andriashek, and M.M. Fenton 1983. Bedrock topography of the Sand River map area NTS 73L, Alberta. Alberta Geological Survey, Alberta Research Council, 1:250 000 scale map.

Green, R. 1972. Geological map of Alberta. Alberta Geological Survey, Alberta Research Council. 1:1 267 000 scale map, reprinted 1982.

Greenlee, G.M. 1981. Guidebook for use with soil survey reports of Alberta provincial parks and recreational areas. Alberta Research Council. Earth Sciences report 81-1. 66 pp.

Howitt, R.W. 1988. Soil survey of the County of Beaver, Alberta. Terrain Sciences Dept., Alberta Research Council. Alberta Soil Survey Report No. 47. 62 pp. and maps.

Hume, G.S. and C.O. Hage 1941. The geology of east-central Alberta. Geological Survey of Canada, Memoir 232, 101 p.

Kjearsgaard, A.A. 1972. Soil survey of the Tawatinaw map sheet (83I). Canada Dept. of Agric., Soil Research Institute. Alberta Institute of Pedology, Report No. S-72-29. 103 pp. and maps.

Kjearsgaard, A.A., J. Tajek, W.W. Pettapiece and R.L. McNeil. 1986. Soil survey of the County of Warner, Alberta. Research Branch, Agriculture Canada. Alberta Soil Survey Report No. 46, 108 pp and maps.

Kocaoglu, S.S. 1975. Reconnaissance soil survey of the Sand River area (73L). Agriculture Canada, Soil Research Institute. The Univ. of Alberta Bull. No. SS 15. Alberta Institute of Pedology Report No. S-74-34. 83 pp. and maps.

Lacate, D.S. 1969. Guidelines for bio-physical land classification. Subcommittee on Bio-physical Land Classification, Department of Fisheries and Forestry Service, Publication No. 1264, Ottawa. 61 pp.

Macdonald, D.E. 1982. Marl Resources of Alberta. Alberta Geological Survey, Alberta Research Council. Earth Sciences Report 82-1, 94 pp.

MacMillan, R.A., W.L. Nikiforuk and A.T. Rodvang 1988. Soil survey of the County of Flagstaff, Alberta. Research Br., Agriculture Canada and Terrain Sciences Dept., Alberta Research Council. Alberta Soil Survey Report No. 51. 88 pp. and maps.

Macyk, T.M., G.M. Greenlee and C.F. Veauvy. 1985. Soil survey of the County of Two Hills No. 21, Alberta. Terrain Sciences Dept., Alberta Research Council. Alberta Soil Survey Report No. 35. 86 pp. and maps.

Mapping Systems Working Group. 1981. A soil mapping system for Canada. Land Resource Research Institute, Contribution No. 142 Agriculture Canada, Ottawa. 94pp.

McKeague, J.A. (ed.) 1978. Manual on soil sampling and methods of analysis 2nd edition. Can. Soc. Soil Sci. Ottawa, Ont. 212pp.

Mitchell, C.W. 1973. Soil classification with particular reference to the Seventh Approximation. J. of Soil Science, Vol.24, No.4, 411-420.

Peech, M. 1965. Hydrogen ion activity. *In* Black *et al.* (eds.), Methods of soil analysis. Am. Soc. Agron. Monogr. 9:914-926.

Pettapiece, W.W. 1986. Physiographic subdivisions of Alberta; Land Resource Research Center, Research Branch, Agriculture Canada; 1:1 500 000 scale map.

Shaw, E.W. and S.R.L. Harding. 1949. Lea Park and Belly River formations east-central Alberta: Alberta Symposium, Bulletin of the American Association of Petroleum Geologists, v. 33, pp. 487-499.

Sheldrick, B.H. (ed.) 1984. Analytical methods manual 1984. LRRI Contribution No. 84-30. Agriculture Canada. Land Resource Research Institute, Ottawa, Ont.

Shetsen, I. 1990. Quaternary geology, central Alberta. Terrain Sciences Dept., Alberta Research Council, Edmonton, Alberta. 1:500 000 scale map.

Smoliak, S., W.D. Willms, R.A. Wroe, B.W. Adams, and G. Ehlert. 1988. Range pastures in Alberta. Alberta Agriculture, Edmonton. AGDEX 134/14-8. 24 pp.

Walker, B.D., J.A. Brierley and G.M. Coen. 1991. Soil Survey of the Pincher Creek-Crowsnest Pass Area, Alberta. Research Branch, Agriculture Canada. Alberta Soil Survey Report No. 50. 194 pp. and maps.

Wyatt, F.A., J.D. Newton, W.E. Bowser and W. Odynsky. 1944. Soil Survey of Wainwright and Vermilion Sheets. Dept. of Extension, University of Alberta, Edmonton, Alberta. Bulletin No. 42. 122 pp. and map.

Appendix A.
Soil formation, classification and mapping procedures

This appendix is divided into 2 sections. The first section provides a description of soil forming factors, characteristics used to describe soils in the field, and a brief description of the Canadian System of Soil Classification. The second section describes the procedures involved in displaying, at a County scale, the soils information and additional landscape characteristics on a map.

I. Soil formation, characteristics and classification concepts

This section provides a brief introduction to the topic of soil genesis and classification.

A definition of soil is a complex term. Soil is the naturally occurring unconsolidated mineral or organic material at the earth surface, which is capable of supporting plant growth. More specifically, soil is comprised of a number of soil individuals that mantle the surface of the earth as a continuum, except where interrupted by water, shifting sand, salt deposits, perpetual ice and snow, and steep rocky areas. Each soil individual is a natural body of mineral and organic matter that changes or has changed with time in response to climate, vegetation, organisms and topography. The change is called soil formation.

a) Soil formation

Soil formation (or soil genesis, or soil development) is a complex process involving the five principal factors (parent material, climate, biota, topography and time) which occur in unique and individual combinations. Therefore, soils differ across the landscape because of differences in one or more of these factors. Parent material is the raw unaltered geologic material within which a soil individual has developed. Climate, principally precipitation and temperature, controls the rate of chemical and physical weathering of the parent material. The biota, including vegetative growth, soil organisms, as well as human activities determine the proportion of organic matter (humus) present in the soil. Topography or relief influences the micro-environment of the soil and this in turn determines the rate of soil formation or degradation. The last factor, time, represents the period during which soil genesis has altered the original parent material. Within the County of St. Paul the present-day soils have developed during the last 10 000 years, since the departure of the Wisconsin ice sheets. Soils occurring in the valleys associated with the North Saskatchewan River and other modern day waterways, are younger.

The products of soil forming processes are best observed in vertical exposures or cuts. These exposures, are called profiles which are characterized by a sequence of layers or horizons. Based on soil profiles, pedologists describe and measure properties of soil horizons and classify the soils. An example of an hypothetical soil profile is depicted in Figure 11. No individual soil profile contains all of these layers or horizons, but each soil will contain one or more of them.

L,F,and H or O - These designations are characteristic of organic horizons. The organic matter is raw in L (Of), partly decomposed in F (Om), and decomposed in H (Oh). Horizons of Organic soils are described using O designations.

A - This designates a mineral horizon at or near the surface. It may be dark coloured because of an accumulation of organic matter (Ah), or light coloured when clay, iron and humus have been leached out (Ae). Some soils contain intergrades Ahe, or contain both a distinct Ah as well as a distinct Ae.

AB and BA - These designations are transitional horizons.

B - This designates a mineral horizon altered substantially compared to the parent material (C horizon). This horizon represents a zone of enrichment or alteration. Some are enriched with clay (Bt), iron or other sesquioxides (Bf), or humus (Bh). Carbonates and salts are usually removed, altering the colour and structure. Oxidation occurs in dry environments (Bm). Reduction occurs in wet environments (Bg).

BC - This designates a transitional horizon.

C - This designates a mineral horizon, comparatively unaffected by soil forming processes operative within the A and B horizons. Exceptions include gleying in wet environments (Cg), accumulation of carbonates (Cca) and salts (Csa). Most parent materials within the County are inherently calcareous (Ck).

R - This designates a geologic layer composed of consolidated bedrock.

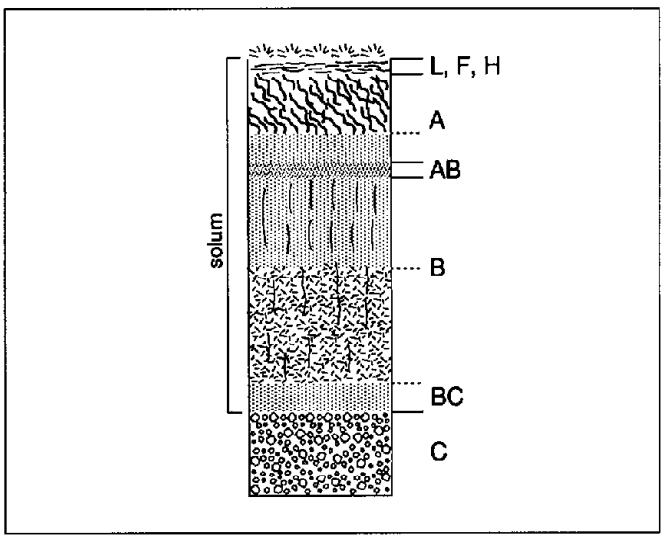


Figure 11. Schematic drawing of a soil profile depicting the master soil horizons.

Appendix A. *(continued)*

The arrangement and composition of these horizons is unique amongst soil profiles. Horizons differ from one another relative to one or more the following characteristics.

b) Soil characteristics

Many soil properties (or characteristics, or attributes) are used to describe and differentiate soil horizons and to classify soil entities; interpretations are based upon these soil characteristics. Some of the important soil features are described below.

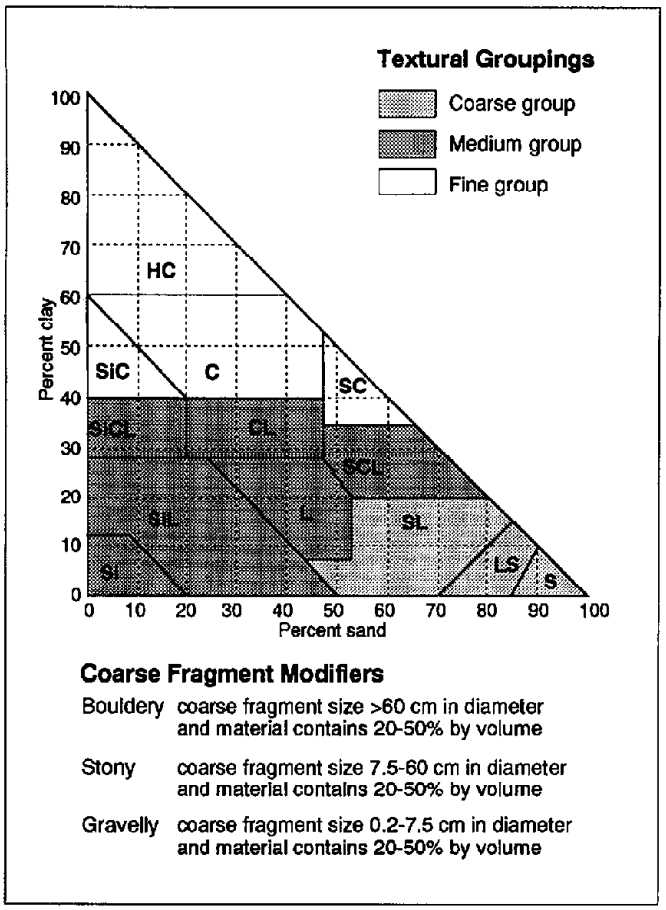
Soil texture refers to the proportion of sand, silt and clay, the fine earth fraction less than 2mm in diameter. The proportions are arranged into classes and groups as defined by the textural triangle, Figure 12. Modifiers are used to describe the coarse fragment content (particles greater than 2 mm) as a percentage of the total soil volume.

Soil colour is determined and described according to the Munsell colour system. The range and kinds of colours in soil horizons are usually good indications of organic matter content, drainage, aeration and leaching – properties that can not be measured analytically at each site.

Soil structure is an important feature that indicates pedogenic development, and which influences plant growth, water movement and soil stability. The form, size and durability of soil aggregates affect pore space, moisture-holding capacity and distribution of roots within the soil mass. A soil horizon may have granular, blocky, platy, prismatic, or columnar structure, or it may be structureless.

Soil reaction is expressed in pH values and is a measure of the acidity and alkalinity of a soil mass. It may range from extremely acid (below pH 4.5) to strongly alkaline (pH 8.5 and higher).

Other features of soil horizons which may be noted include: thickness, range, distinctness and form of the lower horizon boundaries; the frequency, thickness, and location of clay films; size and abundance of stones and boulders; as well as depth to bedrock, salts, and mottles.



Coarse Fragment Modifiers

Bouldery	coarse fragment size >60 cm in diameter and material contains 20-50% by volume
Stony	coarse fragment size 7.5-60 cm in diameter and material contains 20-50% by volume
Gravelly	coarse fragment size 0.2-7.5 cm in diameter and material contains 20-50% by volume

Figure 12. Textural triangle, textural groupings and coarse fragment modifier definitions.

c) Soil classification

The purpose of a soil classification system is to organize soil characteristics, which are a product of soil forming processes, into a logical arrangement. This conceptual frame work provides a means for communicating, testing and applying pedological information of similar natural entities (soils) (Mitchell 1973). Soil taxonomy is the hierarchical ordered arrangement of classified soils.

In the County of St. Paul the soil resource was classified according to the guidelines established by the Canadian System of Soil Classification (E.C.S.S. 1978b). This hierarchical system has five taxonomic levels: order; great group; subgroup; family; and series. Classes at the order level have the broadest range of characteristics, whereas classes at the series level are the narrowest (a more refined range of properties).

The County of St. Paul maps and legend display and describe the distribution of soil units. Soils described to the series level are the building blocks for these soil units. The soil series are described in Appendix B and the soil units are described in Appendix C.

Within this overview of the Canadian System of Soil Classification, the six orders of soil types which are mapped in this County are briefly described.

Brunisolic Order soils:

- Have Bm horizons from which most carbonate has been removed, resulting in structure and colour changes due to oxidation.
- Lack B horizons which meet the criteria for Bf, Bt, or Bg.
- Ah horizons, if present are less than 10 cm thick. If horizon is greater than 10cm, then the Ah horizon does not meet the Chernozemic Ah criteria (usually C:N ratio).
- In this County, the occurrence of these soils are confined to the coarse textured parent materials.

Chernozemic Order soils:

- Have dark coloured, organic rich surface horizon (Ah) greater than 10 cm thick.

Appendix A. *(continued)*

- Definitive characteristics of the Ah horizon include: 1-17% organic Carbon; Carbon:Nitrogen ratio is less than 17; and are base rich (more than 80%).
- Do not have Bf, Bg, Bn, or Bnt horizons.
- Mean annual soil temperature is 0°C or higher.
- Are associated with grassland and transitional grassland-aspen vegetation.

Gleysolic Order soils:

- Have dull colours and /or mottles which are indicative of periodic or sustained reducing conditions during their development.
- Usually associated with poorly drained, wet regional or local depressional areas of the landscape.
- Develop under hydrophytic vegetation.

Luvisolic Order soils:

- Have Bt horizons, enriched with clay leached from the above horizons, usually an Ae.
- Associated with mixedwood forest vegetation.

Organic Order soils:

- Organic material (peat) are at least 40cm thick.
- Organic material must contain more than 17% organic Carbon (30% organic matter).
- Occur in very poorly drained depressional areas.
- Associated with hydrophytic vegetation, usually black spruce, larch, bog birch, sedges and mosses.

Regosolic Order soils:

- Have little or no profile development, other than depositional layers. No B horizon is present.
- Occur in "recent" deposits where there has been insufficient time for the development of soil horizons. In severely eroded areas horizons may have been destroyed.

II. Mapping procedures

In this section of the appendix, the procedure for compiling a soil map and accompanying legend are presented, utilizing the soil classification and associated terminology. Within the mapping process there are several stages or steps which are followed, principally field activities, and legend building. These topics are discussed in the following sections.

The purpose of a soil survey is to quantify and depict on maps the distribution of soils within a map area. To conduct a soil survey, the soil surveyors systematically subdivide the landscape into repeating sub-areas (or units) containing a similar distribution of soils. These units are delineated on a map and then interpreted for the specific land use practices which are identified at the out set of the soil survey project. The methodology used in the preparation of the County of St. Paul soil maps is briefly outlined.

a) Field activities

The survey area was traversed by vehicle on accessible roads and trails, as well as by foot in the more remote areas. Soil profiles and landscape features were recorded at inspection sites. These sites are regularly spaced in the accessible areas, with a density of between 80-100 per township (approximately 1-3 shared digs per quarter section). The density and regularity of inspections decreased as access was more limited. Generally there is at least 1 inspection per map delineation.

At each inspection site, soil profile and landscape characteristics are recorded. Soil features included; horizon designation, thickness and arrangement, texture, structure, colour and mode of parent material deposition. Landscape specific information included: slope length, aspect and steepness; surface form and local relief; and site position within the landscape. Additional features such as; the areal extent of erosion (eroded knolls, slumps, gullies), surface stoniness, and salinity are also recorded where present.

Stereoscopic aerial photographs are an integral component in the survey procedure. They were used to plan traverses and locate sites; to extrapolate site data; to identify repeating surface form, soil and vegetation patterns; and to delineate these patterns on a map. In the County of St. Paul area, 1:30 000 scale aerial black and white photos taken in 1981-1983 were used.

b) Legend development

Based on the soil information, soils were classified according to the previously described standards (E.C.S.S. 1987b). The recurring combinations of classified soils are described as soil units. Soils units are then subdivided on the basis of associated topographic classes. A soil unit plus a topographic class description equals a soil map unit. Soil map unit descriptions are reported in Appendix C.

Soil map units represent conceptual repeatable landscapes that are visible on the ground and that can be delineated on a map. For example, AGUC2/3 describes a combination of soils comprised of Eluviated Black Chernozemics (AGS) and Dark Gray Luvisolics (UCS) developed on till, as well as significant proportions of wet soils (soil map unit code 2), within a landscape where the slopes range from 2-5% (topographic class code 3). When this symbol is placed on the map, within a enclosed area, this is referred to as an individual polygon of this soil map unit.

During the course of the field activities, each polygon represented on the preliminary maps are individually described. These polygon descriptions are evaluated regularly. Sometimes similar soil map units are combined, in order that the soil map units remain unique and relatively distinct. For example, AGUC1/3 and UCAG1/3 map symbols may have been used to describe different polygons. However, after reviewing the polygon descriptions of these

Appendix A. *(continued)*

soil map units, the areal extent of AGUC1/3 may greatly exceed UCAG1/3, so the latter polygons will be changed. Also, the difference in the proportions of AGS and UCS soils within the respective polygons may only differ by 10%, a marginal difference.

For the County of St. Paul, 185 soil map units were recognized, including 10 miscellaneous map units (ZAV's and ZRB's). After consolidation of the soils map units within the project area, the polygons and accompanying map unit symbols were transferred to 4, 1:50 000 scale, chronar topographic base maps. These maps were then digitized. The resulting digital files were used to produce the four final 1:50 000 scale planametric soil maps, as well as the various small scale interpretive maps for the County.

Appendix B. Soil series descriptions

I. Introduction

The major soils within the County of St. Paul are described in this Appendix. These soils, which occur as dominant and significant members of a soil unit, are described in terms of their definitive characteristics. The descriptions are based upon on existing named soil concepts developed in other north central Alberta soil survey reports, principally: Tawatinaw Map Sheet (Kjearsgaard 1972); Sand River Area (Kocaoglu 1975); County of Two Hills (Macyk et al. 1985); and County of Beaver (Howitt 1988). New soil series names were established for new kinds of soils, for which the areal extent generally exceeded 800 ha. (E.C.S.S. 1987a). Eleven new soil series were established during the course of the County of the St. Paul soil survey.

The definitive criteria used to distinguish the different soil series are: agroclimatic zone and energy index value; physiographic district; parent materials and textures; as well as the soil classification as determined by profile characteristics, such as horizon differentiation based upon structure, color, texture etc. as well as analytical data.

Sometimes, it appears that several soil series names are applied to similarly classified soils. However, one definitive attribute will always be different within a soil description. Climate is the most common distinguishing attribute that differentiates soils of similar classification. For example, there are three series names for Orthic Gray Luvisolic soils developed on medium textured till. They are COA, LCY, and ABC which are associated with the 2-3H, 3H and 4H agroclimatic zones, respectively. The associated energy index values for these agroclimatic zones decrease, respectively. These index values are integral in the determination of land capability classification values. Therefore, land capability ratings are also intimately associated with soil series names.

II. Analytical methods

The information displayed in the following soil description tables include a combination of field and laboratory data. The field data was collected according to guidelines outlined in the CanSIS Manual for describing soils in the field, (E.C.S.S. 1983). The soils were classified according to the Canadian System of Soil Classification (E.C.S.S. 1987b). Laboratory analytical procedures which were followed are outlined in McKeague (1978) and Sheldrick (1984), except where noted. The routine laboratory analysis include:

pH $CaCl_2$. Determined with a pH meter using a 2:1 ratio of 0.01 M $CaCl_2$ solution to soil (Peech 1965) [84-001][1].

Organic C (Carbon). Total C determined using the induction furnace (Leco CR12) with gasometric detection of evolved CO_2. Organic C is the difference between total C and inorganic C ($CaCO_3$ equivalent) (Allison et al. 1965) [84-013].

$CaCO_3$ equivalent. Determined by the inorganic carbon manometric method of Boscombe (1961).

Total N (Nitrogen). Determined using the semi-micro version of the Kjeldahl-Wilforth-Gunning method (A.O.A.C. 1955). Soil is digested using a mixture of HgO, $CuSO_4$ and K_2SO_4 as a catalyst. Ammonium-N in the distillate measured using an ammonium ion electrode.

CEC (Cation Exchange Capacity). Determined by the displacement of ammonium with NaCl (Chapman 1965). Ammonium ion displacement the detected by using an ammonium ion electrode [84-006].

Particle size distribution (% sand, silt and clay). Determined using the hydrometer method (Gee and Bauder 1979) which excludes the removal of organic matter. However, organic matter was removed from analyzed samples which were collected during the County of St. Paul soil survey.

Rubbed fiber content (Organic soils). Determined by placing a volume of organic material in a milkshake mixer for 5 minutes. Then wash mixed sample through 100 mesh sieve. Volume of residue compared with initial volume. [84-044]

Ash content % (Organic soils). Determined by placing sample in an induction furnace at 550°C. [84-045]

1. Number in square bracket indicates method listed in Sheldrick (1984).

Appendix B. *(continued)*

III. Descriptions of major soils used in soil map unit symbols

ABC (Athabasca)

Classification: Orthic Gray Luvisol (O.GL)
Agroclimate: 4H; Energy index value <1050.
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on hummocky, thrust morainal materials associated with the Bunder Upland and Muriel Highland.

Selected attributes of an ABC pedon
(NE22-Tp58-R6-W4; Samples 88 - 83-87)

	Ae	AB	Bt	BC	Ck
Depth, cm	0-9	9-17	17-70	70-101	101+
pH $CaCl_2$	6.0	4.8	4.6	4.9	7.5
Organic C, %	0.3	0.5	-	-	-
CEC, cmol/kg	3.9	13.8	21.5	22.8	18.4
$CaCO_3$ equiv. %	-	-	-	-	3.5
% S	59	48	39	37	37
% Si	32	27	25	28	31
% C	9	25	36	35	32
Texture	sl	scl	cl	cl	cl

Notes: A LFH layer, between 5-10 cm. thick, overlies the Ae layer. The texture of the Ae layer may vary from loamy sand to loam. The $CaCO_3$ equivalent of the Ck in the above profile should be >5%, to meet the moderately calcareous class criteria.

Competing series:
GMT - D.GL, medium textured till, 4H.
LCY - O.GL, medium textured till, 3H.
WST - D.GL, fine textured till, 4H.

AGS (Angus Ridge)

Classification: Eluviated Black (E.BL, Chernozemic)
Agroclimate: 2H; Energy index value 1200.
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on morainal materials associated with the Alma Plain, Dolo Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain and Therien Upland.

Selected attributes of an AGS pedon
(EC9-Tp58-R10-W4; Samples 88 - 118-122)

	Ap	Ae	Bt	BC	Ck
Depth, cm	0-17	17-23	23-70	70-100	100+
pH $CaCl_2$	5.5	6.6	6.1	6.5	7.6
Organic C, %	5.1	0.6	-	-	-
CEC, cmol/kg	31.6	15.5	23.1	18.3	-
$CaCO_3$ equiv. %	-	-	-	0.3	4.8
% S	50	45	42	41	43
% Si	41	33	26	29	27
% C	9	22	32	30	30
Texture	l	l	cl	cl	cl

Notes: Ah and/or Ahe horizons are present at the surface under native conditions. A recognizable white, ashy Ae horizon is required within the profile to meet the AGS soil specifications. The $CaCO_3$ equivalent of the Ck should be >5% to meet the moderately calcareous class definition.

Competing series:
BVH - O.BL, medium textured till, 2H.
FRY - E.BL, medium textured till, 3H.
NTV - E.BL, coarse textured glaciofluvial veneer/till, 2H.
UCS - D.GL, medium textured till, 3H.

ATM (Atimoswe)

Classification: Orthic Black (O.BL, Chernozemic)
Agroclimate: 2H; Energy index value 1200.
Parent Material: Non gravelly (0-2% coarse fragments), coarse textured (sl) glaciofluvial veneer over gravelly (>20% coarse fragments), coarse textured (ls-s), moderately calcareous glaciofluvial materials.
Physiography: Mapped on glaciofluvial and fluvial terraces adjacent to the Kehiwin spillway associated with the Northern Valley Plain, Therien Upland and Whitney Lowland.
Comments: The texture of the glaciofluvial veneer overlying the gravels varies from loamy sand to loam (sandy loam is common). This veneer is greater than 30 cm thick. The coarse fragment content as well as texture of glaciofluvial veneer materials are extremely variable but gravels are present within a meter of the surface.
Competing series:
FTH - O.BL, gravelly, coarse textured glaciofluvial, 2H.
MSW - E.BL, coarse textured glaciofluvial, 2H.

BLA (Birkland)

Classification: Terric Fibrisol (T.F)
Agroclimate: 4H; Energy index value <1050.
Parent Material: Very strongly to extremely acid (pH <5.0), fibric sphagnum bog peat.
Physiography: Organic wetland forms associated with the Bunder Upland, Sugden Plain and Vincent Upland.
Comments: Mapped in complex with SBN soils, in areas of 3H as well as 4H agroclimate. Vegetation associated with these bog-type soils consists of dominantly black spruce, lowbrush cranberry, Labrador tea, and sphagnum moss.

Selected attributes of a BLA pedon
(SW26-Tp67-R13-W4; from Sand River Report)

	Of_1	Of_2
Depth, cm	0-69	69-130
pH $CaCl_2$	3.0	3.3
Organic C, %	48	45
CEC, cmol/kg	131	171
Rubbed fiber, %	80	41
Ash content, %	2.0	2.2

Note: The mineral material contact, which occurs between 80-150 cm, is usually medium textured glaciolacustrine or till.

Competing series:
SBN - TY.F, Sphagnum bog peat, 4H.
TCK - T.MF, Sphagnum bog peat/medium till, 4H.

Appendix B. *(continued)*

BLT (Bluet)

Classification: Orthic Humic Gleysol (O.HG)
Agroclimate: 4H; Energy index value <1050.
Parent Material: Medium textured, weakly calcareous till with 2-15% coarse fragments.
Physiography: Mapped on morainal materials associated with the Bunder Upland and Muriel Highland.
Comments: Peaty, organic surface layers (<40 cm thick) are present with these wet soils.

Selected attributes of a BLT pedon
(NE23-Tp58-R6-W4, Samples 89 - 92-95)

	Om	Ahg	Bg	BCg
Depth, cm	0-18	18-29	29-76	76-100
pH $CaCl_2$	5.9	6.0	6.7	7.1
Organic C, %	-	7.8	-	-
CEC, cmol/kg	-	45.7	14.5	15.9
$CaCO_3$ equiv. %	-	-	-	0.1
% S	-	53	56	43
% Si	-	36	22	26
% C	-	11	22	31
Texture	-	sl	scl	cl

Competing series:
KSY - R.HG, medium textured glaciolacustrine, 3H.
MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H.
MPV - Hu.LG, medium textured till, 3H.
NWB - O.LG, medium textured till, 4H.

BOB (Boscombe)

Classification: Gleyed Dark Gray Luvisol (G.DGL)
Agroclimate: 2-3H; Energy index value 1150
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on undulating to level morainal materials associated with the St. Edouard Plain.
Comments: Characteristics are very similar to PIB, except that the surface layer is Dark Gray instead of Black. Therefore, the surface organic C% will be slightly less than PIB values.
Competing series:
AGS - E.BL, medium textured till, 2H
PIB - G.EBL, medium textured till, 2H
UCS - D.GL, medium textured till, 3H

BVH (Beaver Hills)

Classification: Orthic Black (O.BL Chernozemic)
Agroclimate: 2H; Energy index value 1200
Parent Material: Medium textured, weakly to moderately calcareous till with 2-15% coarse fragments.
Physiography: Morainal materials associated with the Northern Valley Plain, St. Paul Plain, Therien Upland and Whitney Lowlands.
Comments: Developed on the same parent material as AGS. Characteristics are similar to AGS except they lack an Ae horizon beneath the Ap or Ah(e).

Competing series:
AGS - E.BL, medium textured till, 2H
FLU - O.DG, medium textured till, 2H
FRY - E.BL, medium textured till, 3H
KHW - O.DG, medium textured till, 3H
NTV - E.BL, coarse glaciofluvial/medium textured till, 3H
POK - E.BL, medium textured glaciolacustrine, 2H

COA (Cooking Lake)

Classification: Orthic Gray Luvisol (O.GL)
Agroclimate: 3H; Energy index value 1150.
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Morainal materials associated with the Alma Plain, Dolo Upland, Northern Valley Plain, St. Paul Plain, Therien Upland and Whitney Lowlands.
Comments: Within the Therien Upland the COA soils occur on thrusted morainal material so the texture of the parent material is variable; scl-c.

Selected attributes of a COA pedon
(SW12-Tp57-R8-W4; samples 88 - 10-14)

	LFH	Ah	Ae	Bt1	Bt2	BC
Depth, cm	6-0	0-2	2-12	12-27	27-60	60-85
pH $CaCl_2$	6.3	-	5.4	5.4	5.2	4.9
Organic C, %	-	-	0.6	-	-	-
CEC, cmol/kg	116	-	8.2	18.9	24.4	25.9
$CaCO_3$ equiv. %	-	-	-	-	-	-
% S	-	-	48	36	36	36
% Si	-	-	35	31	27	28
% C	-	-	17	33	37	36
Texture	-	-	l	cl	cl	cl

Notes: COA profiles are associated with Aspen tree vegetation. Calcareousness class of the till for this soil varies from weak to moderate ($CaCO_3$ equiv. <5-15%) within the County.

Competing Series:
AGS - E.BL, medium textured till, 2H
LCY - O.GL, medium textured till, 3H
SDN - D.GL, medium textured till, 3H
UCS - D.GL, medium textured till, 3H

CTW (Chatwin)

Classification: Typic Mesisol (TY.M)
Agroclimate: 3H, Energy index value 1100
Parent Material: Mesic fen peat, more than 160 cm thick.
Physiography: Mapped on organic wetland forms (fens) associated with Bunder Upland, Kehiwin Plain, Mann Lake Upland, Muriel Highlands, St. Paul Plain, Sugden Plain, Therien Upland, Vincent Upland and Whitney Lowlands.
Comments: Mapped throughout County, from the 2-3H to 4H Agroclimatic zones. Associated vegetative cover consists of Black spruce, willows, mosses and sedges.

Appendix B. *(continued)*

Selected attributes of a CTW pedon
(NW10-Tp64-R11-W4; from Sand River Report)

	Of1	Om1	Om2
Depth, cm	0-25	25-86	86-142+
pH $CaCl_2$	5.0	5.6	5.2
Organic C, %	40	33.9	33.8
CEC, cmol/kg	106	172	170
Rubbed fiber, %	70	22	12
Ash content, %	5.7	8.7	9.9

Notes: Material composition is fen and forest fen peat. pH's are variable, ranging from 5.0 to 8.0.

Competing Series:
DDE - TY.F, fibric sedge fen peat, 3H
MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H
SBN - TY.F, fibric sphagnum peat, 4H
TCK - T.Me.F, fibric sphagnum bog peat/medium textured till, 4H

DDE (Drysdale)

Classification: Typic Fibrisol (TY.F)
Agroclimate: 3H; Energy index value 1100
Parent Material: Fibric fen peat (>160 cm thick)
Physiography: Mapped on level organic wetland forms (fens) associated with Bunder Upland, Kehiwin Plain, Muriel Highland, St. Paul Plain, Sugden Plain and the Therien Upland.
Comments: Mapped throughout the County with 2-3H to 4H agroclimate zones.

Selected attributes of a DDE pedon
(NE21-Tp56-R9-W4; Samples 89 - 120-122)

	Of1	Of2	O3
Depth, cm	0-20	20-120	120-160
pH $CaCl_2$	6.3	6.2	6.4
Organic C, %	41.7	51.4	48.0
CEC, cmol/kg	94.0	92.4	87.5
Rubbed fiber content, %	52.8	27.4	35.7
Ash content, %	19.2	7.0	7.6
Wood material (% vol.)	<10	<10	<10

Note: The fen peat composition is brown moss and sedge. These floating fen soils often contain hydric layers within the control section.

Competing Soils:
CTW - TY.M, mesic fen and forest fen peat, 3H
MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H
SBN - TY.F, fibric sphagnum peat, 4H

EDW (Edwand)

Classification: Eluviated Eutric Brunisol (E.EB)
Agroclimate: 3H; Energy index value 1100
Parent Material: Gravelly and stony, (>20% coarse fragments) coarse textured (s-sl) glaciofluvial.
Physiography: Mapped on hummocky and inclined glaciofluvial materials associated with the Gadois Plain, Sugden Plain and Whitney Lowlands.
Comments: Mapped in association with NIT soils. Also, EDW soils are within delineations of other soil names, containing the soil map unit number "6".

Selected attributes of a EDW pedon
(NW7-Tp57-R5-W4; Samples 89 - 108-112)

	Ahe	Ae	Bm	IIBm	ABC
Depth, cm	0-3	3-13	13-23	23-70	70-100+
pH $CaCl_2$	5.2	5.2	5.5	5.5	6.1
Organic C, %	4.9	.3	-	-	-
CEC, cmol/kg	20.4	3.0	4.7	4.7	2.8
% S	81	8.5	91	91	95
% Si	16	11	3	3	1
% C	3	4	6	6	4
Texture	ls	ls	s	s	s
Coarse fragment, %	10	10	50	50	10

Note: An LFH layer, between 2-10 cm thick, overlies the mineral horizons.

Competing Series:
FTH - O.BL, gravelly & stoney, coarse textured glaciofluvial, 2H
HOD - O.GL, coarse glaciofluvial/medium textured till, 3H
HLW - O.DG, coarse textured glaciofluvial, 3H
NIT - E.EB, sandy glaciofluvial, 3H

ELP (Elk Point)

Classification: Dark Gray Luvisol (D.GL)
Agroclimate: 3H; Energy index value 1150
Parent Material: Coarse textured (sl), weakly calcareous glaciofluvial with 2-15% coarse fragments.
Physiography: Mapped on undulating to hummocky and inclined glaciofluvial materials associated with the Kehiwin Plain, Northern Valley Plain, Sugden Plain and the Whitney Lowlands.

Selected attributes of a ELP pedon
(NE14-Tp56-R6-W4; Samples 89 - 102-106)

	Ap	Ae	AB	Bt	Ck
Depth, cm	0-20	20-33	33-43	48-73	73-100
pH $CaCl_2$	6.5	7.1	7.2	7.5	7.9
Organic C, %	3.4	1.0	-	-	-
CEC, cmol/kg	22.8	12.8	9.7	17.4	-
$CaCO_3$ eq., %	-	-	-	-	3.8
% S	43	40	57	48	65
% Si	46	46	27	28	25
% C	11	14	16	24	10
Texture	l	l	sl	l	sl
Coarse fragment %	10	10	10	50	10

Competing Series:
GBL - D.GL, coarse textured glaciofluvial veneer/till, 3H
HLW - O.DG, coarse textured glaciofluvial, 3H
HOD - O.GL, coarse textured glaciofluvial veneer/till, 3H
MSW - E.BL, coarse textured glaciofluvial, 3H

FRY (Fergy)

Classification: Eluviated Black (E.BL, Chernozemic)
Agroclimate: 3H; Energy index value 1100

Appendix B. *(continued)*

Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on morainal materials associated with the Gadois Plain, Mann Lake Upland, Sugden Plain, Vilna Plain and Vincent Upland.
Comments: Calcareousness class of the till varies from weakly to moderate within the County.

Selected attributes of a FRY pedon
(NW24-Tp58-R12-W4; from Sand River Report)

	Ap	Ae	Bt	BC	Ck	IICK
Depth, cm	0-18	18-20	20-46	46-69	69-89	89-100
pH H_2O	6.8	6.4	6.1	6.2	7.7	7.7
pH $CaCl_2$	6.4	6.0	5.7	5.8	7.5	7.5
Organic C, %	4.5	1.1	1.1	-	-	-
CEC, cmol/kg	26.6	12.5	18.3	14.3	-	-
$CaCO_3$ eq., %	-	-	-	-	7.1	4.9
% S	43	39	35	44	53	44
% Si	39	45	37	35	29	29
% C	18	16	27	21	18	27
Texture	l	l	cl	cl	sl	l

Competing Series:
AGS - E.BL, medium textured till, 2H
KHW - O.DG, medium textured till, 3H
SDN - D.GL, medium textured till, 3H
UCS - D.GL, medium textured till, 3H
VIL - G.EBL, medium textured till, 3H

FTH (Ferintosh)

Classification: Orthic Black (O.BL, Chernozemic)
Agroclimate: 2H; Energy index value 1200
Parent Material: Gravelly (>20% coarse fragments) coarse textured (s-ls), weakly calcareous glaciofluvial.
Physiography: Mapped on glaciofluvial materials with undulating to hummocky surface forms associated with the Alma Plain, Northern Valley Plain and the Whitney Lowlands.
Comments: Soil name also used within the 3H Agroclimatic zone, to a limited extent.

Selected attributes of a FTH pedon
(SE14-Tp56-R15-W4; from Two Hills Report)

	Ah	Bm	BC	CK
Depth, cm	0-18	18-33	33-51	51+
pH $CaCl_2$	6.9	6.7	6.9	7.0
Organic C, %	5.1	2.7	-	-
CEC, cmol/kg	25.5	16.7	9.2	-
$CaCO_3$ eq., %	-	-	0.4	2.4
% S	59	62	83	84
% Si	28	23	12	12
% C	13	15	5	4
Texture	sl	sl	ls	ls
% coarse fragments	<20	>20	>20	>20

Note: The sl textured veneer, with <20% coarse fragments must be less than 30 cm thick, otherwise the soil series is ATM.

Competing Series:
ATM - O.BL, sl veneer/gravel, 2H
EDW - E.EB, sands and gravel, 3H

FWT (Fawcett)

Classification: Dark Gray Luvisol (D.GL)
Agroclimate: 3H; Energy index value 1150
Parent Material: Medium textured, weakly calcareous glaciolacustrine with 0-15% coarse fragments.
Physiography: Mapped on hummocky glaciolacustrine materials in association with the Therien Upland.
Comments: Within the County, these soils occur on high relief (hummocks) with elevation differences of >30 m).

Selected attributes of a FWT pedon
(SW20-Tp53-R7-W4; from Two Hills Report)

	Ah	Ahe	Ae	Bt1	Bt2	BC	CK
Depth, cm	0-8	8-20	20-33	33-53	53-71	71-122	122+
pH $CaCl_2$	6.4	6.1	5.8	5.3	5.9	6.5	6.9
Organic C, %	3.5	2.1	0.7	0.5	0.4	-	-
CEC, cmol/kg	27.5	16.7	9.4	16.1	15.5	17.4	13.0
$CaCO_3$ eq., %	-	-	-	-	-	-	2.2
% S	43	55	65	65	67	66	36
% Si	34	36	22	13	12	11	41
% C	23	9	13	22	21	23	23
Texture	l	sl	sl	scl	scl	scl	l

Notes: The texture and calcareousness of the parent material are variable. They may be siltier and more calcareous than shown in the above profile example.

Competing Series:
POK - E.BL, medium textured glaciolacustrine, 2H
UCS - D.GL, medium textured till, 3H

GBL (Gabriel)

Classification: Dark Gray Luvisol (D.GL)
Agroclimate: 3H; Energy index value 1150
Parent Material: Medium textured glaciofluvial veneer (>30, <100 cm) overlying medium textured till. Both materials contain 2-15% coarse fragments.
Physiography: Mapped on glaciofluvial and morainal materials associated with the Dolo Upland, Gadois Plain, Mann Lake Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain, Sugden Plain, Therien Upland, Vilna Plain and Whitney Lowlands.
Comments: Primarily mapped in the 2-3H Agroclimatic zone. However this soil is used to a limited extent as a dominant soil within SDN soil units, in the 3H zone.

Selected attributes of a GBL pedon
(NW26-Tp55-R9-W4; Samples 88 - 49-53)

	Ahe	Ae	Bm	IIBt	IIBC
Depth, cm	0-6	6-15	15-50	50-70	70-100
pH $CaCl_2$	4.9	5.3	5.4	5.9	6.2
Organic C, %	8.7	0.7	-	-	-
CEC, cmol/kg	38	7.4	5.2	14.7	14.2
$CaCO_3$ eq., %	-	-	-	-	-
% S	67	76	88	49	49
% Si	28	18	6	26	26
% C	5	6	6	25	25
Texture	sl	sl	s	scl	scl

Note: This GBL profile is not typical since the Bm horizon is very coarse textured, but this variability is typical of glaciofluvial materials.

Appendix B. *(continued)*

Competing Series:
AGS - E.BL, medium textured till, 2H
ELP - D.GL, coarse textured glaciofluvial, 3H

GMT (Grosmont)

Classification: Dark Gray Luvisol (D.GL)
Agroclimate: 4H; Energy index value <1050
Parent Material: Medium textured, weakly calcareous till with 2-15% coarse fragments.
Physiography: Mapped on hummocky thrust morainal materials, associated with the Bunder Upland and Muriel Highland.
Comments: Mapped with ABC soils. Profile characteristics are similar to ABC soils, except the surface layer, an Ap or Ahe, is dark gray in colour. Therefore, the organic C% of this horizon is greater than the Ae horizon of the ABC soil. Typical horizon sequence of a GMT soil is Ap, Ae, Bt, Ck.
Competing Series:
ABC - O.GL, medium textured till, 4H
GDI - O.GL, fine textured till, 4H
LCY - O.GL, medium textured till, 3H
SDN - D.GL, medium textured till, 3H
WST - D.GL, fine textured till, 4H

GOG (Goodridge)

Classification: Orthic Gray Luvisol (O.GL)
Agroclimate: 3H; Energy index value 1150
Parent Material: Coarse textured (sl), weakly calcareous till with 2-15% coarse fragments.
Physiography: Mapped on fluted morainal materials associated with the Kehiwin Plain.
Comments: The till contains stones and boulders (some >60 cm in diameter). Upon removal of the brush, surface stoniness is often a limitation to cultivation.

Selected attributes of a GOG pedon
(SE30-Tp58-R7-W4; Samples 88 - 15-18)

	Ae	Bt1	Bt2	BC
Depth, cm	0-20	20-50	50-70	70-100
pH $CaCl_2$	4.4	5.2	5.4	5.5
Organic C, %	0.3	-	-	-
CEC, cmol/kg	4.5	15.5	11.5	6.2
$CaCO_3$ eq., %	-	-	-	-
% S	64	60	67	75
% Si	30	19	18	15
% C	6	21	15	10
Texture	sl	scl	sl	sl

Notes: A LFH layer, between 5-10 cm thick, overlies the Ae. The texture of the till is dominantly sl but layers or lenses of coarser (ls) materials may be encountered within profiles.

Competing Series:
GBL - D.GL, coarse textured glaciofluvial/till, 3H
LCY - O.GL, medium textured till, 3H
SDN - D.GL, medium textured till, 3H

GRZ (Gratz)

Classification: Cumulic Humic Regosol (Cu.HR)
Agroclimate: 2H; Energy index values 1200
Parent Material: Nongravelly, medium textured, moderately calcareous fluvial materials.
Physiography: Mapped on the fluvial terraces adjacent to the North Saskatchewan River.
Comments: Mapped in association with POK soils.

Selected attributes of a GRZ pedon
(SW8-Tp56-R7-W4; Samples 88 - 143-147)

	Apk	Ck1	Ck2	Ck3	Ck4
Depth, cm	0-15	15-40	41-58	61-87	90-100+
pH $CaCl_2$	7.3	7.6	7.7	7.7	
Organic C, %	6.7	-	-	-	7.6
CEC, cmol/kg	-	-	-	-	-
$CaCO_3$ eq., %	0.6	11.9	13.2	11.4	-
% S	32	53	37	57	12.7
% Si	54	37	51	33	35
% C	14	10	12	10	53
Texture	sil	sl	l	sl	12 l

Notes: Buried Ah horizons occur in between the successive Ck horizons. That is why the depths in the above table are not consecutive. These buried layers were not sampled.

Competing Series:
KSY - R.HG, medium textured glaciolacustrine, 3H
MSW - E.BL, coarse textured glaciofluvial, 3H
POK - E.BL, medium textured glaciolacustrine, 2H

HLW (Helliwell)

Classification: Orthic Dark Gray (O.DG, Chernozemic)
Agroclimate: 3H; Energy index value 1150
Parent Material: Coarse textured (ls-s), weakly calcareous glaciofluvial with 2-15% coarse fragments.
Physiography: Mapped on hummocky glaciofluvial materials associated with the Alma Plain, Kehiwin Plain, Northern Valley Plain, Sugden Plain, Therien Upland and the Whitney Lowlands.
Comments: DG equivalent of MGS soils. Therefore the characteristics are similar, except the surface layer contains less organic matter and is dark gray in colour.
Competing Series:
MGS - O.BL, coarse textured glaciofluvial, 2H
NIT - E.EB, sandy glaciofluvial, 3H

HOD (Hoadley)

Classification: Orthic Gray Luvisol (O.GL)
Agroclimate: 3H; Energy index value 1100
Parent Material: Coarse textured (sl-ls) glaciofluvial veneer (>30, <100 cm) over medium textured till. Both materials contain 2-15% coarse fragments.
Physiography: Mapped on undulating to hummocky glaciofluvial and morainal materials associated with the Gadois Plain, Kehiwin Plain and the Sugden Plain.
Comments: The glaciofluvial veneer is more than 30 cm thick and the Bt horizon may be within this veneer. Typical horizon sequence is LFH, Ae, Bt, IIBt, IIBC.

Appendix B. *(continued)*

Competing Series:
ELP - D.GL, coarse textured glaciofluvial, 3H
GBL - D.GL, coarse textured glaciofluvial/till, 3H
MHL - O.GL, coarse textured glaciofluvial/till, 4H

HYL (Hairy Hill)

Classification: Rego Humic Gleysol (R.HG)
Agroclimate: 2H; Energy Index value 1200
Parent Material: Medium textured, moderately saline and moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on level to undulating morainal materials associated with the St. Paul Plain and Therien Upland.
Comments: Classification of these profiles is difficult and arbitrary since the B horizons are weakly developed.

Selected attributes of a HYL pedon
(SE32-Tp55-R14-W4; Two Hills Report)

	Ahks	ACksg	Ccasg
Depth, cm	0-18	18-46	46-68
pH $CaCl_2$	7.7	8.5	8.6
Organic C, %	2.9	-	-
EC, mS/cm	>4	>4	>8
$CaCO_3$ eq., %	6.3	6.8	15.3
% S	65	39	61
% Si	23	34	24
% C	12	27	15
Texture	sl	cl	sl

Note: The horizon designation of the second layer has been altered from Two Hills Report. The existence of a B horizon is unlikely for such a calcareous and saline profile. Texture of the lower layer is coarser than the norm, should be loam to clay loam.

Competing Series:
JVE - HU.LG, medium textured glaciolacustrine, 3H
KSY - R.HG, medium textured glaciolacustrine, 3H

JVE (Jarvie)

Classification: Humic Luvic Gleysol (HU.LG)
Agroclimate: 3H; Energy Index value 1150
Parent Material: Nongravelly, medium textured glaciolacustrine
Physiography: Mapped on level lacustrine areas within morainal materials associated with the St. Paul Plain.
Comments: Profile characteristics are similar to the POK soils except that there are distinct mottles within 50 cm and prominent mottles within the control section. These soils are mapped in association with COA soils.
Competing Series:
COA - O.GL, medium textured till, 3H
HYL - O.HG, medium textured till, 2-3H
KSY - R.HG, medium textured glaciolacustrine, 3H
POK - E.BL, medium textured glaciolacustrine, 2H

KHW (Kehiwin)

Classification: Orthic Dark Gray (O.DG, Chernozemic)
Agroclimate: 3H; Energy index value 1100
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on undulating, hummocky and ridged morainal materials associated with Mann Lake Upland, Sugden Plain, Vilna Plain and the Vincent Upland.
Comments: KHW soils are mapped with SDN soils. These soil map units are used extensively for describing cultivated landscapes. The KHW profiles are usually eroded SDN profiles.

Selected attributes of a KHW pedon
(WC5-Tp61-R10-W4; Samples 89 - 26-28)

	Ap	Bt	BC
Depth, cm	0-16	16-70	70-90+
pH $CaCl_2$	5.7	5.0	6.4
Organic C, %	1.1	-	-
CEC, cmol/kg	18.2	25.4	23.7
% S	48	35	34
% Si	28	26	30
% C	24	39	36
Texture	l	cl	cl

Note: The Bt horizon has good angular, blocky structure and many clay skins.

Competing Series:
FRY - E.BL, medium textured till, 3H
LCY - O.GL, medium textured till, 3H
SDN - D.GL, medium textured till, 3H

KSY (Kerensky)

Classification: Rego Humic Gleysol (R.HG)
Agroclimate: 3H; Energy index value 1100
Parent Material: Medium textured, moderately calcareous glaciolacustrine
Physiography: Mapped on level lacustrine materials associated with the Alma Plain, Dolo Upland, Gadois Plain, Kehiwin Plain, Mann Lake Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain, Sugden Plain, Therien Upland, Vilna Plain, Vincent Plain and the Whitney Lowlands.
Comments: Most common Gleysolic soil mapped in the County of St. Paul.

Selected attributes of a KSY pedon
(CanSIS profile 60-83; SW28-Tp60-R19-W4, from Tawatinaw Map sheet)

	Om	Ahkg	ACg1	ACg2	Ckg1	Ckg2
Depth, cm	13-0	0-23	23-46	46-64	64-81	81-110
pH $CaCl_2$	7.0	7.7	7.7	7.9	7.7	7.7
Organic C, %	35.8	2.9	1.5	2.0	0.5	0.2
CEC, cmol/kg	93	21	17	21	11	11
$CaCO_3$ eq., %	6	4	3	1	14	8
% S	-	47	25	30	50	30
% Si	-	36	55	45	30	50
% C	-	17	20	25	20	20
Texture	-	l	sil	l	l	l

Note: Peaty surface (Oh) horizons are not always present within KSY profiles.

Appendix B. *(continued)*

Competing Series:
JVE - HU.LG, medium textured glaciolacustrine, 3H
MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H

LCY (La Corey)

Classification: Orthic Gray Luvisol (O.GL)
Agroclimate: 3H; Energy index value 1100
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on undulating to hummocky and fluted morainal materials associated with the Gadois Plain, Kehiwin Plain, Mann Lake Upland, Sugden Plain, Vilna Plain and Vincent Upland.

Selected attributes of a LCY pedon
(WC34-Tp57-R5-W4; Samples 87 - 08-12)

	Ahe	Ae	Bt	BC	Ck
Depth, cm	0-4	4-22	22-60	60-100	100-120+
pH $CaCl_2$	4.6	4.8	4.8	5.2	7.7
Organic C, %	2.9	0.3	-	-	-
CEC, cmol/kg	49.6	5.8	20.6	17.7	-
$CaCO_3$ eq., %	-	-	-	-	6.1
% S	63	60	41	43	40
% Si	32	27	24	25	30
% C	5	13	35	32	30
Texture	sl	sl	cl	cl	cl

Note: LFH layer 2-10 cm thick is usually present.

Competing Series:
ABC - O.GL, medium textured till, 4H
COA - O.GL, medium textured till, 3H
GOG - O.GL, coarse textured till, 3H
SDN - D.GL, medium textured till, 3H

MAA (Maughan)

Classification: Orthic Gray Luvisol (O.GL)
Agroclimate: 3H; Energy index value 1150
Parent Material: Medium textured, noncalcareous residual material with 2-15% coarse fragments.
Physiography: Mapped on bedrock controlled ridges associated with the Therien Upland.

Selected attributes of a MAA pedon
(SW4-Tp53-R7-W4; Two Hills Report)

	Ae	Bt	BC	C
Depth, cm	0-7	7-22	22-42	42+
pH $CaCl_2$	6.7	6.4	6.4	6.1
Organic C, %	1.1	0.5	-	-
CEC, cmol/kg	17.4	22.3	19.7	16.7
% S	40	29	51	54
% Si	34	34	21	19
% C	26	37	28	27
Texture	l	cl	scl	scl

Note: A LFH layer, between 2-10 cm thick, is generally present.

Competing Series:
COA - O.GL, medium textured till, 3H
UCS - D.GL, medium textured till, 3H

MGS (Morningside)

Classification: Orthic Black (O.BL, Chernozemic)
Agroclimate: 2H; Energy index value 1200
Parent Material: Coarse textured (ls-s), weakly calcareous glaciofluvial with 0-10% coarse fragments.
Physiography: Mapped on level to hummocky glaciofluvial materials associated with the Alma Plain, Northern Valley Plain and the Whitney Lowlands.

Selected attributes of a MGS pedon
(SW6-Tp57-R5-W4; Samples 88 - 68-72)

	Ap	Ah	Bm	BC	C
Depth, cm	0-12	12-20	20-39	39-61	61-100
pH $CaCl_2$	4.6	5.0	5.1	5.3	6.7
Organic C, %	3.7	1.8	.9	-	-
CEC, cmol/kg	17.9	11.8	9.2	1.7	1.0
$CaCO_3$ eq., %	-	-	-	-	0.2
% S	83	80	73	98	99
% Si	15	17	21	0	0
% C	2	3	6	2	1
Texture	ls	ls	sl	s	s

Notes: Surface horizons (Ap & Ah) are uncharacteristically thick within this profile. The A horizons are generally not greater than 15 cm.

Competing Series:
HLW - O.DG, coarse textured glaciofluvial, 3H
MSW - E.BL, coarse textured glaciofluvial, 3H
NIT - E.EB, sandy glaciofluvial, 3H

MHL (Moose Hills)

Classification: Orthic Gray Luvisol (O.GL)
Agroclimate: 4H; Energy index value <1050
Parent Material: Coarse textured (ls-sl), glaciofluvial veneer (>30, <100cm) over medium textured till. Both materials contain 2-15% coarse fragments.
Physiography: Mapped on hummocky glaciofluvial and morainal materials associated with the Muriel Highland and Gadois Plain.
Comments: Mapped with Athabasca (ABC) soils around the base and on the Muriel Highlands. The glaciofluvial veneer is greater than 30 cm thick overlying till. The till may contain layers or lenses of gravel.

Selected attributes of a MHL pedon
(SW24-Tp58-R6-W4; Samples 88 - 74-79)

	Ae1	Ae2	IIBt	IIBC
Depth, cm	0-12	12-37	37-95	95-100+
pH $CaCl_2$	4.4	4.6	4.4	5.2
Organic C, %	0.3	0.3	-	-
CEC, cmol/kg	2.8	4.4	14.3	2.1
$CaCO_3$ eq., %	-	-	-	-
% S	66	63	48	94
% Si	29	36	25	42
% C	5	7	27	4
Texture	sl	sl	cl	s

Notes: The IIIBC layer is an anomaly within this profile. However, this layer or lense is not an uncommon phenomenon within till. A LFH layer between 2-10 cm thick, generally overlies the Ae horizon.

Appendix B. *(continued)*

Competing Series:
ABC - O.GL, medium till, 4H
HOD - O.GL, coarse textured glaciofluvial/till, 3H

MNT (Manatokan)

Classification: Terric Mesisol (T.M)
Agroclimate: 3H; Energy index values 1100
Parent Material: Mesic fen peat (>40 cm, <160 cm thick) overlying medium textured (l-cl) glaciolacustrine or till.
Physiography: Mapped on organic wetland forms (fens) in all land units except Poitras Plain and Alma Plain.
Comments: Mapped throughout the County, from the 2-3H to 4H Agroclimate zones. Associated vegetative cover consists of black spruce, larch, willows, sedges and mosses.

Selected attributes of a MNT pedon
(SW21-Tp63-R3-W4; Sand River Report)

	Of	Om1	Om2
Depth, cm	0-8	8-74	74-102
pH $CaCl_2$	6.1	5.7	5.4
Organic C, %	41.4	43.6	49.8
CEC, cmol/kg	86.1	80.5	24.0
Rubbed fiber content, %	70	30	30
Ash content, %	11.5	7.8	56.8

Notes: The mineral material below the 102 cm depth is glaciofluvial sand within this profile. However, the most common mineral material is glaciolacustrine. This material is generally medium textured and moderately calcareous. Depth to the mineral contact varies from 80-150 cm. The pH's of the organic material are also variable, ranging from 5.0 - 8.0.

Competing Soils:
BLT - O.HG, medium textured glaciolacustrine, 4H
CTW - TY.M, mesic fen and forest fen peat, 3H
DDE - TY.F, fibric sedge fen peat, 3H
KSY - R.HG, medium textured glaciolacustrine, 3H
SBN - TY.F, fibric sphagnum peat, 4H
TCK - T.Me.F, fibric sphagnum bog peat/medium textured fluvial, 4H

MPV (Mapova)

Classification: Humic Luvic Gleysol (HU.LG)
Agroclimate: 3H; Energy index value 1100
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on morainal materials associated with the Mann Lake Upland and the Vincent Lake Upland.
Comments: Mapped in association with ONW soils.

Selected attributes of a MPV pedon
(SE32-Tp61-R6-W4; Sand River Report)

	Ah	Aeg	Btg	BCg	Ckg1	Ckg2
Depth, cm	0-13	13-20	20-33	33-61	61-94	94+
pH $CaCl_2$	6.2	6.9	6.1	6.2	7.1	7.4
Organic C, %	3.4	0.2	0.4	-	-	-
CEC, cmol/kg	20.3	3.7	20.6	17.5	12.4	-
$CaCO_3$ eq., %	-	-	-	-	3.5	6.2
% S	50	55	41	44	44	43
% Si	32	37	22	24	27	27
% C	18	8	37	32	29	30
Texture	sl	cl	cl	cl	cl	cl

Competing Series:
JVE - HU.LG, medium textured glaciolacustrine, 3H
KSY - R.HG, medium textured glaciolacustrine, 3H
MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H
ONW - O.HG, medium textured till, 3H

MSW (Mooswa)

Classification: Eluviated Black (E.BL, Chernozemic)
Agroclimate: 2H; Energy Index Value 1200
Parent Material: Coarse textured (sl), moderately calcareous glaciofluvial material with 2-15% coarse fragments.
Physiography: Mapped on undulating to hummocky glaciofluvial materials associated with the Kehiwin Plain, Northern Valley Plain, Poitras Plain, St. Paul Plain, Therien Upland and the Whitney Lowlands.

Selected attributes of a MSW pedon
(SW3-Tp56-R5-W4; Samples 89-68-73)

	Ah	Ahe	Ae	Btj	BC	Cca
Depth, cm	0-15	15-23	23-31	31-51	51-101	101+
pH $CaCl_2$	6.1	5.9	6.0	6.1		7.8
Organic C, %	4.4	1.0	0.6	-	6.1	-
CEC, cmol/kg	23.8	12.7	11.5	11.0	-	-
$CaCO_3$ eq., %	-	-	-	-	9.6	7.8
% S	37	52	51	44	-	55
% Si	58	34	34	41	48	31
% C	5	13	15	15	39	14
Texture	sil	sl	l	l	13	sl
					l	

Note: Under native vegetation an LFH layer, ranging from 1-5 cm thick, may be present.

Competing Series:
ELP - D.GL, coarse textured glaciofluvial, 3H
GBL - D.GL, coarse textured glaciofluvial/till, 3H
NTV - E.BL, coarse textured glaciofluvial/till, 2H

Appendix B. *(continued)*

NIT (Nicot)

Classification: Eluviated Eutric Brunisol (E.EB)
Agroclimate: 3H; Energy index value 1150
Parent Material: Coarse textured glaciofluvial with 0-10% coarse fragments.
Physiography: Mapped on undulating, hummocky and/or inclined glaciofluvial materials associated with the Alma Plain, Gadois Plain, Kehiwin Plain, Northern Valley Plain, Sugden Plain, Therien Upland, Vincent Upland and the Whitney Lowlands.

Selected attributes of a NIT pedon
(SE10-Tp62-R7-W4; Sand River Report)

	Ae	Bm1	Bm2	Bm3	C
Depth, cm	0-5	5-18	18-38	38-66	66+
pH $CaCl_2$	5.8	5.9	5.9	6.0	6.2
Organic C, %	0.4	0.3	0.1	-	-
CEC, cmol/kg	2.3	2.3	2.3	1.4	1.4
% S	90	85	86	96	96
% Si	8	13	12	2	2
% C	2	2	2	2	2
Texture	2	2	2	2	2

Notes: An LFH layer, 2-10 cm thick overlies the Ae horizon. The pH values of NIT soils are variable. If the pH of the B horizon is less than 5.5, the classification changes from Eutric to Dystric Brunisol. Some NIT soils are around this 5.5 pH split. However, the majority of these Brunisols are Eutric.

Competing Series:
MGS - O.BL, coarse textured glaciofluvial, 2H
NTW - EDY.B, sandy glaciofluvial, 3H

NTV (Northern Valley)

Classification: Eluviated Black (E.BL, Chernozemic)
Agroclimate: 2H; Energy index value 1200
Parent Material: Coarse textured (sl) glaciofluvial veneer (>30, 100cm) over medium textured, moderately calcareous till. Both materials contain 2-15% coarse fragments.
Physiography: Mapped on undulating, hummocky and/or inclined glaciofluvial and morainal materials associated with the Alma Plain, Northern Valley Plain and Whitney Lowlands.
Comments: The till, associated with NTV soils, commonly contains discrete lenses of sand.

Selected attributes of a NTV pedon
(NW9-Tp55-R3-W4; Sample 87-23-28)

	Ap	Ahe	Ae	Btj	IIBC	IICK
Depth, cm	0-15	15-30	30-40	40-50	50-70	70+
pH $CaCl_2$	5.4	6.1	6.1	6.3	7.2	7.9
Organic C, %	4.2	1.2	0.7	0.3	-	-
CEC, cmol/kg	19.8	12.3	8.0	7.5	-	-
$CaCO_3$ eq., %	-	-	-	-	-	12.0
% S	76	72	77	78	52	48
% Si	17	17	14	10	23	24
% C	7	11	9	12	24	28
Texture	sl	sl	sl	sl	scl	scl

Competing Series:
AGS - E.BL, medium textured till, 2H
GBL - D.GL, coarse textured glaciofluvial/till, 3H
MSW - E.BL, medium textured glaciofluvial, 3H

NWB (Newbrook)

Classification: Orthic Luvic Gleysol (O.LG)
Agroclimate: 4H; Energy index value 1050
Parent Material: Medium textured till with 2-15% coarse fragments.
Physiography: Mapped on morainal materials associated with the Muriel Highland.
Comments: Mapped in association with ABC soils.

Selected attributes of a NWB pedon
(CanSIS profile 68-1000; SE21-Tp63-R20-W4, from Tawatinaw Map sheet)

	Ah	Aegj	Btg1	Btg2	BCg1	BCg2	Cg
Depth, cm	0-5	5-28	28-38	38-63	63-84	84-137	137-182
pH $CaCl_2$	6.2	5.7	5.4	5.3	5.7	5.3	
Organic C, %	4.6	0.8	0.7	0.4	0.4	-	6.2
CEC, cmol/kg	30.5	15.7	20.2	16.2	11.8	17.9	-
% S	30	29	22	43	46	42	17.3
% Si	46	50	51	30	37	30	41
% C	24	21	27	27	17	28	33
Texture	l	l	cl	cl	l	cl	26 l

Note: A peaty organic layer, less than 15 cm thick may overlie the mineral material.

Competing Series:
BLT - O.HG, medium textured glaciolacustrine, 4H
MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H

ONW (Onoway)

Classification: Orthic Humic Gleysol (O.HG)
Agroclimate: 3H; Energy index value 1100
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on morainal materials associated with the Mann Lake Upland and the Vincent Upland.

Selected attributes of a ONW pedon
(from Tawatinaw report)

	Of-h	Ahg	Bg	Ccag	CKg
Depth, cm	12-0	0-18	18-38	38-74	74-102
pH $CaCl_2$	7.1	7.3	7.1	7.4	7.4
Organic C, %	-	1.3	0.3	-	-
CEC, cmol/kg	15.3	16.9	15.2	-	-
$CaCo_3$ eq., %	2.0	0.2	0.6	6.2	3.0
% S	-	71	-	-	48
% Si	-	18	-	-	31
% C	-	11	-	-	21
Texture	-	sl	-	-	l

Note: A peaty organic layer, less than 15 cm thick, often overlies the mineral material.

Competing Series:
BLT - O.HG, medium textured glaciolacustrine, 4H
HYL - O.HG, medium textured till, 2-3H
JVE - HU.LG, medium textured glaciofluvial, 3H

Appendix B. *(continued)*

MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H
MPV - HU.LG, medium textured till, 3H

PIB (Pibroch)

Classification: Gleyed Eluviated Black (GLE.BL, Chernozemic)
Agroclimate: 2H; Energy index value 1200
Parent Material: Moderately calcareous, medium textured till with 2-15% coarse fragments.
Physiography: Mapped on undulating to level morainal materials associated with the St. Edouard Plain and St. Paul Plain.
Comments: Mapped in association with AGS soils. Distinct mottles indicating a semi-permanent water table, are present in the profile within 50 cm of the surface.

Selected attributes of a PIB pedon
(SW9-Tp58-R8-W4; Samples 89-97-100)

	Ap	Ae	Btjg	Ccag
Depth, cm	0-18	18-28	28-71	71-100
pH $CaCl_2$	6.0	6.7	7.1	7.8
Organic C, %	4.6	.5	-	-
CEC, cmol/kg	33	19	23	-
$CaCO_3$ eq., %	-	-	.1	12.5
% S	35	43	34	26
% Si	49	24	30	37
% C	16	33	36	37
Texture	l	cl	cl	cl

Competing Series:
AGS - E.BL, medium textured till, 2H
BOB - G.DGL, medium textured till, 2-3H
UCS - D.GL, medium textured till, 3H

POK (Ponoka)

Classification: Eluviated Black (E.BL, Chernozemic)
Agroclimate: 2H; Energy index value 1200
Parent Material: Nongravelly (<2% coarse fragments), medium textured, moderately calcareous glaciolacustrine
Physiography: Mapped on glaciolacustrine materials associated with the Mann Lake Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain, Therien Upland, Whitney Lowland and on the terraces adjacent to the North Saskatchewan River.

Selected attributes of a POK pedon
(NW22-Tp58-R11-W4; Samples 88 - 102-106)

	Ap	Ae	Bt	BC	CK
Depth, cm	0-23	23-33	33-65	65-95	95-100
pH $CaCl_2$	5.7	6.3	6.1	6.4	7.5
Organic C, %	6.1	0.4	-	-	-
CEC, cmol/kg	38.4	12.3	18.2	19.3	-
$CaCO_3$ eq., %	-	-	-	-	3.9
% S	40	51	36	23	44
% Si	46	30	27	45	32
% C	14	19	27	32	24
Texture	l	l	l	cl	l

Note: The $CaCO_3$ equivalent % of this profile is lower than usual; it should be in the range of 5-15%.

Competing Series:
AGS - E.BL, medium textured till, 2H
MSW - E.BL, coarse textured glaciofluvial, 3H
PIB - GLE.BL, medium textured till, 2H

RDW (Redwater)

Classification: Orthic Dark Gray (O.DG, Chernozemic)
Agroclimate: 3H, Energy index value 1150
Parent Material: Coarse textured (sl) glaciofluvial with 2-15% coarse fragments.
Physiography: Mapped on hummocky glaciofluvial materials associated with the Alma Plain, Kehiwin Plain, Northern Valley Plain, Therien Upland and Whitney Lowland.
Comments: RDW soils are mapped in the 2-3H agroclimatic zones within the County of St. Paul. These soils occur in association with Black Chernozemic soils, therefore the energy index value is borderline 3H. Profile characteristics are similar to MSW soils except the organic C% of the Ah layer is lower and the Ae layer, if present, is less than 5 cm thick.
Competing Series:
ELP - D.GL, coarse textured (sl) glaciofluvial, 3H
HLW - O.DG, coarse textured (s-ls) glaciofluvial, 3H
MSW - E.BL, coarse textured glaciofluvial, 2H
POK - E.BL, medium textured glaciolacustrine, 2H
RMY - O.DG, medium textured glaciolacustrine, 3H

RMY (Rimbey)

Classification: Orthic Dark Gray (O.DG, Chernozemic)
Agroclimate: 3H; Energy index value 1150
Parent Material: Nongravelly (<2% coarse fragments), medium textured, moderately calcareous glaciolacustrine.
Physiography: Mapped on hummocky glaciolacustrine materials associated with the Therien Upland and the Whitney Lowland.
Comments: RMY soils mapped in the 2-3H agroclimatic zone within the County of St. Paul. These soils occur in association with Black Chernozemic soils.

Selected attributes of a RMY pedon
(NW10-Tp63-R4-W4; from Sand River Report)

	Ah	Ahe	Bt	BC	CK
Depth, cm	0-20	20-25	25-48	48-61	61+
pH $CaCl_2$	6.0	-	6.3	6.8	7.6
Organic C, %	4.6	-	0.8	-	-
CEC, cmol/kg	33.2	-	21.9	20.8	-
$CaCO_3$ eq., %	-	-	-	0.5	12.4
% S	1	-	-	-	-
% Si	66	-	58	62	66
% C	33	-	42	38	34
Texture	sicl	-	sic	sicl	sicl

Note: The texture of the parent material is generally silt loam to clay loam.

Competing Series:
AGS - E.BL, medium textured till, 2H
FWT - D.GL, medium textured glaciofluvial, 3H
POK - E.BL, medium textured glaciolacustrine, 2H

Appendix B. *(continued)*

SBN (Stebbing)

Classification: Typic Fibrisol (Ty.F)
Agroclimate: 4H; Energy index value <1050
Parent Material: Very strongly to extremely acid, fibric sphagnum bog peat (>160 cm thick)
Physiography: Mapped on organic wetland forms associated with Bunder Upland, Sugden Plain and Vincent Upland.
Comments: Agroclimate of this soil is 4H, but it is mapped in 3H areas. Vegetation consists of dominantly Black spruce, lowbrush cranberry, Labrador tea and sphagnum moss.

Selected attributes of a SBN pedon
(SW25-Tp68-R13-W4; from Sand River Report)

	Of1	Of2	Of3
Depth, cm	0-33	33-142	142-157+
pH $CaCl_2$	2.8	2.9	-
Organic C, %	38.7	44.8	45.8
CEC, cmol/kg	107.3	136.0	119.1
Rubbed fiber content, %	74	56	-
Ash content, %	7.8	1.8	-

Notes: The above pH values are lower than values obtained from County of St. Paul samples. However, pH values of SBN organic materials are always less than 5.0.

Competing Soils:
BLA - T.F, fibric bog peat/medium till, 4H
CTW - TY.M, mesic fen and forest fen peat, 3H
DDE - TY.F, fibric fen peat, 3H
MNT - T.M, mesic fen and forest fen peat/medium textured glaciolacustrine, 3H

SDN (Spedden)

Classification: Dark Gray Luvisol (D.GL)
Agroclimate: 3H; Energy index value 1150
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on undulating to hummocky, fluted morainal materials associated with the Gadois Plain, Kehiwin Plain, Mann Lake Upland, Sugden Plain, Vilna Plain and Vincent Upland.
Comments: Mapped in association with FRY and LCY soils. Profile characteristics are similar to these soils except the surface Ap or Ah horizon is dark gray in colour. Therefore, the organic C% of the surface horizons is less than similar horizons from FRY soils.

TCK(Tucker)

Classification: Terric Mesic Fibrisol (TME.F)
Agroclimate: 4H; Energy index value <1050
Parent Material: Mesic and fibric bog peat (<160 cm thick)
Physiography: Mapped on organic wetland forms associated with the Bunder Plain, Sugden Plain and Vincent Upland.
Comments: Mapped in association with CTW soils. The TCK soils are associated with the isolated bogs within the fen organic landform. The organic component of the TCK is dominantly fibric but there is at least 25 cm of mesic decomposed organic material. The mineral contact is between 80-150 cm from the surface. This mineral material is weakly to moderately calcareous and medium textured glaciofluvial, lacustrine or till. The characteristics of the organic layer are similar to SBN and CTW for the appropriately decomposed layers - ie. pH of the Of layer is 4.5, and >5 for the Om layer.
Competing Series:
BLA - T.F, fibric sphagnum bog peat/medium till, 4H
CTW - TY.M, mesic fen and forest fen peat, 3H
MNT - T.M, mesic fen or forest fen peat/medium textured glaciolacustrine, 3H
SBN - TY.F, fibric sphagnum peat, 4H

TWH (Two Hills)

Classification: Orthic Dark Gray (O.DG, Chernozemic)
Agroclimate: 3H; Energy index value 1150
Parent Material: Gravelly and cobbly (15-35% coarse fragments) medium textured, weakly calcareous glaciofluvial.
Physiography: Mapped on hummocky glaciofluvial materials associated with the Poitras Plain and the Therien Upland.
Comments: Surface stones consisting of gravels, cobbles and occasional boulders are a problem for cultivation practices.

Selected attributes of a TWH pedon
(NW32-Tp53-R10-W4; from Two Hills Report)

	Ah	Ahe	Btj	BC
Depth, cm	0-13	13-20	20-40	40+
pH $CaCl_2$	5.4	5.7	6.2	7.5
Organic C, %	7.9	4.6	1.3	-
CEC, cmol/kg	40	26	14	-
$CaCO_3$ eq., %	-	-	-	-
% S	44	49	54	82
% Si	37	32	32	9
% C	19	19	14	9
Texture	l	l	sl	ls

Notes: The coarse fragment content is variable throughout the profile. After 30 cm, content is greater than 20%. This pedon is a variant; the texture of the B and C horizons are coarser textured than normal.

Competing Series:
AGS - E.BL, medium textured till, 2H
MGS - O.BL, coarse textured glaciofluvial, 2H

UCS (Uncas)

Classification: Dark Gray Luvisol (D.GL)
Agroclimate: 3H, Energy index value 1150
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on undulating and hummocky, fluted morainal landforms associated with the Alma Plain, Dolo Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain and the Therien Upland.

Appendix B. *(continued)*

Comments: Mapped in association with COA and AGS within Agroclimatic zone 2-3H.

Selected attributes of a UCS pedon
(NW20-Tp55-R7-W4; from Two Hills Report)

	Ah	Ahe	Ae	Bt1	Bt2	BC	CK
Depth, cm	0-5	5-18	18-31	31-51	51-69	69-87	87+
pH $CaCl_2$	7.0	6.6	5.8	6.1	6.3	6.5	7.6
Organic C, %	8.2	3.2	0.9	0.5	0.5	-	-
CEC, cmol/kg	26.5	21.5	10.3	15.0	13.7	12.6	-
$CaCO_3$ eq., %	-	-	-	-	-	-	6.2
% S	44	45	34	45	49	50	51
% Si	35	32	45	25	23	23	23
% C	21	23	21	30	28	27	26
Texture	l	l	l	cl	scl	scl	scl

Competing Series:
AGS - E.BL, medium textured till, 2H
BOB - GLD.GL, medium textured till, 2-3H
COA - O.GL, medium textured till, 3H
PIB - GLE.BL, medium textured till, 2H
SDN - D.GL, medium textured till, 3H

VIL (Vilna)

Classification: Gleyed Eluviated Black (GLE.BL, Chernozemic)
Agroclimate: 3H; Energy index values 1100
Parent Material: Medium textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on level to undulating morainal materials associated with the Sugden Plain and Vincent Upland.
Comments: Mapped in association with SDN soils.

Selected attributes of a VIL pedon
(SW8-Tp59-R13-W4; from Sand River Report)

	Ap	Ahe	AB	Btgj	Ckg
Depth, cm	0-20	20-25	25-36	36-71	71+
pH $CaCl_2$	5.9	6.0	6.0	6.4	7.6
Organic C, %	3.6	1.0	0.4	0.4	-
CEC, cmol/kg	22.8	14.9	14.3	15.3	-
$CaCO_3$ eq., %	-	-	-	-	8.4
% S	48	48	55	47	47
% Si	33	34	24	26	27
% C	19	18	21	27	26
Texture	l	l	scl	scl	l

Competing Series:
FRY - E.BL, medium textured till, 3H
PIB - G.EBL, medium textured till, 2H
SDN - D.GL, medium textured till, 3H

WST (Winston)

Classification: Dark Gray Luvisol (D.GL)
Agroclimate: 4H; Energy index value <1050
Parent Material: Fine textured, moderately calcareous till with 2-15% coarse fragments.
Physiography: Mapped on level to hummocky, thrusted morainal materials associated with the Bunder Upland.
Comments: The parent material is till but it contains a high proportion of weathered shale. The resulting till has a high clay content, generally between 45-65%. Mapped in association with ABC soils.

Selected attributes of a WST pedon
(SW3-Tp61-R11-W4; Samples 89 - 58-61)

	Ap	Ae	Bt	Ck
Depth, cm	0-11	11-19	19-52	52-107+
pH $CaCl_2$	5.7	5.4	6.5	7.7
Organic C, %	2.5	-	-	-
CEC, cmol/kg	32.5	9.9	39.8	-
$CaCO_3$ eq., %	-	-	-	8.7
% S	23	28	7	6
% Si	39	52	33	31
% C	37	20	60	63
Texture	cl	sil	hc	hc

Competing Series:
ABC - O.GL, medium textured till, 4H
GDI - O.GL, fine textured till, 4H
GMT - D.GL, medium textured till, 4H
SDN - D.GL, medium textured till, 3H

Appendix C. Soil Unit, Soil Map Unit and Miscellaneous Unit Descriptions

I. Introduction

This appendix describes the 185 recognized soil map units used to represent the landscapes within the County of St. Paul. These descriptions concentrate on the 121 soil units (soil map units without topographic subdivision), with topographic characteristics described secondarily. Descriptions for the 6 miscellaneous map units (ZAV1 - ZW) are also included. The closed legend format and the soil unit numbering system utilized in this survey project are modeled after recent soil surveys (County of Warner Soil Survey, M.D. of Pincher Creek - Crowsnest Pass Soil Survey).

Initially, the soil unit and soil map unit criteria are briefly explained. Then, the composition and characteristics of the 121 recognized individual soil units are discussed. Most of the terms used in the following sections are defined in the Glossary of Terms, Appendix E.

II. Definitions

a) Soil Unit

A soil unit is a geographic grouping of soil series occurring on repeating soil landscapes. The soils within these landscapes, are described in terms of their relative proportions or amounts (dominant, significant, codominant or inclusions); topography is not a component of the soil unit.

Each soil unit is labeled on the basis of the major soil or soils (maximum of two) within the specific unit. A soil unit number identifies additional information about the distribution and / or composition of the major soils. For example, ABC1 and ABC8 soil units are both named after their dominant soil series ABC (Athabasca), but the distribution of soils within these units are distinctly different. The soil unit number "1" signifies that the soil series ABC is deemed the major (or principal) soil within this relatively "pure" soil landscape. On the other hand, soil number "8" signifies that in addition to having a major amount of ABC soils, there are significant amounts of wet (gleyed soils, Gleysolics and water) soils as well as coarse variants (contrasting soils). These numbers thus allow the mapper to account for the many intergrades or variants of the principal soil, to be represented in this conceptual description of a soil landscape.

Similarly, many identified variants may be described within complex soil units by using the soil unit number. For example, within an ABWS8 soil unit, ABC and WST soils are codominant, but also wet soils as well as coarse variants of both ABC and WST soils are present in significant proportions.

According to the County of St. Paul soil survey, the following soil unit numbers are used. These numbers do not apply to the miscellaneous map units, they are numbered independently.

Soil unit Number	Explanation
1	The major (or representative) soils account for the large proportion of the soil unit.
2	The soil unit contains significant Gleyed subgroups (related to the named major soil), Gleysolics and water (ponds, lakes, swamps etc.). Organic soils are unnamed soil members which may be present in variable amounts.
3	The soil unit contains significant saline variants, usually associated with wet soils.
4	The soil unit contains major amounts of soils classed as Rego and Calcareous subgroups within the Chernozemic Order. Also included within this suite of variants are eroded Luvisolics which are classified as Dark Gray Chernozemics.
6	The soil unit contains major amounts of soils which have similar profile development as the representative soil, but are coarser with respect to texture and / or coarse fragment content.
7	The soil unit contains major amounts of Gleyed subgroups, Gleysolics and water as well as eroded soils. This soil number combines the characteristic features of numbers "2" and "4".
8	The soil unit contains major amounts of Gleyed subgroups, Gleysolics and water as well as coarse textured variants. This soil number combines the characteristic features of numbers "2" and "6".

b) Soil Map Unit

The soil map unit is the complete landscape description - which includes a topographic descriptor added to the soil unit. Soil map units represent landscape entities which may be visually observed and delineated on a map. Changes in landform appearance and dominant slopes are the principal factors.

Topographic (slope) classes used to distinguish soil map units are based upon a standard system (E.C.S.S. 1983, 1987b) and are listed on the individual maps. In addition to the slope class numbers, modifiers are used sparingly to depict landscape characteristics which are crucial for some interpretations. These 3 modifiers are:

D - Dissected - Used to denote long unidirectional slopes which contain gullies or dissections. The slope length within these landscapes is greater than 300 m.

i - Inclined - Used to denote long unidirectional slopes. The slope length is greater than 300 m.

T - Terraced - Delineations with this modifier contain single or multiple terrace treads which are bounded or separated by risers. The presence of the risers limit access within the map unit.

Appendix C. *(continued)*

III. Soil Map Unit Descriptions

ABC1 (Athabasca) Soil Unit

The ABC1 soil unit is associated with hummocky and fluted, ice-thrust morainal landforms within the Bunder Upland and Muriel Highland land systems. Delineations of this unit occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout delineations of the unit.

ABC soils (Orthic Gray Luvisols on medium textured till) are dominant (40-70%). When the native vegetation is removed, variants of ABC soils are created. These variants, associated with improved pastures or cultivated fields, have thicker surface Ah horizons than ABC soils. The presence of this horizon alters the classification from Orthic to Dark Gray Luvisol. Therefore, the proportion of Dark Gray Luvisolic soils is variable, depending upon land management practices.

Soils occurring in minor (<20%) amounts include Luvisolic soils developed on a coarse (sl) textured glaciofluvial veneer overlying till, as well as gleyed soils, Gleysolic soils and water. The wet soils are associated with lower slope and depressional areas of the landscape.

Two ABC1 soil map units are recognized:

- ABC1/5 is mapped on hummocky or inclined, or hummocky and inclined surface forms, where the majority of slopes are between 10-15%. Class 4 and 6 slopes are commonly present within these delineations.
- ABC1/6 is mapped on hummocky or inclined, or hummocky and inclined surface forms, where the majority of slopes are between 15-30%. Class 4 and 5 slopes are commonly present within these delineations.

ABC2 (Athabasca) Soil Unit

The ABC2 unit is associated with the Bunder Upland and Muriel Highland land systems. Delineations of the unit occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout the delineations of this unit.

ABC soils (Orthic Gray Luvisols on medium textured till) are dominant (40-60%). When the native vegetation is removed, variants of ABC soils are created. These variants, associated with improved pastures or cultivated fields, have thicker surface Ah horizons than ABC soils. The presence of this horizon alters the classification from Orthic to Dark Gray Luvisol. Therefore, the proportion of Dark Gray Luvisolic soils is variable depending upon land management practices. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils occupy the depressional areas of the landscape. The Gleysolic soils commonly have peaty surface horizons which are less than 40 cm thick.

Chernozemic, Luvisolic and Brunisolic soils developed on coarse (s-sl) textured glaciofluvial sediments occur in minor (<20%) amounts. They are randomly distributed throughout delineations of this unit. The coarse fragment content of these soils is variable.

Five ABC2 soil map units are recognized:

- ABC2/3 is mapped on undulating surface forms, where the majority of slopes are between 2-5%. Class 2 and 4 slopes are commonly present within the delineations.
- ABC2/4 is mapped on hummocky or fluted surface forms, where the majority of slopes are between 5-9%. Class 3 slopes are commonly present within the delineations.
- ABC2/5 is mapped on hummocky surface forms, where the majority of slopes are between 10-15%. Class 4 and 6 slopes are commonly present within the delineations.
- ABC2/5-6D is mapped on hummocky, inclined and dissected surface forms, where the majority of slopes are between 10-30%.
- ABC2/6 is mapped on hummocky surface forms, where the majority of slopes are between 15-30%.

ABC8 (Athabasca) Soil Unit

The ABC8 soil unit is associated with the Bunder Upland and Muriel Highland land systems. Delineations of the unit occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest.

ABC soils (Orthic Gray Luvisols on medium textured till) are dominant (30-50%). Coarse variants of ABC soils are present in significant (20-30%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or as randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils occupy the depressional areas between hummocks, and ridges.

One ABC8 soil map unit is recognized:

- ABC8/6 is mapped on hummocky surface forms, where the majority of slopes are between 15-30%. Class 4 and 5 slopes are commonly present within delineations.

ABGM2 (Athabasca - Grosmont) Soil Unit

The ABGM2 soil unit is associated with the Bunder Upland land system. Delineations of this unit occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout the delineations.

ABC soils (Orthic Gray Luvisols on medium textured till) and GMT soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each). Their distribution is related to the extent of cleared land. GMT soils occur under improved pasture and cultivated fields. ABC soils are found under native aspen vegetation. Gleyed soils, Gleysolic soils and water are present in significant (15-

Appendix C. *(continued)*

30%) amounts. These wet soils occupy lower slopes and depressional areas within the landscape.

Luvisolic soils developed on fine or coarse (sl) textured till are present in minor (<15%) amounts.

Two ABGM2 soil map units are recognized:

- ABGM2/4 is mapped on hummocky donut-shaped surface forms, where the majority of slopes are between 5-9%. Hummocky, donut-shaped landscapes have a ring of upland soils surrounding a depression.
- ABGM2/5 is mapped on hummocky and ridged surface forms, where the majority of slopes are between 10-15%.

ABMH2 (Athabasca - Moose Hills) Soil Unit

The ABMH2 soil unit is associated with the Muriel Highlands land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout the delineations of the unit.

ABC soils (Orthic Gray Luvisols on medium textured till) are dominant (30-50%). MHL soils (Orthic Gray Luvisols on a coarse (sl) textured glaciofluvial veneer overlying till), as well as gleyed soils, Gleysolic soils and water are present in significant (20-30%) amounts. These wet soils occupy lower slopes and depressional areas within the landscape.

Luvisolic and Brunisolic soils developed on coarse textured glaciofluvial sediments and on fine textured till occur in minor (<20%) amounts. Organic soils are also present as inclusions (<10%).

Two ABMH2 soil map units are recognized:

- ABMH2/4 is mapped on hummocky surface forms, where the majority of slopes are between 6-9%. Class 3 slopes are commonly present within delineations.
- ABMH2/5 is mapped on hummocky surface forms, where the majority of slopes are between 10-15%. Class 4 slopes are commonly present within delineations.

Comments:

The ABMH2/4 delineation located in Twp 58 Range 5 contains significant (20-30%) amounts of NIT soils. The ABMH2/5 delineation located in Twp 58 Range 5 contains significant (20-40%) amounts of EDW soils; class 6 slopes are dominant within this delineation.

ABMN1 (Athabasca - Manatokan) Soil Unit

The ABMN1 soil unit is associated with the Muriel Highlands land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest interspersed with areas of black spruce, larch, willows and mosses.

ABC soils (Orthic Gray Luvisols on medium textured till) and MNT soils (Terric Mesisols on mesic forest fen peat over till or glaciolacustrine sediment) are co-dominant (30-50% each). MNT soils are associated with concave to level depressional areas between the upland portions of the delineation.

Luvisolic soils developed on a coarse (sl) textured glaciofluvial veneer over till occur in minor (<20%) amounts. Peaty Gleysolic soils and Typic Mesisols are also present in minor amounts, found in association with MNT soils.

One ABMN1 soil map unit is recognized:

- ABMN1/3-4 is mapped on nearly level to gently undulating surface forms, where the majority of slopes are between 3-9%. Class 2 slopes associated with the MNT soils, is commonly present within delineations.

ABNW1 (Athabasca - Newbrook) Soil Unit

The ABNW1 soil unit is associated with the Muriel Highlands land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest interspersed with areas of willows, sedges and mosses.

The soil unit contains two major soils. ABC soils (Orthic Gray Luvisols on medium textured till) are dominant (20-50%). NWB soils (Orthic Luvic Gleysols on medium textured till) are co-dominant (20-50%). NWB soils are associated with the level, concave depressional areas, which are extensive in this unit.

Luvisolic soils developed on a coarse (sl) textured glaciofluvial veneer overlying till occur in minor (<20%) amounts. Undifferentiated Organic soils, associated with NWB soils, are also present in minor amounts.

One ABNW1 soil map unit is recognized:

- ABNW1/3-4 is mapped on gently undulating and hummocky surface forms, where the majority of slopes are between 3-9%. Class 2 slopes are present within delineations.

ABSB1 (Athabasca - Stebbing) Soil Unit

The ABSB1 soil unit is associated with the Bunder Upland land system. Delineations occur within agroclimatic zone 4H. The native vegetation on upland areas is mixed deciduous-conifer forest. The native vegetation associated with the depressional areas consists of black spruce, Labrador tea, low bush cranberry and sphagnum moss. A peat mining operation is located in a delineation of this unit.

ABC soils (Orthic Gray Luvisols on medium textured till) and SBN soils (Typic Fibrisols on fibric sphagnum bog peat) are co-dominant (20-50% each). SBN soils are associated with the level, concave depressional areas, which are extensive in this unit. The ABC soils occur as islands within the organic area.

Appendix C. *(continued)*

Undifferentiated Organics and Luvisolic soils developed on fine textured till are present in minor (<20%) amounts.

One ABSB1 soil map unit is recognized:

- ABSB1/3 is mapped on gently undulating surface forms, where the majority of slopes are between 3-5%. Class 2 and 4 slopes are commonly present within delineations.

ABWS1 (Athabasca - Winston) Soil Unit

The ABWS1 soil unit is associated with the Bunder Upland land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout delineations of this unit.

ABC soils (Orthic Gray Luvisols on medium textured till) and WST soils (Dark Gray Luvisols on fine textured till) are co-dominant (20-50% each). The fine and medium textured tills are intimately intermixed, so their distribution is random. The distribution of Orthic and Dark Gray Luvisols is related to the extent of cleared land. Orthic Gray Luvisols are associated with native vegetative cover. Dark Gray Luvisols are found in cleared areas, where cultivation has resulted in addition of organic matter to surface horizons.

Dark Gray Luvisols developed on medium textured till and Orthic Gray Luvisols developed on fine textured till are intimately associated with ABC and WST soils, in variable proportions. Gleyed soils, Gleysolic soils and water are common inclusions (<15%).

Two ABWS1 soil map units are recognized:

- ABWS1/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%. Class 6 slopes are commonly present within delineations.
- ABWS1/6 is mapped on hummocky or inclined, or hummocky and inclined surface forms, where the majority of slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

ABWS2 (Athabasca - Winston) Soil Unit

The ABWS2 soil unit is associated with the Bunder Upland land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout delineations of the unit.

ABC soils (Orthic Gray Luvisols on medium textured till) and WST soils (Dark Gray Luvisols on fine textured till) are co-dominant (20-40%). The fine and medium textured tills are intimately intermixed, so their distribution is random. The distribution of Orthic and Dark Gray Luvisols is related to the extent of cleared land. Orthic Gray Luvisols are associated with native vegetative cover. Dark Gray Luvisols are found in cleared areas, where cultivation has resulted in addition of organic matter to surface horizons. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with on lower slope and depressional areas of the landscape.

Dark Gray Luvisols developed on medium textured till and Orthic Gray Luvisols developed on fine textured till are intimately associated with ABC and WST soils, in variable proportions. Coarse textured variants of these soils are also present in minor (<15%) amounts.

Four ABWS2 soil map units are recognized:

- ABWS2/3 is mapped on gently undulating surface forms, where the majority of slopes are between 3-5%. Class 4 slopes are commonly present within delineations.
- ABWS2/4 is mapped on hummocky or ridged, or hummocky and ridged surface forms, where the majority of slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations.
- ABWS2/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.
- ABWS2/6 is mapped on hummocky surface forms, where the majority of slopes are between 16-30%. Class 5 slopes are commonly present within delineations.

ABWS6 (Athabasca - Winston) Soil Unit

The ABWS6 soil unit is associated with the Bunder Upland land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout delineations of the unit.

ABC soils (Orthic Gray Luvisol on medium textured till), WST soils (Dark Gray Luvisol on fine textured till) and coarse variants of ABC and WST soils are co-dominant (20-40% each). The fine and medium textured tills are intimately intermixed, so their distribution is random. The distribution of Orthic and Dark Gray Luvisols is related to the extent of cleared land. Orthic Gray Luvisols are associated with native vegetative cover. Dark Gray Luvisols are found in cleared areas, where cultivation has resulted in addition of organic matter to surface horizons. Coarse variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content.

Dark Gray Luvisols developed on medium textured till and Orthic Gray Luvisols developed on fine textured till are intimately associated with ABC and WST soils, in variable proportions. Gleyed soils, Gleysolic soils and water are also present in minor (<15%) amounts.

Appendix C. *(continued)*

One ABWS6 soil map unit is recognized:

- ABWS6/5-6 is mapped on hummocky or inclined, or hummocky and inclined surface forms, where the majority of slopes are between 9-30%.

ABWS8 (Athabasca - Winston) Soil Unit

The ABWS8 soil unit is associated with the Bunder Uplands land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout delineations of this unit.

ABC soils (Orthic Gray Luvisols on medium textured till) and WST soils (Dark Gray Luvisols on fine textured till) are co-dominant (20-40% each). The fine and medium textured tills are intimately intermixed, so their distribution is random. The distribution of Orthic and Dark Gray Luvisols is related to the extent of cleared land. Orthic Gray Luvisols are associated with native vegetative cover. Dark Gray Luvisols are found in cleared areas, where cultivation has resulted in addition of organic matter to surface horizons. Coarse variants of these soils are also present in significant (20-40%) amounts. These coarse variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water occur in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Dark Gray Luvisols developed on medium textured till and Orthic Gray Luvisols developed on fine textured till are intimately associated with ABC and WST soils, in variable proportions.

One ABWS8 soil map unit is recognized:

- ABWS8/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%.

AGBV1 (Angus Ridge - Beaver Hills) Soil Unit

The AGBV1 soil unit is associated with 4 land systems; Dolo Upland, Northern Valley Plain, St. Paul Plain and Whitney Lowland. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. The majority of the area is cultivated.

AGS soils (Eluviated Blacks on medium textured till) and BVH soils (Orthic Blacks on medium textured till) are co-dominant (20-50% each). These soils are intimately interrelated, therefore their distribution is random.

Luvisolic soils developed on medium textured till, as well as Chernozemic and Luvisolic soils developed on coarse textured glaciofluvial sediments are present in minor (<20%) amounts. Gleyed soils, Gleysolic soils and water are present as inclusions (<15%).

Four AGBV1 soil map units are recognized:

- AGBV1/3 is mapped on gently undulating or inclined and gently undulating and inclined surface forms, where the majority of slopes are between 2-5%. Class 2 and 4 slopes are commonly present within delineations.
- AGBV1/4 is mapped on hummocky surface forms, where the majority of slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations.
- AGBV1/4i is mapped on inclined surface forms, where the majority of slopes are between 5-9%. The slopes are usually more than 300 meters long. Class 3 and 5 slopes are commonly present within delineations.
- AGBV1/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%. Class 4 slopes are commonly present within delineations.

AGBV2 (Angus Ridge - Beaver Hills) Soil Unit

The AGBV2 unit is associated with 4 land systems: Dolo Upland, Northern Valley Plain, St. Paul Plain and Whitney Lowland. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. The majority of the area is cultivated.

AGS soils (Eluviated Blacks on medium textured till) and BVH soils (Orthic Blacks on medium textured till) are co-dominant (20-50% each). These soils are intimately interrelated, therefore their distribution is random. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional areas within the landscape.

Chernozemic and Luvisolic soils developed on coarse textured glaciofluvial sediments, and Dark Gray Luvisols developed on medium textured till occur in minor (<20%) amounts. Luvisolic soils are associated with areas of aspen tree cover.

Three AGBV2 soil map units are recognized:

- AGBV2/3 is mapped on gently undulating surface forms, where the majority of slopes are between 2-5%. Class 2 and 4 slopes are commonly present within delineations.
- AGBV2/4 is mapped on hummocky surface forms, where the majority of slopes are between 5-9%.
- AGBV2/5 is mapped on hummocky and ridged surface forms, where the majority of slopes are between 9-15%. Class 4 slopes are commonly present within delineations.

AGBV3 (Angus Ridge - Beaver Hills) Soil Unit

The AGBV3 soil unit is associated with the St. Paul Plain land system. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. The majority of the area is cultivated.

Appendix C. *(continued)*

AGS soils (Eluviated Blacks on medium textured till) and BVH soils (Orthic Blacks on medium textured till) are co-dominant (20-40% each). Saline variants of these soils are present in significant (20-30%) amounts. Saline soils are generally imperfectly to poorly drained, thus gleyed soils and Gleysolic soils are found in association with these saline areas. Delineations occur within regional discharge areas, where the net movement of saline groundwater is to the surface. Therefore, wet, saline soils are associated with these areas.

One AGBV3 soil map unit is recognized:

- AGBV3/2-3 is mapped on level to gently undulating surface forms, where the majority of slopes are between 1-5%.

AGGB1 (Angus Ridge - Gabriel) Soil Unit

The AGGB1 soil unit is associated with 4 land systems: Alma Plain, Northern Valley Plain, St. Paul Plain, and Whitney Lowland. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. However, the majority of the area is cultivated and used as improved range.

This soil unit contains two major soils. AGS soils (Eluviated Blacks on medium textured till) are dominant (30-50%). GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) are significant (20-40%). This glaciofluvial veneer is discontinuous, therefore the distribution of these soils is random.

Soils occurring in minor (<20%) amounts include: Dark Gray Luvisols developed on medium textured till; and Orthic Blacks developed on a coarse textured glaciofluvial veneer over till. Gleyed soils, Gleysolic soils and water are also present as inclusions (15%). Stones and boulders often litter the surface, within cultivated areas.

Two AGGB1 soil map units are recognized:

- AGGB1/3 is mapped on gently undulating surface forms, where the majority of slopes are between 2-5%. Class 2 and 4 slopes are commonly present within delineations.
- AGGB1/4i is mapped on hummocky and inclined surface forms, where the majority of slopes are between 5-9%. The slopes are usually longer than 300 meters. This map unit is highly susceptible to water erosion ass a result of the long slopes and coarse (sl) textured surface horizons. Class 3 and 5 slopes are commonly present within delineations.

AGGB2 (Angus Ridge - Gabriel) Soil Unit

The AGGB2 unit is associated with the Northern Valley Plain and Whitney Lowland land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. However, the majority of the area is cultivated and used as improved range.

AGS soils (Eluviated Blacks on medium textured till) and GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer overlying medium textured till) are co-dominant (20-40% each). The glaciofluvial veneer is discontinuous, therefore the distribution of these soils is random. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope positions and depressional areas of the landscape.

Soils occurring in minor (<20%) amounts include: Eluviated Blacks developed on a coarse (sl) textured glaciofluvial veneer overlying till; and Dark Gray Luvisols developed on medium textured till.

One AGGB2 soil map unit is recognized:

- AGGB2/3 is mapped on hummocky surface forms, where the majority of slopes are between 2-5%. Class 2 and 4 slopes are commonly present within delineations.

AGGB6 (Angus Ridge - Gabriel) Soil Unit

The AGGB6 unit is associated with the Alma Plain and Northern Valley Plain land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. The majority of the area is cultivated and used as improved range.

AGS soils (Eluviated Blacks on medium textured till), GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) as well as coarse variants of these soils are co-dominant (20-40% each). The glaciofluvial veneer is discontinuous, therefore the distribution of the AGS and GBL soils is random. The coarse variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or beds within the glaciofluvial sediments and till. The soils developed on these latter materials exhibit extreme variability with respect to texture and coarse fragment content.

Soils occurring in minor (<20%) amounts include: Orthic Gray Luvisols developed on till; and Eluviated Blacks on medium textured glaciolacustrine sediments.

One AGGB6 soil map unit is recognized:

- AGGB6/3 is mapped on gently undulating surface forms, where the majority of the slopes are between 2-5%.

AGGB8 (Angus Ridge - Gabriel) Soil Unit

The AGGB8 soil unit is associated with the Northern Valley Plain, St. Paul Plain and Therien Upland land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. However, the majority of the area is cultivated and used as improved range.

Appendix C. *(continued)*

AGS soils (Eluviated Blacks on medium textured till), GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) as well as coarse variants of these soils are co-dominant (20-40% each). The glaciofluvial veneer is discontinuous, therefore the distribution of the AGS and GBL soils is random. The coarse variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or beds within the glaciofluvial sediments and till. The soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional areas of the landscape.

Luvisolic soils developed on medium textured till, and Eluviated Blacks on medium textured glaciolacustrine sediments occur in minor (<20%) amounts.

Two AGGB8 soil map units are recognized:

- AGGB8/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations.
- AGGB8/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%. Class 4 slopes are commonly present within delineations.

AGMS2 (Angus Ridge - Mooswa) Soil Unit

The AGMS2 unit is associated with the Northern Valley Plain and Whitney Lowland land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. However, the majority of the area is cultivated and used as improved range.

AGS soils (Eluviated Blacks on medium textured till) and MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial) are co-dominant (20-40% each). The distribution of these soils is random. Intergrades of these soil types, consisting of glaciofluvial veneers over till, are inherent to this soil unit. Gleyed soils, Gleysolic soils and water are present in significant (15-40%) amounts. These wet soils are associated with lower slope and depressional area within the landscape.

Eluviated Blacks developed on medium textured glaciolacustrine sediments and Luvisolic soils developed on medium textured till occur in minor (<20%) amounts.

One AGMS2 soil map unit is recognized:

- AGMS2/2-3 is mapped on nearly level to gently undulating landscapes where the majority of slopes are between 1-5%.

AGNT1 (Angus Ridge - Northern Valley) Soil Unit

The AGNT1 soil unit is associated with 4 land systems; Alma Plain, Northern Valley Plain, Therien Upland and Whitney Lowland. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. However, the majority of the area is cultivated and used as improved range.

AGS soils (Eluviated Blacks on medium textured till) and NTV soils (Eluviated Blacks on a coarse (sl) textured glaciofluvial veneer overlying medium textured till) are co-dominant (30-50% each). The glaciofluvial veneer is discontinuous, therefore the distribution of the AGS and NTV soils is random. The texture of the till within this soil unit is typically sandy clay loam, and discrete lenses of sand are commonly interbedded within the material.

Soils occurring in minor (<20%) amounts include: Orthic Blacks and Dark Gray Luvisols developed on medium textured till; as well as coarser textured variants of all the previously described soils. Gleyed soils, Gleysolic soils and water are common inclusions (<15%).

Two AGNT1 soil map units are recognized:

- AGNT1/3 is mapped on gently undulating surface forms, where the majority of slopes are between 1-5%. Delineations of this map unit describe subdued, ridges (or fluted) morainal landscapes. Class 2 and 4 slopes are commonly present within delineations.
- AGNT1/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.

AGPI2 (Angus Ridge - Pibroch) Soil Unit

The AGPI2 unit is associated with the St. Edouard Plain and St. Paul Plain land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland, with groves of aspen trees interspersed throughout. However, annual cultivation is extensive within delineations.

AGS soils (Eluviated Blacks on medium textured till) and PIB soils (Gleyed Eluviated Blacks on medium textured till) are co-dominant (20-40% each). The PIB soils occupy the poorly drained parts of the landscape. These areas can only be recognized by examination of soil profiles. They are not visible from roadside inspection of the landscape. The distribution of these soils appears to be random. Gleysolic soils are also present in significant (15-30%) amounts. These very poorly drained soils are associated with the more prominent depressional landscape positions.

Orthic Blacks developed on medium textured till and Eluviated Blacks developed on medium textured glaciolacustrine sediments are present in minor (<20%) amounts.

Appendix C. *(continued)*

Two AGPI2 soil map units are recognized:

- AGPI2/2 is mapped on nearly level surface forms, where the majority of slopes are between 0-2%. Class 3 slopes are present in minor amounts.
- AGPI2/3 is mapped on gently undulating surface forms, where the majority of slopes are between 2-5%.

AGPO1 (Angus Ridge - Ponoka) Soil Unit

The AGPO1 soil unit is associated with 5 land systems; Northern Valley Plain, Poitras Plain, St. Paul Plain, Therien Upland and Whitney Lowland. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen. However, the majority of the area is cultivated and used as improved range.

AGS soils (Eluviated Blacks on medium textured till) and POK soils (Eluviated Blacks on medium textured glaciolacustrine sediment) are co-dominant (20-50% each). The POK soils are associated with supraglacial lake sediments that were deposited on stagnant ice during deglaciation. These glaciolacustrine soils are randomly distributed throughout this soil unit. Parent material intergrades of these soils are common.

Soils occurring in minor (<20%) amounts include: Orthic Blacks developed on medium textured till; as well as coarse textured variants of these soils. Gleyed soils, Gleysolic soils and water are present as common inclusions (<15%).

Two AGPO1 soil map units are recognized:

- AGPO1/3 is mapped on gently undulating surface forms, where the majority of slopes are between 2-5%.
- AGPO1/5-6 is mapped on hummocky or inclined surface forms, where the majority of slopes are between 9-30%. Eroded soils are present in significant (15-30%) amounts within some delineations of this unit.

AGPO2 (Angus Ridge - Ponoka) Soil Unit

The AGPO2 soil unit is associated with the St. Paul Plain and Therien Upland land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland with groves of aspen trees interspersed throughout. However, the majority of the area is cultivated.

AGS soils (Eluviated Blacks on medium textured till) and POK soils (Eluviated Blacks on medium textured glaciolacustrine sediment) are co-dominant (20-50% each). The POK soils are associated with supraglacial lake sediments that were deposited on stagnant ice during deglaciation. These glaciolacustrine soils are randomly distributed throughout this soil unit. Parent material intergrades of these soils are common. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional areas of the landscape.

Chernozemic and Luvisolic soils developed on medium textured till and on coarse (sl) textured glaciofluvial veneers over till occur in minor (<20%) amounts.

Two AGPO2 soil map units are recognized:

- AGPO2/3 is mapped on gently undulating surface forms, where the majority of slopes are between 2-5%.
- AGPO2/4 is mapped on hummocky surface forms, where the majority of slopes are between 5-9%. Class 5 slopes are commonly present within delineations.

AGRD6 (Angus Ridge - Redwater) Soil Unit

The AGRD6 unit is associated with the Alma Plain, Northern Valley Plain and Therien Upland land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest and is interspersed with grassland areas.

AGS soils (Eluviated Blacks on medium textured till) and RDW soils (Orthic Dark Grays on coarse (sl) textured glaciofluvial sediments) are co-dominant (20-30% each). Coarse textured variants of AGS and RDW soils occupy 30-50% of the unit. These coarse variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or pockets within the till. The soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content.

Soils occurring in minor (<20%) amounts include: Luvisolic soils developed on medium textured till; and Eluviated Blacks developed on medium textured glaciolacustrine sediments. Gleyed soils, Gleysolic soils and water are present as inclusions (<15%).

One AGRD6 soil map unit is recognized:

- AGRD6/5-6 is mapped on hummocky surface forms, where the majority of the slopes are between 9-30%.

AGRM6 (Angus Ridge - Rimbey) Soil Unit

The AGRM6 unit is associated with the Therien Upland and Whitney Plain land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest is interspersed with grassland areas. However, the majority of the area is cultivated.

AGS soils (Eluviated Blacks on medium textured till), RMY soils (Orthic Dark Grays on medium textured glaciolacustrine sediments) and coarse textured variants are co-dominant (20-40% each). The RMY soils are associated with supraglacial lake sediments that were deposited on stagnant ice during deglaciation. These glaciolacustrine soils are randomly distributed throughout this soil unit. Parent material intergrades of these soils are common. The coarse variants of AGS and RMY soils are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or pockets within the till. The soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content.

Appendix C. *(continued)*

Soils occurring in minor (<20%) amounts include, Orthic Dark Grays developed on medium textured till and Eluviated Blacks on medium textured glaciolacustrine sediments. Gleyed soils, Gleysolic soils and water are present as inclusions (<15%).

One AGRM6 soil map unit is recognized:

- AGRM6/6 is mapped on hummocky surface form where the majority of slopes are between 15-30%.

AGUC1 (Angus Ridge - Uncas) Soil Unit

The AGUC1 soil unit is associated with 7 land systems: Alma Plain, Dolo Upland, Northern Valley Plain, Poitras Plain, St., Edouard Plain, St. Paul Plain, Therien Upland and Whitney Plain. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest with ares of grassland interspersed throughout. However, the majority of area is cultivated.

AGS soils (Eluviated Blacks on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (30-60% each). The distribution of these soils is generally random, but there is a correlation with microclimate and agricultural management practices. UCS soils are associated with north aspect slopes, where the climate is marginally cooler. They are also found on the tops of cultivated knolls where the organic matter content is lower than in adjacent areas.

Soils occurring in minor (<20%) amounts include, other Chernozemics and Orthic Gray Luvisols developed on till. These latter soils are generally found in areas of native forest vegetation. Gleyed soils, Gleysolic soils are present as inclusions (<15%).

Four AGUC1 soil map units are recognized:

- AGUC1/3 is mapped on gently undulating surface forms, where the majority of slopes are between 2-5%. Class 4 slopes are commonly present within delineations.
- AGUC1/4 is mapped on hummocky surface forms, where the majority of slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations.
- AGUC1/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.
- AGUC1/6 is mapped on hummocky surface forms, where the majority of slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

AGUC2 (Angus Ridge - Uncas) Soil Unit

The AGUC2 soil unit is associated with 7 land systems: Alma Plain, Dolo Upland, Mann Lake Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain and Therien Upland. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly aspen forest with grassland areas interspersed. However, majority of the area is annually cultivated.

AGS soils (Eluviated Blacks on medium textured till) and UCS soils (Dark Gray Luvisol on medium textured till) are co-dominant (20-50%). The distribution of these soils is generally random, but there is a correlation with microclimate and agricultural management practices. UCS soils are associated with north aspects, where the climate is marginally cooler. They are also found on the tops of cultivated knolls where the organic matter content is lower than in the adjacent areas. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils which occur in minor (<15%) amounts include Orthic Blacks and Orthic Dark Gray Chernozemics developed on till. Similar soils developed on glaciolacustrine materials are common inclusions (<10%). Coarse variants are also present as inclusions. Within delineations where native forest vegetation is present, Orthic Gray Luvisols developed on till are present.

Three AGUC2 map units are recognized:

- AGUC2/3 is mapped on undulating surface forms, where the majority of the slopes are between 2-5%.
- AGUC2/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations.
- AGUC2/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 6 slopes are commonly present within delineations.

AGUC4 (Angus Ridge - Uncas) Soil Unit

The AGUC4 soil unit is associated with 5 land systems: Dolo Upland, Mann Lake Upland, Northern Valley Plain, St. Paul Plain and Therien Upland. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly aspen forest with grassland areas interspersed. However, majority of the area is annually cultivated.

AGS soils (Eluviated Blacks on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-50% each). The distribution of these soils is generally random, but there is a correlation related to variable microclimate and agricultural management practices. UCS soils are associated with north aspects, where the climate is marginally cooler. They are also found on the tops of cultivated knolls where the organic matter content is lower than in adjacent areas. Eroded soils are also present in significant (20-30%) amounts. These soils are where the subsoil is being incorporated within the cultivated surface layer. They appear as soils with brown coloured surfaces. These eroded soils are

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associated with the crests of knolls and adjacent upper slope positions.

Soils occurring in minor (<15%) amounts include; coarse variants of the previously described soils, as well as gleyed soils, Gleysolic soils and water.

Three AGUC4 soil map units are recognized:

- AGUC4/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%.
- AGUC4/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.
- AGUC4/6 is mapped on hummocky surface forms, where the majority of the slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

AGUC6 (Angus Ridge - Uncas) Soil Unit

The AGUC6 soil unit is associated with 4 land systems: Northern Valley Plain, St. Paul Plain, Therien Upland and Whitney Plain. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest. Some areas are cultivated.

AGS soils (Eluviated Blacks on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-50% each). The distribution of these soils is generally random, but there is a correlation related to variable microclimate and agricultural management practices. UCS soils are associated with north aspects, where the climate is marginally cooler. They are also found on the tops of cultivated knolls where the organic matter content is lower than in adjacent areas. Coarse variants of AGS and UCS soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or as randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability in terms of texture and coarse fragment content.

Soils occurring in minor (<20%) amounts include, eroded soils especially within map units on class 6 topography. Gleyed soils, Gleysolic soils and water are present as inclusions (<15%). Orthic Gray Luvisols are found in areas of native forest vegetation.

Three AGUC6 map units are recognized:

- AGUC6/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations.
- AGUC6/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 6 slopes are commonly present within delineations.
- AGUC6/6 is mapped on hummocky surface forms, where the majority of slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

AGUC7 (Angus Ridge - Uncas) Soil Unit

The AGUC7 soils unit is associated with the Therien Upland land system. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest. However, majority of the area is annually cultivated.

AGS soils (Eluviated Blacks on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each). The distribution of these soils is generally random, but there is a correlation related to variable microclimate and agricultural management practices. UCS soils are associated with north aspects, where the climate is marginally cooler. They are also found on the tops of cultivated knolls where the organic matter content is lower than in adjacent areas. Eroded soils are also present in significant (20-30%) amounts. These soils are where the subsoil is being incorporated within the cultivated surface layer. They appear as soils with brown coloured surfaces. These eroded soils are associated with the crests of knolls and adjacent upper slope landscape positions. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils occur in the lower slope and depressional landscape positions.

Soils which occur as common inclusions (<10%) include Chernozemics and Luvisolics developed on glaciolacustrine materials and coarse variants of till.

One AGUC7 soil map unit is recognized:

- AGUC7/6 is mapped on hummocky surface forms, where the majority of the slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

AGUC8 (Angus Ridge - Uncas) Soil Unit

The AGUC8 soil unit is associated with Mann Lake Upland and Therien Upland land systems. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest.

AGS soils (Eluviated Blacks on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each). The distribution of these soils is generally random, but there is some correlation related to variable microclimate and agricultural management practices. UCS soils are associated with north aspects, where the climate is marginally cooler. They are also found on the tops of cultivated knolls where the organic matter content is lower than in adjacent areas. Coarse variants of AGS and UCS soils are present in significant (20-40%) amounts. These variants are associated with isolated ice contact ridges or knolls, or as ran-

Appendix C. *(continued)*

domly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional areas of the landscape.

Soils which occur as inclusions (<10%) include; Chernozemic soils developed on medium textured glaciolacustrine materials, as well as eroded variants of these described soils.

One AGUC8 soil map unit is recognized:

- AGUC8/5-6 is mapped on hummocky surface forms, where the majority of the slopes are between 9-30%.

ATFT1 (Atimoswe - Ferintosh) Soil Unit

The ATFT1 soil unit is associated with 3 land systems; Northern Valley Plain, Therien Upland and Whitney Lowland. The area is associated with agroclimatic zone 2-3H. The native vegetation is dominantly grassland interspersed with groves of aspen forest.

ATM soils (Orthic Blacks on coarse (sl) textured glaciofluvial veneer over gravelly and stoney, coarse (ls-s) textured glaciofluvial) and FTH soils (Orthic Blacks on gravelly and stoney, coarse textured glaciofluvial) are co-dominant (20-50% each) within delineations. The distribution of these soils is random. Within glaciofluvial terrace landforms, the materials are variable due to the fluctuations of water levels and flow rates during de-glaciation.

Soils which are present in minor (<20%) amounts include, Brunisolics and other Chernozemics developed on deeper (>1 m) coarse (s-sl) glaciofluvial deposits.

One ATFT1 soil map unit is recognized:

- ATFT1/3 is mapped on terraced surface forms, where the dominant slopes are between 1-5%, on the tread portion. Steeper slopes are associated with the risers which separate the treads.

BLMN1 (Bluet - Manatokan) Soil Unit

The BLMN1 soil unit is associated with the Bunder Upland and Muriel Highland land systems. These area is within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. Blacks spruce, willows and sedges are characteristic of these wet areas.

BLT (Orthic Humic Gleysols on medium textured till or glaciolacustrine sediment) and MNT soils (Terric Mesisols on mesic forest fen peat over till or glaciolacustrine sediment) are co-dominant (20-50% each) within delineations. The BLT soils generally have a peat layer overlying the mineral, but it is <40 cm thick.

Soils which are present in minor (<20%) amounts include other Organics developed on a variety of differently decomposed forest fen peat material. Luvisolic soils developed on medium textured till are common inclusions (<10%), generally associated with the edges of these wet areas.

One BLMN1 map unit is recognized:

- BLMN1/2 is mapped on level poorly drained surface forms, where the majority of the slopes are between 0-3%. Class 3 slopes are commonly present within delineations.

COGB1 (Cooking Lake - Gabriel) Soil Unit

The COGB1 soil unit is associated with the Northern Valley Plain and Therien Upland land systems. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

COA soils (Orthic Gray Luvisols on medium textured till) and GBL soils (Dark Gray Luvisols on coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-50% each) within delineations. The distribution of these soils is random, since the glaciofluvial veneer is discontinuous. Coarse textured (gravelly and stoney) variants of these soils are common within some delineations (eg. sec.11, Tp.56, Rge.10).

Soils occurring in minor (<20%) amounts include other Luvisolic soils developed on similar materials, as well as on deep (>1 m) glaciofluvial material. Gleyed soils, Gleysolic soils and water are present as inclusions (<15%).

One COGB1 soil map unit is recognized:

- COGB1/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.

COJV1 (Cooking Lake - Jarvie) Soil Unit

The COJV1 soil unit is associated with the Therien Upland land system. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest. Blacks spruce, willows and sedges are characteristic of the wet areas within this soil unit.

COA soils (Orthic Gray Luvisols on medium textured till) are dominant (30-50%). JVE soils (Humic Luvic Gleysols on medium textured glaciolacustrine) are significant (20-50%). Delineations of this soil unit occur in the regional recharge areas of the Therien Upland. The Gleysolic soils, which may have an organic veneer 40 cm thick, are found in the depressional positions of the landscape.

Soils which occur as inclusions (<10%) include other Luvisolics developed on till as well as some Organics.

One COJV1 soil map unit is recognized:

- COJV1/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 3 slopes are commonly present within delineations.

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COUC1 (Cooking Lake - Uncas) Soil Unit

The COUC1 soil unit is associated with 8 land systems; Dolo Upland, Gadois Plain, Mann Lake Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain, Therien Upland and Whitney Lowland. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest. Majority of the area, within the class 4 and 5 topography map units, is cultivated.

COA soils (Orthic Gray Luvisols on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-50% each) within delineations. Their distribution is related to the extent of cleared land. COA soils are found under native vegetative cover, consisting of dominantly aspen with some conifers. UCS soils are associated with areas of improved pasture or annual cultivation.

Soils occurring in minor (<20%) amounts include; Chernozemic soils developed on till and glaciolacustrine material, as well as coarse variants of the soils on till. Gleyed soils, Gleysolic soils and water are also present in minor (<15%) amounts. Eroded variants of these soils are found within cultivated portions of these delineations in variable amounts.

Four COUC1 soil map units are recognized:

- COUC1/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations.
- COUC1/4i is mapped on inclined surface forms, where the majority of the slopes are between 5-9%. Slope lengths exceed 300 m, in delineations of this soil map unit.
- COUC1/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 4 slopes are commonly present within delineations.
- COUC1/6 is mapped on hummocky surface forms, where the majority of the slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

COUC2 (Cooking Lake - Uncas) Soil Unit

The COUC2 soil unit is associated with 5 land systems; Alma Plain, Dolo Upland, Mann Lake Upland, St. Paul Plain and Therien Upland. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

COA soils (Orthic Gray Luvisols on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-50% each) within delineations. Their distribution is related to the extent of cleared land. COA soils are found under native vegetative cover, consisting of dominantly aspen with some conifers. UCS soils are associated with areas of improved pasture or annual cultivation. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include Chernozemic soils developed on till, as well as coarse variants of these soils on till. Eroded variants are found, in variable amounts, in cultivated areas.

Three COUC2 soil map units are recognized:

- COUC2/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 5 slopes are commonly present within delineations.
- COUC2/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.
- COUC2/6 is mapped on hummocky surface forms, where the majority of the slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

COUC6 (Cooking Lake - Uncas) Soil Unit

The COUC6 soil unit is associated with 3 land systems; Mann Lake Upland, St. Paul Plain and Therien Upland. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest.

COA soils (Orthic Gray Luvisols on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each) within delineations. Their distribution is related to the extent of cleared land. COA soils are found under native vegetative cover, consisting of dominantly aspen with some conifers. UCS soils are associated with areas of improved pasture or annual cultivation. Coarse variants of COA and UCS soils are present in significant (20-30%) amounts. These variants are associated with isolated ice contact ridges or knolls, or as randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content.

Soils which occur as inclusions (<10%) include Chernozemics developed on till. Gleyed soils, Gleysolic soils and water are also common inclusions.

Two COUC6 soil map units are recognized:

- COUC6/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.
- COUC6/6 is mapped on hummocky surface forms, where the majority of slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

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COUC8 (Cooking Lake - Uncas) Soil Unit

The COUC8 soil unit is associated with 4 land systems; Dolo Upland, Mann Lake Upland, St. Paul Plain and Therien Upland. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest.

COA soils (Orthic Gray Luvisols on medium textured till) and UCS soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each) within delineations. Their distribution is related to the extent of cleared land. COA soils are found under native vegetative cover, consisting of dominantly aspen with some conifers. UCS soils are associated with areas of improved pasture or annual cultivation. Coarse variants of COA and UCS soils are present in significant (20-30%) amounts. These variants are associated with isolated ice contact ridges or knolls, or as randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include Chernozemic soils developed on medium textured till and glaciolacustrine materials.

Four COUC8 soil map units are recognized:

- COUC8/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%.
- COUC8/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.
- COUC8/6 is mapped on hummocky surface forms, where the majority of the slopes are between 15-30%. Class 5 slopes are commonly present within delineations.
- COUC8/6-7 is mapped on hummocky surface forms, where the dominant slopes range from 15-45%. This soil map unit describes a complex hill-like, ice-thrust feature, north of Stoney Lake. This feature has been modified by glaciofluvial processes, thus materials and topography are extremely variable within delineations of this map unit.

CTMN1 (Chatwin - Manatokan) Soil Unit

The CTMN1 soil unit is associated with 8 land systems; Bunder Upland, Kehiwin Plain, Mann Lake Upland, Muriel Highlands, Sugden Plain, Therien Upland, Vincent Upland and Whitney Lowland. The soil unit is used to describe organic landscapes within all agroclimatic zones of the County (2-3H,3H,4H). The native vegetation associated with these areas consist of dominantly blacks spruce, larch, willows and mosses.

CTW soils (Typic Mesisols on mesic forest fen peat) and MNT soils (Terric Mesisols on mesic forest fen peat over till or glaciofluvial) are co-dominant (20-50% each) within delineations. These soils describe the major soils found within these organic landforms where the deposits are >40 cm to over 2 m in depth, and are moderately decomposed. A characteristic feature of organic soil areas is that the state of decomposition and depth of material varies considerably, within and around specific site inspections. Therefore, many other organic soil profiles may be encountered within these areas. The majority of the profiles ressemble and react like CTW and MNT soils.

Soils which occur as inclusions (<10%) include Gleysolics developed on till or glaciolacustrine. Many of these Gleysolics have a peaty surface layer which is <40 cm thick.

One CTMN1 soil map unit is recognized:

- CTMN1/2 is mapped on level organic wetland forms where the slopes are <3%. Steeper slopes may be present around the edges of delineations.

CTTC1 (Chatwin - Tucker) Soil Unit

The CTTC1 soil unit is associated with 3 land systems; Bunder Upland, Sugden Plain and Vincent Upland. The soil unit is used to describe organic landscapes within agroclimatic zones 3H and 4H. The native vegetation consists of blacks spruce, larch, scrub birch, willows, and mosses.

CTW soils (Typic Mesisols on mesic forest fen peat) and TCK soils (Terric Fibric Mesisols on mesic and fibric bog peat) are co-dominant (20-50% each) within delineations. CTW soils are associated with fens, which may be sometimes recognized by the native vegetation (blacks spruce, larch, willows and sphagnum moss). TCK soils are associated with bog areas which generally occur as islands within the fen. The vegetation of these bog areas may consist of dominantly scrub birch, Labrador tea, low bush cranberry, and sphagnum. A characteristic feature of organic soil areas is that the state of decomposition and depth of material varies considerably, within and around specific site inspections. Therefore, many other organic soil profiles will be encountered within these areas.

Soils which occur as inclusions (<10%) include Gleysolics developed on till and glaciolacustrine. Many of these Gleysolic soils have a peaty layer which is <40 cm thick.

One CTTC1 soil map unit is recognized:

- CTTC1/2 is mapped on level organic wetland forms, where the slopes are <3%. Steeper slopes may be encountered around the edges of delineations.

DDMN1 (Drysdale - Manatokan) Soil Unit

The DDMN1 soil unit is associated with 5 land systems; Bunder Upland, Kehiwin Plain, Muriel Highlands, Sugden

Appendix C. *(continued)*

Plain and Therien Upland. The soil unit is used to describe organic landscapes within agroclimatic zones 3H and 4H. The native vegetation consists of dominantly larch, scrub birch, sedges and mosses.

DDE soils (Typic Fibrisols on fibric fen peat) are dominant (30-50%). MNT soils (Terric Mesisols on mesic fen peat) are significant (20-40%). These soils occur randomly throughout the delineation, although the MNT soils are usually associated with the fringes of these organic soil areas. A characteristic feature of organic soil areas is that the state of decomposition and depth of material varies considerably, within and around specific site inspections. Therefore, many other organic soil profiles will be encountered within these areas.

Soils which occur as inclusions (<10%) include Gleysolics developed on till and glaciolacustrine. Many of these Gleysolic soils have a peaty layer which is <40 cm thick.

One DDMN1 soil map unit is recognized:

- DDMN1/2 is mapped on level organic wetland forms, where the slopes are 3%. Steeper topography may be encountered around the edges of delineations.

ELGB1 (Elk Point - Gabriel) Soil Unit

The ELGB1 soil unit is associated with 3 land systems; Northern Valley Plain, Therien Upland and Whitney Lowland. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest. Majority of the area is annually cultivated.

ELP soils (Dark Gray Luvisols on coarse (sl) textured glaciofluvial) and GBL soils (Dark Gray Luvisols on coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-50% each). The parent materials of these soils are intimately related, so their distribution is random. These Dark Gray Luvisolics are associated with areas of improved pasture or annual cultivation. Orthic Gray Luvisolic soil profiles developed on similar parent materials are found under forest vegetation.

Eroded soils, which are identified by having brown coloured surfaces, are associated with tops of knolls, within delineations where cultivation is extensive. They may occupy up to 30% of a delineation. Other soils, which occur as inclusions (<10%), include Chernozemic soils and other Luvisolic soils developed on till.

Two ELGB1 soil map units are recognized:

- ELGB1/3 is mapped on undulating surface forms, where the majority of the slopes are between 2-5%.
- ELGB1/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 5 slopes are commonly present within delineations.

ELHO2 (Elk Point - Hoadley) Soil Unit

The ELHO2 soil unit is associated with the Gadois Plain and Sugden Plain land systems. The area is within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Majority of the area is annually cultivated.

ELP soils (Dark Gray Luvisols on coarse (sl) textured glaciofluvial) and HOD soils (Orthic Gray Luvisols on coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-40% each) within delineations. The parent materials of these soils are intimately related, so their distribution is random. These Dark Gray Luvisolics are associated with areas of improved pasture or annual cultivation. Orthic Gray Luvisol profiles on similar parent materials are found under forest vegetation. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional areas of the landscape.

Soils which occur as common inclusions (<10%) include other Luvisolic soils developed on similar materials as HOD and on till.

One ELHO2 soil map unit is recognized:

- ELHO2/3 is mapped on undulating surface forms, where the majority of the slopes are between 2-5%. Class 4 slopes are commonly present within delineations.

ELHO8 (Elk Point - Hoadley) Soil Unit

The ELHO8 soil unit is associated with the Northern Valley Plain land system. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

ELP soils (Dark Gray Luvisols on coarse (sl) textured glaciofluvial) and HOD soils (Orthic Gray Luvisols on coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-40% each) within delineations. These parent materials of these soils are intimately related, so their distribution is random. These Dark Gray Luvisols are associated with areas of improved pasture or annual cultivation. Orthic Gray Luvisol profiles on similar parent materials are found under forest vegetation. Coarse variants of ELP and HOD soils are present in significant (20-30%) amounts. These variants are associated with isolated ice contact ridges or knolls, or as randomly occurring lenses or pockets within the parent materials. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Appendix C. *(continued)*

Soils which occur as inclusions (<10%) include Luvisolic soils developed on till.

One ELHO8 soil map unit is recognized:

- ELHO8/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 5 slopes are commonly present within delineations.

ELNI1 (Elk Point - Nicot) Soil Unit

The ELNI1 soil unit is associated with the Whitney Plain land system. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

ELP soils (Dark Gray Luvisols on coarse (sl) textured glaciofluvial) and NIT soils (Eluviated Eutric Brunisol on coarse (s) textured glaciofluvial) are co-dominant (20-50% each) within the delineation. These soils are intimately related and their distribution is random, due to the inherent nature of glaciofluvial materials.

Soils occurring in minor (<20%) amounts include Chernozemic soils developed on similar parent materials. Gleyed soils, Gleysolic soils and water are also present as inclusions (%).

One ELNI1 soil map unit is recognized:

- ELNI1/5D is mapped on glaciofluvial materials with inclined and dissected surface forms, where the majority of slopes are between 9-15%. Steeper slopes are associated with the dissections.

FRSD1 (Fergy - Spedden) Soil Unit

The FRSD1 soil unit is associated with the Gadois Plain and Sugden Plain land system. The area is within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Most of the area with class 3 slopes is cultivated.

FRY soils (Eluviated Blacks on medium textured till) and SDN soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-50% each). The distribution of these soils is generally random, but there is a correlation related to variable microclimate and agricultural management practices. SDN soils are associated with north aspects, where the climate is marginally cooler. They are also found on the tops of cultivated knolls where the organic matter content is lower than in adjacent areas, due to shallower profile development and/or soil erosion. Within the delineations of class 6D topography the proportion of SDN soils is greater and GBL soils (Dark Gray Luvisols on coarse (sl) textured glaciofluvial veneer over till) are present in variable amounts ranging between 10-30%.

Soils occurring in minor (<20%) amounts include other Luvisolic soils developed on till. Gleyed soils, Gleysolic soils and water are also present as inclusions (<10%).

Two FRSD1 soil map units are recognized:

- FRSD1/3 is mapped on undulating surface forms, where the majority of the slopes are between 2-5%.
- FRSD1/6D is mapped on inclined and dissected surface forms, where the dominant slopes are between 15-30%. Delineations of this soil map unit generally have a south aspect, and FRY soils are dominant.

FTH1 (Ferintosh) Soil Unit

THe FTH1 soil unit is associated with the Northern Valley Plain and Whitney Plain land systems. The area is within agroclimatic zone 2-3H. The native vegetation is grassland with groves of aspen interspersed.

FTH soils (Orthic Blacks on gravelly, coarse (ls-s) textured glaciofluvial) are dominant (30-50%). ATM soils (Orthic Blacks on coarse (sl) textured glaciofluvial veneer over gravels) are present in variable amounts ranging between 10-30%. These soils are associated with glaciofluvial terraces adjacent to the Kehiwin Channel and North Saskatchewan River. The distribution of these soils is random due to the inherent nature of the parent materials.

Soils occurring in minor (<20%) amounts include Brunisolic soils and other Chernozemic soils developed on similar parent materials of variable thicknesses.

One FTH1 soil map unit is recognized:

- FTH1/4-5 is mapped on hummocky and terraced surface forms, where the majority of the slopes are between 5-15%.

FWUC8 (Fawcett - Uncas) Soil Unit

The FWUC8 soil unit is associated with the Therien Upland land system. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

FWT soils (Dark Gray Luvisols on medium textured glaciolacustrine) and Uncas soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each) within delineations. Coarse variants of FWT and UCS soils are present in significant (20-30%) amounts. These variants are associated with isolated ice contact ridges or knolls or randomly occurring lenses or pockets within the glaciolacustrine and till. Soils developed on these materials exhibit extreme variation with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water are also present in significant amounts (15-25%). These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include Chernozemic soils developed on similar parent materials. Orthic Gray Luvisols developed on till are common inclusions (<10%).

Appendix C. *(continued)*

One FWUC8 soil map unit is recognized:

- FWUC8/6 is mapped on high relief (>50 m) hummocky surface forms, where the majority of the slopes are between 15-30%. Class 5 slopes are commonly present within delineations.

GMAB1 (Grosmont - Athabasca) Soil Unit

The GMAB1 soil unit is associated with the Muriel Upland land system. Delineations occur within agroclimatic zone 4H. The native vegetation is mixed deciduous-conifer forest. However, majority of the area is cultivated.

GMT soils (Dark Gray Luvisols on medium textured till) are dominant (30-50%). ABC soils (Orthic Gray Luvisols on medium textured till) are significant (20-40%). The distribution of these soils are related to the proportion of cleared land. The GMT soils are associated with the portions of the delineation which are cultivated, while ABC soils are found in the areas of native forest vegetation.

Soils which occur as inclusions (<10%) include coarse variants of the dominant soils, as well as Gleyed soils, Gleysolic soils and water.

One GMAB1 soil map unit is recognized:

- GMAB1/3-4 is mapped on undulating to hummocky surface forms, where the majority of the slopes are between 3-9%.

GOG1 (Goodridge) Soil Unit

The GOG1 soil unit is associated with Kehiwin Plain land system. The area is within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest. Cleared areas are interspersed throughout delineations of this unit. Surface stones and boulders are numerous and may hinder cultivation.

GOG soils (Orthic Gray Luvisols on coarse (sl) textured till) are dominant (30-60%). When native vegetation is removed, variants of GOG soils are created. These soil variants, associated with improved pastures, have thicker Ah horizons. The presence of this horizon alters the soil classification from Orthic to Dark Gray Luvisol.

Soils which occur in minor (<20%) amounts include Luvisolic soils developed on medium textured till. Brunisolic soils developed on gravelly, coarse textured glaciofluvial materials, as well as gleyed soils, Gleysolic soils and water are common inclusions (<10%).

Two GOG1 soil map units are recognized:

- GOG1/3 is mapped on fluted morainal materials with undulating to slightly ridged surface forms, where the majority of the slopes are between 2-5%. Class 4 slopes are commonly present within delineations.

GOG1/4 is mapped on hummocky and ridged surface forms, where the majority of the slopes are between 5-9%. Surface stoniness (boulders) is excessive within delineations of this map unit.

GONI6 (Goodridge - Nicot) Soil Unit

The GONI6 soil unit is associated with the Kehiwin Plain land system. The area is within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest.

GOG soils (Orthic Gray Luvisols on coarse (sl) textured till) and NIT soils (Eluviated Eutric Brunisols on coarse (s) textured glaciofluvial) are co-dominant (20-40% each) within delineations. Coarse variants of GOG and NIT soils are present in significant (20-30%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or as randomly occurring lenses or pockets within the till and glaciofluvial materials. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content.

Soils which are present as inclusions (<10%) include gleyed soils, Gleysolic soils and water.

One GONI6 soil map unit is recognized:

- GONI6/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 slopes are commonly present within delineations.

HLMS4 (Helliwell - Mooswa) Soil Unit

The HLMS4 soil unit is associated with the Alma Plain land system. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly aspen forest with grassland areas interspersed. Most of the area is cultivated.

HLW soils (Orthic Dark Grays on coarse (ls-s) textured glaciofluvial) and MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial) are co-dominant (20-50% each) within delineations. The distribution of these soils is random due to the inherent variability of glaciofluvial deposits. Eroded variants of these soils are present in significant (20-30%) amounts. These soils are associated with cultivated areas where the surface layer is "browner" due to erosion of the topsoil and incorporation of the subsoil within the cultivated surface layer. The original surface layer was removed due to wind erosion.

Soils which occur in minor (<20%) amounts include Brunisolic soils developed on coarse (s) textured glaciofluvial materials. Gleyed soils, Gleysolic soils and water are common inclusions (<10%).

One HLMS4 soil map unit is recognized:

- HLMS4/5 is mapped on hummocky surface forms, where the majority of slopes are between 9-15%. Class 4 and 6 slopes are commonly present within delineations.

HYKS4 (Hairy Hill - Kerensky) Soil Unit

The HYKS4 soil unit is associated with the St. Paul Plain land system. The area is within agroclimatic zone 2-3H. The native vegetation consists of dominantly grasses and sedges with some willows.

Appendix C. *(continued)*

HYL soils (saline Rego Humic Gleysols on medium textured till) are dominant (30-60%). KSY soils (Rego Humic Gleysols on medium textured glaciolacustrine) are significant (20-40%). Calcareous variants of these soil are present in significant (20-40%) amounts. Delineations of this soil unit, occupy regional discharge areas within the St. Paul Plain, where the direction of groundwater flow is towards the surface. This phenomenon is responsible for the saline and calcareous soils within the area.

One HYKS4 soil map unit is recognized:
- HYKS4/2 is mapped on level surface forms, where the dominant slopes are between 0-2%.

KSMN1 (Kerensky - Manatokan) Soil Unit

The KSMN1 soil unit is associated with all land systems within the 2-3H and 3H agroclimatic zones. The native vegetation is dominantly blacks spruce, willows and sedges.

KSY soils (Rego Humic Gleysols on medium textured glaciolacustrine sediment) and MNT soils (Terric Mesisols on mesic forest fen peat over till or glaciolacustrine sediment) are co-dominant (20-50% each) within delineations. These soils are intimately related. The difference between them is basically the depth of the surface organic layer. The KSY soils may have a peat layer <40 cm thick. For MNT soils this layer is >40 cm thick.

Soils which occur in minor (<20%) amounts include Organic soils where the peat layer is greater than 160 cm. thick. Luvisolic soils developed on till are common inclusions (<10%).

One KSMN1 soil map unit is recognized:
- KSMN1/2 is mapped on level lowland portions of the landscape where the majority of the slopes are between 1-3%. Class 3 slopes are also commonly present within delineations.

KSMN4 (Kerensky - Manatokan) Soil Unit

The KSMN4 soil unit is associated the Northern Valley Plain and St. Paul Plain land systems. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly blacks spruce, willows and sedges.

KSY soils (Rego Humic Gleysols on medium textured glaciolacustrine sediments) and MNT soils (Terric Mesisols on mesic forest fen peat over till or glaciolacustrine sediment) are co-dominant (20-50% each) within delineations. These soils are intimately related. The difference between them is basically the depth of the organic layer. The KSY soils may have a peat layer <40 cm thick. For MNT soils this layer is >40 cm thick. Calcareous variants of these soils are present in significant (20-50%) amounts. Delineations of this soil unit occupy regional discharge areas within the landscape where the direction of groundwater flow is towards the surface. This phenomenon is responsible for the calcareous soils within the area.

Soils which occur in minor (<20%) amounts include Organic soils where the peat layer is >160 cm thick.

One KSMN4 soil map unit is recognized:
- KSMN4/2 is mapped on level lowland portions of the landscape where the majority of the slopes are between 1-3%. Class 3 slopes are also commonly present within delineations.

KSNI1 (Kerensky - Nicot) Soil Unit

The KSNI1 soil unit is associated with the Sugden Plain and Whitney Plain land systems. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly blacks spruce, willows and sedges with islands of pine and aspen trees interspersed.

KSY soils (Rego Humic Gleysols on medium textured glaciolacustrine sediment) are dominant (20-50%). NIT soils (Eluviated Eutric Brunisols on coarse (ls-s) glaciofluvial sediment) are significant (20-40%). NIT soils occur randomly as islands within these regional lowland areas.

Soils which occur as inclusions (<10%) include Organic soils, as well as Luvisolic and other Brunisolic soils developed on coarse textured glaciofluvial materials.

One KSNI1 soil map unit is recognized:
- KSNI1/3 is mapped on undulating surface forms, where the majority of the slopes are between 2-5%. Class 4 slopes are commonly present within delineations.

KSY1 (Kerensky) Soil Unit

The KSY1 soil unit is associated with 7 land systems; Kehiwin Plain, Mann Lake Upland, Northern Valley Plain, St. Edouard Plain, St. Paul Plain, Sugden Plain and Whitney Plain. The area is within agroclimatic zones 2-3H and 3H. The native vegetation is dominantly willows and sedges.

KSY soils (Rego Humic Gleysols on medium textured glaciolacustrine sediment) are dominant (30-60%). Soils within these lowland, depressional areas of the landscape are variable in terms of texture and profile development. Therefore, although KSY soils are listed to be dominant, many variants of these soils are present within delineations.

Soils which occur in minor (<20%) amounts include Organic soils, as well as Chernozemic soils developed on glaciolacustrine materials. Calcareous variants of these soils may also present in minor amounts.

One KSY1 soil map unit is recognized:
- KSY1/2 is mapped on level surface forms, where the dominant slopes are between 1-3%. Class 3 slopes are commonly present within delineations.

Appendix C. *(continued)*

KSY4 (Kerensky) Soil Unit

The KSY4 soil unit is associated with 4 land systems; Alma Plain, Northern Valley Plain, St. Paul Plain and Therien Upland. The area is within agroclimatic zone 2-3H. The native vegetation is dominantly willows and sedges.

KSY soils (Rego Humic Gleysols on medium textured glaciolacustrine sediment) are dominant (30-60%). Soils within these lowland, depressional areas of the landscape are variable in terms of texture and profile development. Therefore, although KSY soils are listed to be dominant, many variants of these soils are present within delineations. Calcareous variants of these soils are present in significant (20-50%) amounts. Delineations of these units occupy regional and local discharge areas of the landscape where the direction of groundwater flow is towards the surface. This phenomenon is responsible for the calcareous soils within the area.

Soils which occur in minor (<20%) amounts include Organic soils.

One KSY4 soil map unit is recognized:

- KSY4/2 is mapped on level surface forms, where the majority of the slopes are between 1-3%. Class 3 slopes are commonly present within delineations.

LCGO2 (LaCorey - Goodridge) Soil Unit

The LCGO2 soil unit is associated with the Kehiwin Plain land system, in the vicinity of Goodfish Lake. All delineations occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Some cleared areas are interspersed throughout delineations of this unit. Surface stones and boulders are numerous and may hinder annual cultivation.

LCY soils (Orthic Gray Luvisols on medium textured till) and GOG soils (Orthic Gray Luvisols on coarse to medium textured till) are co-dominant (20-50% each) soils. When the native vegetation is removed, variants of these soils are formed. These soil variants, found in improved pastures or cultivated fields, have thicker Ah surface horizons. The presence of this horizon alters the soil classification from Orthic to Dark Gray Luvisols. Gleyed soils, Gleysolic soils and water are also commonly present (15-25%). These wet soils occupy the low-lying depressional areas between the undulations, hummocks and ridges.

Soils occurring in minor (<20%) amounts, include various types of profiles developed on coarser textured (ls-s) glaciofluvial sediments. The coarse fragment content of these sandier soils is variable. Also these coarser textured soils occur randomly in pockets or as discrete deposits throughout delineations of this soil unit.

Two LCGO2 soil map units are recognized.

- LCGO2/3 is mapped on undulating surface forms, where the majority of the slopes are between 2-5%. The unit may contain class 4 slopes.
- LCGO2/4 is mapped on hummocky and weakly ridged surface forms, where the majority of the slopes are between 5-9%. Class 3 slopes are commonly present within delineations.

LCON1 (LaCorey - Onoway) Soil Unit

The LCON1 soil unit is associated with the Mann Lake Upland and Vincent Upland land systems. The soil unit describes collapsed, donut-shaped morainal surface forms. Delineations of this unit occur within agroclimatic zone 3H. The native vegetation cover is mixed deciduous-conifer forest, interspersed with patches of sedges and willows.

LCY soils (Orthic Gray Luvisols on medium textured till) and ONW soils (Orthic Humic Gleysols on medium textured till) are co-dominant (30-50%) within this unit. The LCY soils occupy the upslope landscape positions. The ONW soils occur in between the hummocks in the concave to level depressional areas, in association with willow and sedge vegetation. The areal extent of these level, poorly drained areas exceeds 30%, within the delineation. The greater proportion of wet soils distinguishes these delineations from '2' map units.

Soils occurring in minor (<20%) amounts include: Dark Gray Luvisols on till, found in LCY-like areas where native vegetation is removed; and peaty variants of ONW soils, as well as Terric Mesisols developed on fen material. These latter soils are associated with similar landscape positions as ONW soils.

One LCON1 soil map unit is recognized:

- LCON1/4-5 is mapped on hummocky surface forms, where the majority of the slopes are between 5-15%. Class 2 and 3 slopes are associated with ONW soils.

LCSD1 (LaCorey - Spedden) Soil Unit

The LCSD1 soil unit is extensive and is associated with 6 land systems: Gadois Plain, Kehiwin Plain, Mann Lake Upland, Sugden Plain, Vilna Plain and Vincent Upland. Delineations of this unit occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Many delineations of this unit are extensively cultivated.

LCY soils (Orthic Gray Luvisols on medium textured till) and SDN soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-50% each). Their distribution is related to the extent of cleared land. LCY soils are found under native vegetative cover, consisting of dominantly aspen and some conifers. SDN soils occur under improved pasture and annually cultivated land use situations. Cultivation incorporates more organic matter within the surface Ah horizon. The increased Ah thickness changes the soil classification from Orthic to Dark Gray Luvisols. Also KHW-like soils (Orthic Dark Grays on medium textured till) are commonly present within cultivated areas, in upper slope landscape positions. These KHW-

Appendix C. *(continued)*

like soils represent eroded soils, where the brown coloured B horizons are being incorporated within the cultivated surface layer.

Soils occurring in minor (<20%) amounts include: gleyed soils, Gleysolic soils and water, which are associated with lowland depressional areas; coarse variants of LCY and SDN soils; and Eluviated Blacks developed on till. The coarse variant soils are associated with isolated ice contact ridges or knolls, or may randomly occurring lenses or pockets within the till. The Black soils are generally confined to the delineations on class 4 and 5 hummocky surface form.

Four LCSD1 soil map units are recognized:

- LCSD1/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. The unit may contain class 3 and 5 slopes.
- LCSD1/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. The unit may contain class 4 and 6 slopes.
- LCSD1/5D is mapped on inclined and dissected surface forms, where the dominant slopes are between 9-15%. Slope length is greater than 300 m. and gullies are common. Class 6 slopes are commonly present within the delineations.
- LCSD1/6 is mapped on hummocky surface forms, where the majority of the slopes are between 15-30%. The unit may contain class 4 and 5 slopes.

LCSD2 (LaCorey - Spedden) Soil Unit.

The LCSD2 soil unit is associated with 4 land systems: Gadois Plain, Mann Lake Upland, Vilna Plain and Vincent Upland. Delineations of this unit occur are within agroclimatic zone 3H. The native vegetative cover is mixed deciduous-conifer forest.

LCY soils (Orthic Gray Luvisols on medium textured till) and SDN soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-50% each). Their distribution is related to the extent of cleared land. LCY soils are found under native vegetative cover, consisting of dominantly aspen and some conifers. SDN soils occur under improved pasture and annually cultivated land use situations. Gleyed soils, Gleysolic soils and water are commonly present (15-30%). These wet soils occupy low-lying depressional areas between the hummocks and ridges.

Soils occurring in minor (<20%) amounts include: coarse and fine variants of the LCY and SDN soils; and Orthic Dark Gray soils, which represent eroded variants of SDN-like soils. The coarse variant soils are associated with isolated ice contact ridges or knolls or as randomly occurring lenses or pockets within the till. The fine variants are associated with the high relief flutes or ridges within map units of class 6 slopes. The till within these prominent flutes is clay in texture, due to the incorporation of ice-thrusted shale bedrock. For example, fine textured till occurs within soil map unit delineations in the vicinity of Boscombe.

Three LCSD2 soil map units are recognized:

- LCSD2/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. Class 3 and 5 slopes are commonly present within delineations, in variable amounts.
- LCSD2/5 is mapped on hummocky surface forms, where the majority of the slopes are between 9-15%. Class 4 and 6 slopes may be present within delineations, in variable proportions.
- LCSD2/6 is mapped on hummocky surface forms, where the majority of the slopes are between 15-30%. The unit commonly contains class 5 slopes.

LCSD6 (LaCorey - Spedden) Soil Unit

The LCSD6 soil unit is associated with 4 land systems;the Gadois Plain, Kehiwin Plain, Mann Lake Upland, Vilna Plain. Delineations of this unit occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest.

LCY soils (Orthic Gray Luvisols on medium textured till)and SDN (Dark Gray Luvisols on medium textured till) are the major named soils. Their distribution is related to the extent of cleared land. LCY soils are found under native vegetative cover, dominantly aspen and some conifers. SDN soils occur under improved pasture and annually cultivated land use situations. Coarse variants of these soils are present in significant (20-40%) amounts. These variants are associated with isolated ice contact ridges or knolls, or as randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability with respect to texture and coarse fragment content. Within the map unit with 4D slope class, the coarse variants consists of a discontinuous, sandy textured glaciofluvial veneer overlying the till.

Soils occurring in minor amounts (<15%) include: gleyed soils, Gleysolic soils and water, which are associated with lowland depressional areas; and Orthic Dark Grays developed on similar parent materials. These latter soils represent eroded phases and are generally associated with upland landscape positions in cultivated areas.

Two LCSD6 soil map units are recognized:

- LCSD6/4D is mapped on inclined and dissected surface forms, where the dominant slopes are between 5-9%.
- LCSD6/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%.

Appendix C. *(continued)*

LCSD8 (LaCorey - Spedden) Soil Unit

The LCSD8 soil unit is associated with the Gadois Plain and Kehiwin Plain land systems. Delineations of this unit occur within agroclimatic zone 3H. The dominant vegetative cover is mixed deciduous-conifer forest.

LCY soils (Orthic Gray Luvisols on medium textured till) and SDN soils (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each). SDN soils are associated with areas where the native vegetation has been cleared. Coarse variants of these soils are present in significant (20-40%) amounts. These variants are associated with isolated ice contact ridges or knolls, or as randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variability in texture and coarse fragment content. Gleyed variants of these soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils occupy the low-lying depressional areas between the hummocks, ridges and undulations.

Black Chernozemic variants of the previously described soils are present in minor (<15%) amounts.

One LCSD8 soil map unit is recognized:

- LCSD8/4 is mapped on undulating to hummocky surface forms, where the slopes are between 5-9%.

LCY6 (LaCorey) Soil Unit

The LCY6 soil unit is associated with the Gadois Plain land system. Delineations of this unit occur within agroclimatic zone 3H. The native vegetative cover is mixed deciduous-conifer forest.

LCY soils (Orthic Gray Luvisols on medium textured till) are dominant (30-60%). Within delineations of this unit cleared land is minimal, therefore, Orthic Gray Luvisolic soils are dominant. Coarse variants of LCY soils are present in significant (20-40%) amounts. These variants are associated with isolated ice contact ridges or knolls, or randomly occurring lenses or pockets within the till. Soils developed on these materials exhibit extreme variation in texture and coarse fragment content.

Soils occurring in minor amounts (<15%) include: Dark Gray Luvisols developed on till, found in areas where the native vegetation has been removed; and gleyed soils, Gleysolic soils and water, which are associated with lowland depressional areas.

One LCY6 soil map unit is recognized:

- LCY6/5 is mapped on hummocky surface forms, where the slopes are between 9-15%.

MGFT1 (Morningside - Ferintosh) Soil Unit

The MGFT soil unit is associated with 4 land systems; the Northern Valley Plain, Poitras Plain, Therien Upland, and the Whitney Plain. Delineations of this unit occur within the agroclimatic zone 2-3H. The native vegetative cover is dominantly grassland with some groves of aspen trees interspersed.

MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) are dominant (30-60%). FTH soils (Orthic Blacks on gravelly, coarse (ls-s) textured glaciofluvial sediment) are significant (20-40%). The FTH soils occur randomly throughout the delineations. Pockets of the FTH soil commonly contain marketable gravel deposits.

One MGFT1 soil map unit is recognized:

- MGFT1/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

MGMS1 (Morningside - Mooswa) Soil Unit

The MGMS soil unit is associated with the Therien Upland and Whitney Plain land systems. The majority of the delineations are within the Therien Upland, adjacent to the North Saskatchewan River. Delineations of this unit occur within agroclimatic zone 2-3H. The native vegetative cover is dominantly grassland with some groves of aspen trees interspersed.

MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) and MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-50% each). These soils are intimately related and occur randomly throughout the delineations.

Soils occurring in minor (<20%) amounts include various types of profiles (Brunisolics and Luvisolics) developed on coarse (sl-s) textured glaciofluvial. Chernozemic soils developed on a clean (<2% coarse fragments) coarse textured glaciofluvial veneer over gravel may also be present as inclusions (<10%).

One MGMS soil map unit is recognized:

- MGMS1/3 is mapped on undulating surface forms, where the majority of the slopes are between 2-5%.

MGRD6 (Morningside - Redwater) Soil Unit

The MGRD6 soil unit is associated with the Northern Valley Plain and Whitney Plain land systems. All delineations occur within the agroclimatic zone 2-3H. The vegetative cover is dominantly grassland with groves of aspen trees interspersed.

MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) and RDW soils (Orthic Dark Grays on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-50% each). These soils are intimately related and occur randomly throughout the delineations. Coarse variants of these soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or as randomly occurring lenses or pockets within the glaciofluvial material. Soils developed on these coarser materials are variable with respect to texture and coarse fragment content.

Appendix C. *(continued)*

Soils occurring as inclusions (<10%) include various types of profiles developed on coarse (sl-s) textured glaciofluvial sediment. Chernozemic and Luvisolic soils developed on coarse (sl) textured glaciofluvial veneer over medium textured till may also be present as inclusions.

One MGRD6 soil map unit is recognized:

- MGRD6/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

MGRD8 (Morningside - Redwater) Soil Unit

The MGRD8 soil unit is associated with the Northern Valley Plain, St. Paul Plain and Whitney Plain land systems. All delineations occur within agroclimatic zone 2-3H. The native vegetative cover is dominantly grassland, with groves of aspen trees interspersed.

MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) and RDW soils (Orthic Dark Grays on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-50% each). These soils are intimately related and occur randomly throughout delineations. Coarse variants of these soils are also present in significant (20-30%) amounts. These variants are associated with isolated ice contact ridges or knolls, or as randomly occurring lenses or pockets within the glaciofluvial material. Soils developed on these coarser materials are variable with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water, associated with lowland depressional areas, are also present in significant (15-25%) amounts.

Soils occurring as inclusions (<10%) include, Chernozemic and Luvisolic soils developed on medium textured till.

One MGRD8 soil map unit is recognized:

- MGRD8/4 is mapped on hummocky and sometimes terraced surface forms, where the dominant slopes are between 5-9%. Steeper slopes often present within delineations.

MGS1 (Morningside) Soil Unit

The MGS1 soil unit is associated with the Alma Plain, Northern Valley Plain and the Whitney Plain land systems. Delineations of this unit occur within agroclimatic zone 2-3H. The vegetative cover is dominantly grassland.

MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) are dominant (50-70%). The depth and color of the surface topsoil (Ah) is variable, within these delineations. Therefore, Eutric Brunisols as well as Dark Gray Chernozemic soils may be present in varying amounts.

Soils occurring as inclusions (<10%) include various types of profiles developed on coarse to medium (sl-l) textured glaciofluvial materials. Also, the coarse fragment content of these materials may be variable (>2% by volume).

One MGS1 soil map unit is recognized:

- MGS1/3 is mapped on undulating to level surface forms, where the dominant slopes are between 1-5%.

MSMG2 (Mooswa - Morningside) Soil Unit

The MSMG2 soil unit is associated with Northern Valley Plain and the Whitney Plain land systems. Delineations occur within agroclimatic zone 2-3H. The vegetative cover is dominantly grassland with some groves of aspen trees interspersed.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) and MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) are co-dominant (20-50% each) soils. These soils are intimately related, consequently their distribution is random throughout the delineations. Gleyed soils, Gleysolic soils and water occur in significant (15-30%) amounts. The MSW soils and wet soils are associated with the lower slope and depressional parts of the landscape.

Soils occurring in minor (<20%) amounts include, Orthic Dark Gray soils on coarse textured glaciofluvial sediment. Eluviated Black soils on medium textured glaciofluvial sediment are present as inclusions (<10%).

One MSMG2 soil map unit is recognized:

- MSMG2/3 is mapped undulating to hummocky surface forms, where the dominant slopes are between 2-5%. In some delineations, class 4 slopes are present in major amounts.

MSNT1 (Mooswa - Northern Valley) Soil Unit

The MSNT1 soil unit is associated with the Whitney Plain land system. Delineations occur within agroclimatic zone 2-3H. The vegetative cover is dominantly grassland with groves of aspen trees interspersed.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) and NTV soils (Eluviated Blacks on coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-50% each) soils. These soils are intimately related, consequently their distribution is random throughout the delineations. The texture of the till within delineations of this soil unit is typically sandy clay loam and discrete lenses of sand may be encountered within the till matrix.

Soils occurring in minor (<20%) amounts include Chernozemics and Luvisolics developed on coarse to medium textured glaciofluvial materials of variable thickness overlying till. Gleyed soils, Gleysolic soils and water, associated with depressional areas, are common inclusions (<10%).

Appendix C. *(continued)*

One MSNT1 soil map unit is recognized:

- MSNT1/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 slopes are commonly present within delineations.

MSNT6 (Mooswa - Northern Valley) Soil Unit

The MSNT6 soil unit is associated with the Northern Valley Plain, Therien Upland and Whitney Plain land systems. Delineations of this unit occur within agroclimatic zone 2-3H. The vegetative cover is dominantly grassland with groves of aspen trees interspersed throughout.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) and NTV soils (Eluviated Blacks on coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-50% each) soils. Coarse variants of these soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or beds within the glaciofluvial material and till. Soils developed on these coarser materials exhibit extreme variability with respect to texture and coarse fragment content.

Soils occurring as inclusions (<10%) include Chernozemic soils developed on medium textured till, as well as gleyed soils, Gleysolic soils and water. These wet soils are associated with depressional parts of the landscape.

One MSNT6 soil map unit is recognized:

- MSNT6/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 slopes are commonly present within the delineations.

MSPO8 (Mooswa - Ponoka) Soil Unit

The MSPO8 soil unit is associated with the Alma Plain, Northern Valley Plain and Therien Upland land systems. Delineations of the unit occur in regional lowland areas and remnant terraces of the North Saskatchewan River. The area is within the agroclimatic zone 2-3H. The vegetative cover is dominantly grassland with some groves of aspen trees interspersed throughout.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) and POK soils (Eluviated Blacks on medium textured glaciolacustrine sediment) are co-dominant (20-50% each) soils. Coarse variants of these soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice contact ridges or knolls, or randomly occurring lenses or beds within the glaciofluvial and glaciolacustrine material. Soils developed on these coarser materials are extremely variable with respect to texture and coarse fragment content. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include, Chernozemic soils developed on coarse textured glaciofluvial veneer overlying gravels. Other soils present as inclusions (<10%) are Orthic Dark Gray variants of MSW and POK.

One MSPO8 soil map unit is recognized:

- MSPO8/3-4 is mapped on undulating to hummocky, terrace-like surface forms, where the dominant slopes are between 2-9%.

MSRD1 (Mooswa - Redwater) Soil Unit

The MSRD1 soil unit is associated with the Northern Valley Plain, and Whitney Plain land systems. Delineations of this unit occur within agroclimatic zone 2-3H dominantly aspen forest with grassland areas interspersed throughout.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) and RDW soils (Orthic Dark Grays on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-50% each) soils. POK soils (Eluviated Blacks on medium textured glaciolacustrine) are also commonly present in variable amounts (10-30%).

Soils occurring as inclusions (<10%) include Chernozemic soils developed on till. Gravelly and stoney (>20% coarse fragments) variants of these parent materials are also common inclusions.

One MSRD1 soil map unit is recognized:

- MSRD1/5-6 is mapped on hummocky and some inclined surface forms, where the dominant slopes are between 9-30%.

MSRD4 (Mooswa - Redwater) Soil Unit

The MSRD4 soil unit is associated with the Northern Valley Plain and Whitney Plain land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetative cover is grassland with groves of aspen trees interspersed. Most of the delineations are extensively cultivated.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) and RDW soils (Orthic Dark Grays on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-40% each) soils. The surface layer (Ah) of the MSW soil is slightly more black in color, thus the changing classification. Eroded variants of MSW and RDW soils are also present in significant (20-40%) amounts. These eroded soils are recognizable since the brown coloured B horizon, and sometimes the calcareous C horizon is being incorporated into the cultivated surface horizon. These eroded soils are associated with upper slope positions and tops of knolls within cultivated landscapes.

Soils occurring in minor (10-20%) amounts Chernozemic soils developed on coarse (s) textured glaciofluvial materials. Similar soils on medium textured glaciolacustrine sediment are sometimes present as inclusions (<10%).

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One MSRD4 soil map unit is recognized:

- MSRD4/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Delineations of the map unit may contain class 3 and 5 slopes.

MSW1 (Mooswa) Soil Unit

The MSW soil unit is associated with Whitney Plain land system. Delineation occur within agroclimatic zone 2-3H. The vegetative cover is dominantly grassland with groves of aspen trees interspersed.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) are dominant (50-70%). Similar soils developed on a glaciofluvial veneer over till, are commonly associated with MSW soils.

Soils occurring in minor (10-20%) amounts include: Orthic Dark Gray soils developed on coarse textured glaciofluvial sediment; and other Chernozemic soils on medium textured till. Soils developed on coarse (s) textured glaciofluvial sediment are common inclusions (<10%).

One MSW1 soil map unit is recognized:

- MSW1/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

MSW6 (Mooswa) Soil Unit

The MSW6 soil unit is associated with the 6 land systems; Alma Plain, Kehiwin Plain, Northern Valley Plain, St. Paul Plain, Therien Upland and Whitney Plain. The majority of the delineations occur within agroclimatic zone 2-3H, although the few delineations on the Kehiwin Plain are within the 3H zone. The native vegetative cover is grassland with groves of aspen trees interspersed throughout.

MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) are dominant (20-40%). Coarse variants of these soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or as randomly occurring lenses or beds within the glaciofluvial material. Soils developed on these coarser materials are extremely variable with respect to texture (s-cl) and coarse fragment content (>2%). Within map units on class 5 slopes, till may be encountered within the profile, usually in association with the coarser variants.

Soils occurring as inclusions (<10%) include; eroded variants, fine textured variants, Luvisolic soils developed on till as well as gleyed soils, Gleysolic soils and water. The eroded and fine textured variants occur within delineations of slope class 3 soil units.

Two MSW6 soil map units are recognized:

- MSW6/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.
- MSW6/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%. Delineations of this map unit commonly contain class 4 and 6 slopes.

NIED1 (Nicot - Edwand) Soil Unit

The NIED1 soil unit is associated with the Gadois Plain, Sugden Plain and the Whitney Plain land systems. Delineations occur within agroclimatic zones 2-3H and 3H. The native vegetative cover is dominantly mixed deciduous-conifer forest.

The NIT soils (Eluviated Eutric Brunisols on coarse (s) textured glaciofluvial sediment) and EDW soils (Eluviated Eutric Brunisols on gravelly and stoney, coarse (s) textured glaciofluvial sediment) are co-dominant (20-50% each) soils. These soils are intimately mixed, but EDW soils generally occur as discrete pockets within the clean, (<5% coarse fragments) sand textured, glaciofluvial material.

Soils occurring as inclusions (<10%), differ with respect to topographic classes. Within the map unit of class 4 slopes, common inclusions are: Brunisolic soils developed on sandy loam to loam textured glaciofluvial sediment; and gleyed soils, Gleysolic soils and water. Within the map unit of class 5-6 slopes, Luvisolic soils developed on a discontinuous coarse (sl) glaciofluvial veneer over medium textured till, occur in minor (10-20%) amounts.

Two NIED1 soil map units were recognized.

- NIED1/4 is mapped on hummocky, terraced surface forms, where the dominant slopes are between 5-9%. This soil map unit describe the terraces along the Beaver River. Class 3 and 5 slopes are commonly present within the delineation.
- NIED1/5-6i is mapped on inclined (slope length >200 m) surface forms, where the dominant slopes are between 9-30%. Delineations of this map unit are associated with the slopes of glacial meltwater channels.

NIHL1 (Nicot - Helliwell) Soil Unit

The NIHL1 soil unit is associated with 5 land systems; Kehiwin Plain, Northern Valley Plain, Sugden Plain, Therien Upland and Whitney Plain. Delineations occur within the agroclimatic zones 2-3H and 3H. The vegetative cover is dominantly grassland with some areas of mixed deciduous-conifer forest interspersed throughout.

The NIT soils (Eluviated Eutric Brunisols on coarse (s) textured glaciofluvial sediment) and HLW soils (Orthic Dark Grays on coarse (s) textured glaciofluvial sediment) are co-dominant (20-40% each). These soils are similar, except that HLW soils have a 10cm (or more) thick Ah or Ap horizon.

Soils occurring in minor (10-20%) amounts include, Brunisolic and Chernozemic soils developed on sandy

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loam textured glaciofluvial material and gravelly (>20% coarse fragments) coarse textured glaciofluvial sediments. Gleyed soils, Gleysolic soils and water are present as inclusions (<10%).

One NIHL1 soil map unit is recognized:
- NIHL1/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

NIHL2 (Nicot - Helliwell) Soil Unit

The NIHL2 soil unit is associated with the Whitney Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetative cover is dominantly mixed deciduous-conifer forest, with some grassland and sparsely vegetated areas interspersed throughout.

NIT soils (Eluviated Eutric Brunisols on coarse (s) textured glaciofluvial sediment) and HLW soils (Orthic Dark Grays on coarse (s) textured glaciofluvial sediment) are co-dominant (20-50% each) soils. These soils are similar, except that the HLW soils have a 10cm (or more) thick Ah or Ap horizon. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with inter-ridge furrows within the ridged landscape.

Soils occurring as inclusions (10-20%) include Chernozemic and Brunisolic soils developed on finer (sl-l) textured glaciofluvial materials. These soils are also found in the inter-ridge areas of the landscape in association with the wet soils.

One NIHL2 soil map unit is recognized:
- NIHL2/4-5 is mapped on ridged surface forms, where the dominant slopes are between 5-15%. The ridges have been modified by aeolian processes.

NIMG1 (Nicot - Morningside) Soil Unit

The NIMG1 soils unit is associated with 4 land systems; Alma Plain, Northern Valley Plain, Therien Upland and Whitney Plain. Delineations of this unit occur within agroclimatic zone 2-3H. The native vegetative cover is dominantly mixed deciduous-conifer forest with grassland areas interspersed.

The NIT soils (Eluviated Eutric Brunisols on coarse (s) textured glaciofluvial sediment) and MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) are co-dominant (20-40% each) soils. These soils are similar except that the MGS soils have a 10cm (or more) thick Ah or Ap horizon.

Soils occurring in minor (10-20%) amounts include Chernozemic soils developed on finer (sl-l) textured glaciofluvial materials. Brunisolic and Chernozemic soils developed on shallow glaciofluvial deposits overlying till, as well as gleyed soils, Gleysolic soils and water are common inclusions (<10%).

One NIMG1 soil map unit is recognized:
- NIMG1/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%.

NIMS6 (Nicot - Mooswa) Soil Unit

The NIMS6 soil unit is associated with the Therien Upland land system. Delineations occur within agroclimatic zone 2-3H. The vegetative cover is mixed deciduous-conifer forest with grassland areas interspersed.

The NIT soils (Eluviated Eutric Brunisols on coarse (s) textured glaciofluvial sediment) and MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-40% each). Coarse variants of these soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or pockets within the glaciofluvial material. Soils developed on these coarser materials are extremely variable with respect to texture (s to cl) and coarse fragment content (>2%).

Soils occurring as inclusions (<10%) include Chernozemic and Luvisolic soils developed a discontinuous coarse textured glaciofluvial veneer over medium textured till. Where the veneer is absent soils are developed directly on till. Gleyed soils, Gleysolic soils and water, associated with lower slope and depressional landscape positions, are also common inclusions.

One NIMS6 soil map unit is recognized:
- NIMS6/5-6 is mapped on hummocky surface forms, where the dominant slopes are between 9-30%.

NIRD2 (Nicot - Redwater) Soil Unit

The NIRD2 soil unit is associated with the Northern Valley Plain and Whitney Plain land systems. Delineations occur within the agroclimatic zone 2-3H. The native vegetative cover is dominantly grassland with groves of aspen trees interspersed.

The NIT soils (Eluviated Eutric Brunisols on coarse (s) textured glaciofluvial sediment) and RDW soils (Orthic Dark Grays on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-40% each). Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring in minor (10-20%) amounts include Chernozemic soils developed on coarse (s) textured glaciofluvial materials. Black Chernozemic soils, developed on a coarse (sl) textured glaciofluvial blanket veneer over medium textured till, are common inclusions (<10%).

One NIRD2 soil map unit is recognized:
- NIRD2/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

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NIT1 (Nicot) Soil Unit

The NIT1 soil unit is associated with 3 land systems; Northern Valley Plain, Therien Upland and Whitney Plain. Delineations occur within agroclimatic zone 2-3H. The native vegetative cover is mixed deciduous-conifer forest.

NIT soils (Eluviated Eutric Brunisol on coarse (s) textured glaciofluvial sediment) are dominant (50-70%). Chernozemic soils (HLW and MGS) are present in variable amounts (10-30%). They are associated with open areas within the mixed deciduous-conifer forest canopy.

Common inclusions (<10%) are Chernozemic soils developed on finer (sl-l) textured glaciofluvial materials as well as gleyed soils, Gleysolic soils and water. These soils are associated with the lower slope and depressional landscape positions.

One NIT1 soil map unit is recognized:

- NIT1/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%. Class 4 and 6 topography are commonly present within delineations.

NTGB1 (Northern Valley - Gabriel) Soil Unit

The NTGB1 soil unit is associated with the Alma Plain and Northern Valley Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is grassland with aspen interspersed. Most of the area is cultivated.

NTV soils (Eluviated Blacks on a coarse (sl) textured glaciofluvial veneer over medium textured till) and GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-40% each) within this unit. The underlying till within this unit is generally sandy clay loam in texture. Discrete lenses of sand are commonly encountered within the till. AGS soils (Eluviated Blacks on medium textured till) are randomly present (10-30%), throughout the delineations.

Soils occurring in minor (<20%) amounts include Chernozemic soils developed on coarse textured glaciofluvial materials greater than a meter thick. Luvisolic soil variants of the previously described soils are common inclusions (<10%).

One NTGB1 soil map unit is recognized:

- NTGB1/3i is mapped on long (>300 m) inclined surface forms where the slopes are between 2-5%. These landscapes commonly have gullies developed on their surfaces. They are highly susceptible to water erosion due to the long slope lengths.

NTGB2 (Northern Valley - Gabriel) Soil Unit

The NTGB2 soils unit is associated with the Northern Valley Plain and Therien Upland land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is grassland with groves of aspen interspersed. Most of the area is cultivated.

NTV soils (Eluviated Blacks on a coarse (sl) textured glaciofluvial veneer over medium textured till) and GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-40% each) within this unit. The underlying till within this unit is commonly sandy clay loam in texture. Discrete lenses of sand are also encountered within the till. Gleyed soils, Gleysolic soils and water are also commonly present (15-30%). These wet soils are associated with the lower slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include Chernozemic and Luvisolic soils developed on coarse textured glaciofluvial materials greater than one meter thick. Similar soils developed on medium textured till are common inclusions (<10%).

One NTGB2 soil map unit is recognized:

- NTGB2/3 is mapped on undulating surface forms where the dominant slopes are between 2-5%. Class 2 slopes are commonly present within these delineations.

NTUC8 (Northern Valley - Uncas) Soil Unit

The NTUC8 soil unit is associated with the Northern Valley Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland with groves of aspen interspersed. Most of the area is cultivated.

NTV soils (Eluviated Blacks on a coarse (sl) textured glaciofluvial veneer over medium textured till) and UCS (Dark Gray Luvisols on medium textured till) are co-dominant (20-40% each) within this unit. The texture of the till within this unit is generally sandy clay loam. Discrete lenses of sand are also common within this till. Coarse variants of these soils are also present in significant (20-30%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or pockets within the glaciofluvial and morainal materials. Soils developed on these coarser materials are extremely variable with respect to texture (s to cl) and coarse fragment content (>2%). Gleyed variants, Gleysolics and water are also present in significant (15-30%) proportions. These wet soils are associated with lower slope and depressional landscape positions.

Other soils which occur as inclusions (<10%) are Chernozemic soils developed on thick (>1 meter) glaciofluvial material and till.

One NTUC8 soil map unit is recognized:

- NTUC8/3-4 is mapped on undulating to hummocky surface forms where the dominant slopes are between 2-9%. Surface stones and boulders limit agricultural land use potential of this unit.

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ONMP1 (Onoway - Mapova) Soil Unit

The ONMP1 soil unit is associated with the Mann Lake Upland, Sugden Plain, and Vincent Upland land system. Delineations occur within agroclimatic zone 3H. The associated native vegetative cover is dominantly sedges, willows and some black spruce.

ONW soils (Orthic Humic Gleysols on medium textured till) and MPV soils (Humic Luvic Gleysols on medium textured till) are co-dominant (20-40% each) within this unit. Within delineations of this unit, the sequence of horizons as well as texture of materials may be extremely variable. Consequently, many other types of wet soils are present. For example, the Gleysolic soils developed on a sandy loam veneer overlying till (Tp.61, Rge.10).

Soils occurring in minor (<20%) amounts include Luvisols developed on till. Also, peaty Gleysolic and Organic soils are common inclusions (<10%).

One ONMP1 soil map unit is recognized:

- ONMP1/2-3 is mapped on level to undulating surface forms where the dominant slopes are between 1-5%.

POGR1 (Ponoka - Gratz) Soil Unit

The POGR1 soil unit is associated with the Northern Valley Plain, Therien Upland and Whitney Plain land systems. The majority of the delineations describe the soil landscapes found on terraces, adjacent to the North Saskatchewan River. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly grassland with some mixed deciduous-conifer forest interspersed. Majority of the area is annually cultivated.

POK soils (Eluviated Blacks on medium textured glaciofluvial - lacustrine sediment) and GRZ soils (Cumulic Humic Regosols on medium textured fluvial sediment) are co-dominant (20-50% each) within this unit. The percentage of GRZ soils increases with the 'youthfulness' of the terraces (the lower, most recent floodplain terraces).

Soils occurring in minor (<20%) amounts include Chernozemic soils developed on a discontinuous, coarse textured, glaciofluvial blanket-veneer overlying glaciofluvial gravels.

One POGR1 soil map unit is recognized:

- POGR1/3T is mapped on glaciofluvial and fluvial materials with terraced surface forms, where the dominant slopes are between 2-5%. Class 4 and 5 slopes may be associated with the risers, - the short, steeper slopes separating the different terraces.

POK1 (Ponoka) Soil Unit

The POK1 soil unit is associated with the Whitney Plain land system. Delineations of this unit occur within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest. Most of the area is annually cultivated.

POK soils (Eluviated Blacks on medium textured glaciofluvial - lacustrine sediment) are dominant (50-70%). The texture and mode of deposition of these soils render them susceptible to wind erosion. Eroded variants of POK soils are commonly present on exposed knolls within cultivated fields.

Soils occurring in minor (<20%) amounts include Chernozemic soils developed on coarse (sl) textured glaciofluvial materials.

One POK1 soil map unit is recognized:

- POK1/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%.

POK8 (Ponoka) Soil Unit

The POK8 soil unit is associated with the Kehiwin Plain and Northern Valley Plain land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest. Most of the area is annually cultivated.

POK soils (Eluviated Blacks on medium textured glaciofluvial - lacustrine sediment) is dominant (30-50%). Coarse variants of these soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or beds within the glaciofluvial material. Soils developed on these coarser materials are extremely variable with respect to texture (s to cl) and coarse fragment content (>2%). Gleyed soils, Gleysolic soils and water are also present in significant amounts (15-30%). These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring as inclusions (<10%) are Chernozemic and Luvisolic soils developed on till.

One POK8 soil map unit is recognized:

- POK8/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%. Class 4 slopes are also commonly present within the delineations.

POMS2 (Ponoka - Mooswa) Soil Unit

The POMS2 soils unit is associated with the Kehiwin Plain and Northern Valley Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest and interspersed with grassland. Most of the area is annually cultivated.

POK soils (Eluviated Blacks on medium textured glaciofluvial - lacustrine sediment) and MSW soils (Eluviated Blacks on coarse (sl) textured glaciofluvial sediment) are co-dominant (20-40% each) within this unit. The parent materials of these soils are intimately related, so their distribution is random. Intergrades of these soils are common. Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils

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are associated with lower slope and depressional landscape positions.

Soils occurring as common inclusions (<10%) are Chernozemics developed on a coarse to medium textured glaciofluvial veneer overlying till or gravel.

One POMS2 soil map unit is recognized:

- POMS2/2-3 is mapped on level to undulating surface forms, where the dominant slopes are between 1-5%.

PORD1 (Ponoka - Redwater) Soil Unit

The PORD1 soil unit is associated with the Therien Upland and Whitney Plain land systems. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest interspersed with grassland areas.

POK soils (Eluviated Blacks on medium textured glaciolacustrine sediment) are dominant (30-50%). RDW soils (Orthic Dark Grays on coarse (sl) textured glaciofluvial sediment) are significant (20-40%). The parent materials of these soils are intimately related, so their distribution is random. The surface Ah layer of the POK soil is slightly more black in color, thus changing the classification.

Soils occurring in minor (<20%) amounts include Black Chernozemics developed on glaciofluvial materials. Common inclusions (<10%) are Chernozemics developed on till, as well as gleyed soils, Gleysolic soils and water.

One PORD1 soil map unit is recognized:

- PORD1/4 is mapped on hummocky surface forms, where the majority of the slopes are between 5-9%. In some delineations containing terraces, class 3 and 5 slopes are common.

SBBL1 (Stebbing - Birkland) Soil Unit

The SBBL1 soil unit is associated with the Bunder Upland and Sugden Plain land systems. Delineations of this unit occur within agroclimatic zones 3H and 4H. The native vegetation consists of Black spruce, Labrador tea, low bush cranberry, and sphagnum moss.

SBN soils (Typic Fibrisols on sphagnum bog peat) are dominant (30-50%). BLA soils (Terric Fibrisols on sphagnum bog peat) are present in significant (20-40%) amounts. Within organic materials, the inherent state of decomposition and water regime is variable. This variability alters the classification. Therefore, within organic landforms, the distribution and kinds of Organic soils are complex and numerous.

Soils occurring in minor (<20%) amounts include peaty Gleysolics. These are associated with the edges of the organic deposits.

One SBBL1 soil map unit is recognized:

- SBBL1/2 is mapped on level surface forms, where the slopes are between 0-2%.

SDFR1 (Spedden - Fergy) Soil Unit

The SDFR1 soil unit is associated with the Sugden Plain and Vincent Upland land systems. Delineations of this unit occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Most of the area is annually cultivated.

SDN soils (Dark Gray Luvisols on medium textured till) and FRY soils (Eluviated Blacks on medium textured till) are co-dominant (20-50% each) within this unit. These soils are similar in appearance except FRY soils have a blacker surface layer than the those of SDN soils. These soils of similar appearance are thus intimately intermixed throughout delineations of this unit.

Soils occurring in minor (<20%) amounts include Dark Gray Chernozemics developed on till. These Chernozemics represent eroded variants of the dominant soils. Other soils present as inclusions (<10%) are; Orthic Gray Luvisolics, coarse variants, as well as gleyed variants, Gleysolics and water.

One SDFR1 soil map unit is recognized:

- SDFR1/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 slopes are commonly present within the delineations.

SDFR2 (Spedden - Fergy) Soil Unit

The SDFR2 soil unit is associated with 4 land systems; Mann Lake Upland, Vilna Plain, Vincent Upland and Sugden Plain. Delineations occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Majority of the area is annually cultivated.

SDN soils (Dark Gray Luvisols on medium textured till) and FRY soils (Eluviated Blacks on medium textured till) are co-dominant (20-40% each) within this unit. These soils are similar in appearance except FRY soils have a 'blacker' surface layer than the those of SDN soils. These soils of similar appearance are thus intimately intermixed throughout delineations of this unit. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Delineations of this unit are associated with better drained regional upland areas. The percentage of gleyed soils is not as great as within the SDVI2/3 discharge area map unit.

Soils occurring in minor (<20%) amounts include Orthic Dark Gray and Orthic Gray Luvisolic soils developed on till. Coarse variants of these soils are also common inclusions (<10%).

Two SDFR2 soil map units are recognized:

- SDFR2/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.
- SDFR2/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%.

Appendix C. *(continued)*

SDGB1 (Spedden - Gabriel) Soil Unit

The SDGB1 soils unit is associated with the Gadois Plain land system. Delineations occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Some areas are cultivated.

SDN soils (Dark Gray Luvisols on medium textured till) and GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-50% each) within this unit. The distribution of these soils is random.

Soils occurring as inclusions (<10%) include Chernozemics and Orthic Gray Luvisols developed on till. Also, gleyed soils, Gleysolic soils and water are present.

One SDGB1 soil map unit is recognized:

- SDGB1/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

SDGB2 (Spedden - Gabriel) Soil Unit

The SDGB2 soil unit is associated with the Sugden Plain and Vilna Plain land systems. Delineations occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Extensive areas are cultivated.

SDN soils (Dark Gray Luvisols on medium textured till) and GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-50% each) within this unit. Gleyed variants, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional areas of the landscape.

Soils occurring in minor (<20%) amounts include Luvisolics developed on medium textured glaciolacustrine sediment. Eluviated Blacks and Orthic Gray Luvisols developed on till are common inclusions (<10%). Also coarse variants of these soils may be present.

Two SDGB2 soil map units are recognized:

- SDGB2/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.
- SDGB2/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%.

SDKH1 (Spedden - Kehiwin) Soil Unit

The SDKH soil unit is associated with the Mann Lake Upland and Sugden Plain land systems. Delineations of this unit occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Most of the area is annually cultivated.

SDN soils (Dark Gray Luvisols on medium textured till) and KHW soils (Orthic Dark Grays on medium textured till) are co-dominant (20-50% each) within the unit. The KHW soils represent eroded soils where the brown coloured subsoil is being incorporated within the cultivated surface layer. These soils are generally associated with upper slope positions within annually cultivated landscapes.

Soils occurring in minor (<20%) amounts include Black Chernozemics and Orthic Gray Luvisols developed on till. The latter soils are associated with areas covered with native vegetation. Coarse variants as well as gleyed variants, Gleysolics and water are common inclusions (<10%).

Three SDKH1 soil map units are recognized:

- SDKH1/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.
- SDKH1/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%.
- SDKH1/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%.

SDKH2 (Spedden - Kehiwin) Soil Unit

The SDKH2 soil unit is associated with 4 land systems; Mann Lake Upland, Sugden Plain, Vilna Plain and Vincent Upland. Delineations occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Majority of the area is annually cultivated.

SDN soils (Dark Gray Luvisols on medium textured till) and KHW soils (Orthic Dark Grays on medium textured till) are co-dominant (20-50% each) within the unit. The KHW soils represent eroded soils where the brown coloured subsoil is being incorporated within the cultivated surface layer. These soils are generally associated with upper slope positions within annually cultivated landscapes. Gleyed variants, Gleysolics and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring as inclusions (<10%) include Black Chernozemics and Orthic Gray Luvisols developed on till as well as coarse variants of the previously described soils.

Three SDKH2 soil map units are recognized:

- SDKH2/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.
- SDKH2/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%.
- SDKH2/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%.

SDKH8 (Spedden - Kehiwin) Soil Unit

The SDKH8 soil unit is associated with the Vilna Plain land system. Delineations occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest interspersed with grassland areas. Most of the area is annually cultivated.

SDN soils (Dark Gray Luvisols on medium textured till) and KHW soils (Orthic Dark Grays on medium textured till) are co-dominant (20-50% each) within the unit. The KHW soils represent eroded soils where the brown coloured

Appendix C. *(continued)*

subsoil is being incorporated within the cultivated surface layer. These soils are generally associated with upper slope positions within annually cultivated landscapes. Coarse variants of these soils are also present in significant (20-40%) amounts. These variants are associated with isolated ice-contact ridges or knolls, or randomly occurring lenses or beds within the glaciofluvial material. Soils developed on these coarser materials are extremely variable with respect to texture (s to cl) and coarse fragment content (>2%). Gleyed variants, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Orthic Gray Luvisolic soils developed on till are common inclusions (<10%).

One SDKH8 soil map unit is recognized:

- SDKH8/4 is mapped on surface forms, where the dominant slopes are between 5-9%.

SDLC1 (Spedden - LaCorey) Soil Unit

The SDLC1 soil unit is associated with 4 land systems; Gadois Plain, Kehiwin Plain, Mann Lake Upland and Sugden Plain. Delineations of this unit occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Annual cultivation within delineations is extensive.

SDN soils (Dark Gray Luvisols on medium textured till) and LaCorey soils (Orthic Gray Luvisols on medium textured till) are co-dominant (20-50% each) within the unit. The distribution of these soils is related to the extent of cleared land. LCY soils are found under native vegetative cover, consisting of dominantly aspen and some conifers. SDN soils occur under improved pastures and annually cultivated land use situations.

Soils which are present in minor (10-20%) amounts include Chernozemics developed on till. Coarse variants of the soils developed on till are common inclusions (<10%). Gleyed variants, Gleysolic soils and water are also present as inclusions.

One SDLC1 soil map unit is recognized:

- SDLC1/3 is mapped on undulating and fluted surface forms, where the dominant slopes are between 2-5%.

SDLC2 (Spedden - LaCorey) Soil Unit

The SDLC2 soil unit is associated with 4 land systems; Gadois Plain, Kehiwin Plain, Sugden Plain and Vincent Upland. Delineations of this unit occur within agroclimatic zone 3H. The vegetative cover is dominantly mixed deciduous-conifer forest with some grassland areas interspersed. Landscapes associated with delineations of this unit, within the Kehiwin Plain Land System, are developed on fluted morainal landforms.

SDN soils (Dark Gray Luvisols on medium textured till) and LaCorey soils (Orthic Gray Luvisols on medium textured till) are co-dominant (20-50% each) within the unit. The distribution of these soils is related to the extent of cleared land. LCY soils are found under native vegetative cover, consisting of dominantly aspen and some conifers. SDN soils occur under improved pastures and annually cultivated land use situations. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with the lower slope and depressional or inter-flute, furrowed parts of the landscape. The texture of the till, associated with these fluted landscapes, is generally sandy clay loam.

Soils occurring in minor (<20%) amounts include Chernozemics developed on till. Coarse variants of the soils developed on till are common inclusions (<10%).

One SDLC2 soil map unit is recognized:

- SDLC2/3 is mapped on undulating and fluted surface forms, where the dominant slopes are between 2-5%.

SDMH2 (Spedden - Moose Hills) Soil Unit

The SDMH2 soil unit is associated with the Gadois Plain land system. Delineations occur within agroclimatic zone 3H. The native vegetation is dominantly mixed deciduous-conifer forest.

SDN soils (Dark Gray Luvisols on medium textured till) and MHL soils (Orthic Gray Luvisols on a coarse (ls-s) textured glaciofluvial veneer over medium textured till) are co-dominant (20-40% each) within this unit. The glaciofluvial veneer is discontinuous, thus the distribution of SDN and MHL soils is random. LCY soils (Orthic Gray Luvisols on medium textured till) may be dominant in delineations where the areal extent of native forest vegetation is extensive. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional portions of the landscape.

One SDMH2 soil map unit is recognized:

- SDMH2/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%. Class 4 slopes are commonly present within the delineations.

SDVI2 (Spedden - Vilna) Soil Unit

The SDVI2 soil unit is associated with the Sugden Plain land system. Delineations occur within agroclimatic zone 3H. The native vegetation is mixed deciduous-conifer forest. Annual cultivation is extensive within delineations of this unit.

SDN soils (Dark Gray Luvisols on medium textured till) and VIL soils (Gleyed Eluviated Blacks on medium textured till) are co-dominant (20-40% each) within this unit. The VIL soils occupy the poorly drained parts of the landscape. These areas can only be detected by examination

Appendix C. *(continued)*

of soil profiles. They are not visible from a roadside visual inspection of the landscape. The distribution of these soils appears to be random in most circumstances. Gleysolics are also present in significant (15-30%) amounts. These very poorly drained wet soils are associated with the more prominent depressional landscape positions.

Soils occurring in minor (<20%) amounts include well drained Chemozemics developed on till. Coarse variants of these soils developed on till are common inclusions (<10%).

One SDVI2 soil map unit is recognized:

- SDVI2/2-3 is mapped on undulating to level surface forms, where the dominant slopes are between 1-5%. Within delineations of this map unit there are numerous areas of class 2 slopes. The distribution of these slope classes is too intricate to depict separately at this map scale.

TWMG1 (Two Hills - Morningside) Soil Unit

The TWMG1 soil unit is associated with the Poitras Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly aspen forest with some grassland areas interspersed. Surface stones and boulders severely limit the suitability of these areas for annual cultivation.

TWH soils (Orthic Dark Grays on gravelly and cobbly medium textured glaciofluvial sediment) and MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) are co-dominant (20-50% each) within this unit. The random distribution of TWH and MGS soils, as well as intergrades of these soils, reflect the inherent variability of the glaciofluvial materials.

Brunisolic and Luvisolic soils developed on glaciofluvial materials and till are common inclusions (<10%). Gleyed soils, Gleysolic soils and water are also present, as inclusions.

One TWMG1 soil map unit is recognized:

- TWMG1/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 5 slopes are commonly present within delineations.

TWMG2 (Two Hills - Morningside) Soil Unit

The TWMG2 soil unit is associated with the Poitras Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly aspen forest with grassland areas interspersed. Surface stones and boulders severely limit the suitability of these areas for annual cultivation.

TWH soils (Orthic Dark Grays on gravelly and cobbly medium textured glaciofluvial sediment) and MGS soils (Orthic Blacks on coarse (s) textured glaciofluvial sediment) are co-dominant (20-40% each) within this unit. The random distribution of TWH and MGS soils, as well as intergrades of these soils, reflect the inherent variability of glaciofluvial materials. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with low slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include Luvisolics developed on till.

One TWMG2 soil map unit is recognized:

- TWMG2/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 and 5 slopes are present in variable amounts within the delineation.

UCBO2 (Uncas - Boscombe) Soil Unit

The UCBO2 soil unit is associated with the St. Edouard Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly aspen with grassland areas interspersed. Most of the area is annually cultivated.

UCS soils (Dark Gray Luvisols on medium textured till) and BOB soils (Gleyed Dark Gray Luvisols on medium textured till) are co- dominant (20-40% each) within this unit. The BOB soils occupy the poorly drained portions of the landscape. These areas can only be detected by examination of soil profiles. They are not visible from roadside inspections of the landscape. The distribution of these soils appears to be random in most circumstances. Gleysolics are also present in significant (15-25%) amounts. These very poorly drained wet soils are associated with the more prominent depressional landscape positions.

Soils occurring in minor (<20%) amounts include well drained Chernozemics and Luvisolics developed on till. Coarse variants of these soils on till are common inclusions.

One UCBO2 soil map unit is recognized:

- UCBO2/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%. Class 2 slopes are commonly present within the delineations.

UCCO1 (Uncas - Cooking Lake) Soil Unit

The UCCO1 soil unit is associated with 4 land systems; Kehiwin Plain, Northern Valley Plain, St. Paul Plain and Therien Upland. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly aspen forest with grassland areas interspersed. Most of the area is annually cultivated.

UCS soils (Dark Gray Luvisols on medium textured till) and COA soils (Orthic Gray Luvisols on medium textured till) are co-dominant (20-50% each) within this unit. The distribution of these soils is related to the extent of cleared land. COA soils are found under native vegetative cover, consisting of dominantly aspen and some conifers. UCS

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soils are associated with areas of improved pastures and annually cultivated land use situations.

Soils occurring in minor (<20%) amounts include Chernozemics developed on till. Gleyed soils, Gleysolic soils and water are common inclusions (<10%).

One UCCO1 soil map unit is recognized:

- UCCO1/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%. Class 2 and 4 slopes are present in variable proportions.

UCCO2 (Uncas - Cooking Lake) Soil Unit

The UCCO2 soil unit is associated with the 3 land systems; Mann Lake Upland, St. Edouard Plain and St. Paul Plain. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly aspen forest with grassland areas interspersed. Most of the area is annually cultivated.

UCS soils (Dark Gray Luvisols on medium textured till) and COA soils (Orthic Gray Luvisols on medium textured till) are co-dominant (20-50% each) within this unit. The distribution of these soils is related to the extent of cleared land. COA soils are found under native vegetative cover, consisting of dominantly aspen and some conifers. UCS soils are associated with areas of improved pastures and annually cultivated land use situations. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils which are present in minor (<20%) amounts include Chernozemics developed on till. Coarse variants of the soils developed on till are common inclusions (<10%).

One UCCO2 soil map unit is recognized:

- UCCO2/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%. Class 4 slopes are commonly present.

UCGB1 (Uncas - Gabriel) Soil Unit

The UCGB1 soil unit is associated with the Northern Valley Plain land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is dominantly mixed deciduous-conifer forest.

UCS soils (Dark Gray Luvisols on medium textured till) and GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) are co-dominant (20-50% each) within this unit. The distribution of the UCS and GBL soils is random, due to the discontinuous nature of the glaciofluvial veneer .

Soils occurring in minor (<20%) amounts include coarse variants of the two dominant soils. Chernozemics and Orthic Gray Luvisols developed on till and glaciofluvial sediments are common inclusions (<10%). Gleyed soils, Gleysolic soils and water are also common inclusions.

One UCGB1 soil map unit is recognized:

- UCGB1 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

UCGB6 (Uncas - Gabriel) Soil Unit

The UCGB6 soil unit is associated with 4 land systems; Alma Plain, Northern Valley Plain, Poitras Plain and Therien Upland. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

UCS soils (Dark Gray Luvisols on medium textured till) are dominant (20-50%). GBL soils (Dark Gray Luvisols on a coarse (sl) textured glaciofluvial veneer over medium textured till) as well as coarse variants of these UCS and GBL soils, are present in significant (20-40%) amounts. These coarse variants occur randomly throughout as lenses or pockets within the till and glaciofluvial material. Soils developed on these coarser materials are extremely variable with respect to texture (s to cl) and coarse fragment content (>2%).

Soils occurring as common inclusions (<10%) are Chernozemics and Orthic Gray Luvisols developed on this wide variety of parent materials. Gleyed soils, Gleysolic soils and water are also common inclusions within this unit.

Two UCGB6 soil map units are recognized:

UCGB6/3 is mapped on undulating surface forms, where the dominant slopes are between 2-5%.

- UCGB6/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 and 5 slopes are present in variable proportions.

UCMA1 (Uncas - Maughan) Soil Unit

The UCMA1 soil unit is associated with the Therien Upland land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

UCS soils (Dark Gray Luvisols on medium textured till) and MAA soils (Orthic Gray Luvisols on medium textured residual materials) are co-dominant (20-50% each) within the unit. MAA soils are developed on ice-thrusted bedrock, which has been incorporated within the morainal material in this area. The thrusted bedrock can include intact slabs of sandstone, siltstone and mudstone rock types. Therefore, the soils developed on the weathered bedrock varies in texture from sandy loam to clay. The distribution of UCS and MAA soils is also unpredictable due to the heterogeneity of the source material from which the till was derived.

Other Luvisolic soils developed on this MAA-like till as well as coarse variants of UCS and MAA soils. These soils are coarse due the greater proportion of coarse fragments.

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One UCMA1 soil map unit is recognized:

- UCMA1/6 is mapped on thrusted morainal material with hummocky and inclined surface forms, where the dominant slopes are between 15-30%.

UCMA2 (Uncas - Maughan) Soil Unit

The UCMA2 soil unit is associated with the Therien Upland land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

UCS soils (Dark Gray Luvisols on medium textured till) and MAA soils (Orthic Gray Luvisols on medium textured residual materials) are co-dominant (20-40% each) within the unit. The MAA soils are developed on ice-thrusted bedrock, which has been incorporated within the morainal material in this area. The thrusted bedrock can include intact slabs of sandstone, siltstone and mudstone rock types. Therefore, the soils developed on this weathered bedrock varies in texture from sandy loam to clay. The distribution of UCS and MAA soils is as a result also unpredictable due to the heterogeneity of the source material from which the till was derived. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These soils are associated with lower slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include other Luvisols developed on these materials. Coarse variants of the dominant soils are common inclusions.

One UCMA2 soil map unit is recognized:

- UCMA2/5-6 is mapped on thrusted morainal materials with hummocky surface forms, where the dominant slopes are between 9-30%.

UCMA6 (Uncas - Maughan) Soil Unit

The UCMS6 soil unit is associated with the Therien Upland land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest.

UCS soils (Dark Gray Luvisols on medium textured till) and MAA soils (Orthic Gray Luvisols on medium textured residual material) are co-dominant (20-30%) within this unit. The MAA soils are developed on ice-thrusted bedrock, which has been incorporated within the moraine in this area. The thrusted bedrock can include intact slabs of sandstone, siltstone and mudstone rock types. Therefore, the soils developed on this weathered bedrock varies in texture from sandy loam to clay. The distribution of UCS and MAA soils is, as a result, also unpredictable due to the heterogeneity of the source material from which the till was derived. Within this soil unit, coarse variants are present in significant (20-40%) amounts. These variants are associated with isolated ice contact ridges or knolls, or randomly occurring lenses or pockets within the till material. Soils developed on these coarser materials are extremely variable with respect to texture (s to cl) and coarse fragment content (>2%). In some locations, isolated pockets of well sorted gravel may be encountered.

Soils occurring in minor (<20%) amounts include other Luvisolics developed on this variety of materials. Gleyed soils, Gleysolic soils and water are common inclusions (<10%).

One UCMA6 soil map unit is recognized:

- UCMA6/6D is mapped on ice-thrusted morainal materials with inclined and dissected surface forms, where the dominant slopes are between 15-30%. Steeper slopes are associated with the dissections (deeply incised gullies).

UCPO2 (Uncas - Ponoka) Soil Unit

The UCPO2 soil unit is associated with the Mann Lake Upland and Therien Upland land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest. Most of the area is cultivated.

UCS soils (Dark Gray Luvisols on medium textured till) and POK soils (Eluviated Blacks on medium textured glaciolacustrine sediment) are co-dominant (20-40% each) within this unit. The POK soils are associated with supraglacial lake sediments, that were deposited on stagnant ice during deglaciation. These glaciolacustrine soils are randomly distributed throughout this soil unit. Gleyed soils, Gleysolic soils and water are present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

Soils occurring in minor (<20%) amounts include other Chernozemics and Luvisolics developed on till. Coarse variants of these soils are also present.

One UCPO2 soil map unit is recognized:

- UCPO2/5 is mapped on hummocky surface forms, where the dominant slopes are between 9-15%. Class 6 slopes are commonly present within delineations.

UCPO8 (Uncas - Ponoka) Soil Unit

The UCPO8 soil unit is associated with the Therien Upland land system. Delineations occur within agroclimatic zone 2-3H. The native vegetation is mixed deciduous-conifer forest with grassland areas interspersed.

UCS soils (Dark Gray Luvisols on medium textured till) and POK soils (Eluviated Blacks on medium textured glaciolacustrine sediment) are co-dominant (20-40% each) within this unit. The POK soils are associated with supraglacial lake deposits, that were deposited on stagnant ice during deglaciation. These glaciolacustrine soils are randomly distributed throughout this soil unit. Coarse variants are present in significant (20-40%) amounts. These variants are associated with isolated ice contact ridges or knolls, or randomly occurring lenses or pockets

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within the till material. Soils developed on these coarser materials are extremely variable in terms of the range of texture (s-cl) and coarse fragment content (>2%). Gleyed soils, Gleysolic soils and water are also present in significant (15-30%) amounts. These wet soils are associated with lower slope and depressional landscape positions.

One UCPO8 soil map unit is recognized:

- UCPO8/4 is mapped on hummocky surface forms, where the dominant slopes are between 5-9%. Class 3 slopes are commonly present.

Miscellaneous Map Units

ZAV1 (Alluvium) Miscellaneous Unit

The ZAV1 map unit is associated with all land systems and agroclimatic zones, thus it is defined as an azonal unit. The native vegetation is diverse. Grassland areas interspersed with mixed deciduous-conifer forest are common. The primary land use of this unit is grazing, although some delineations are annually cultivated or used for forage production.

The ZAV1 unit describes landscapes associated with infrequently flooded lower terraces or bottomlands of the major spillways, meltwater channels and river valleys. Within some delineations, the walls of the channel are included. However, the floodplain is still the most extensive feature, occupying more than 50% of a delineation's width. The topography of this unit may be complex and variable. Majority of the delineations are level to undulating but access may be restricted, due to the presence of meandering water ways.

Soils of this unit are Chernozemics, and Luvisolics with some Gleysolics developed on medium to coarse textured fluvial sediment. Coarse fragment content of the parent materials is generally <5%, although gravels may be found in association with terraces. The distribution of the major soils is generally related to the presence of specific native vegetation. Chernozemics are associated with grassland areas, whereas Luvisolics are found beneath forest vegetation. Gleysolics, are also present in amounts <30%, within this 'dry' alluvial unit. These wet soils are associated with the lower slope, depressional areas adjacent to water bodies. The Gleysolics within the northern portion of the County may have a peaty layer up to 40 cm thick. Organic soils are also intimately associated with these peaty Gleysolics.

The ZAV1 delineation within the Kehiwin Channel, near the hamlet of Lindberg (Tp. 56&57, Rge 5), contain marl deposits of variable thickness (generally >30 cm).

The percentage of wet soils and steep topography distinguishes the ZAV1 map unit from the ZAV2 and ZRB4 map units. ZAV2 map units have more than 30% wet soils, commonly in the amount of 50%. The ZRB4 unit is V-shaped and the areal extent of the channel side walls always exceeds that of the floodplain.

ZAV2 (Alluvium) Miscellaneous Unit

The ZAV2 map unit is associated with all land systems and agroclimatic zones and is thus defined as an azonal unit. The native vegetation is diverse. Willows and sedges interspersed with areas mixed deciduous-conifer forest are dominant. The primary land use of this unit is grazing of cattle, where access is not completely restricted due to the presence of high water tables.

The ZAV2 unit describes landscapes associated with the frequently flooded lower terraces or bottomland of the major spillways, meltwater channels, river valleys and areas surrounding large bodies of water. Within delineations the walls of the channel or depression are sometimes included. However, the floodplain is the most extensive feature, occupying more than 50% of the delineation's width. The topography of this unit may be complex and variable. Majority of the delineations are level to undulating but access is restricted due to the presence of open bodies of standing water as well as meandering water ways.

The soils of this unit consist of dominantly Gleysolics, with associated Organics and open water bodies. Luvisolics and Chernozemics occur in variable amounts which are developed on medium to coarse textured fluvial sediments. Coarse fragment content of the parent material is generally <5%, although sands and gravels may be found in association with terraces. The distribution of the major soils is related to the kind of vegetation. Gleysolics, including peaty variants and Organics, occur where willows, sedges and Black spruce are thriving. These wet soils are present in amounts >30%, within the ZAV2 map unit. Chernozemics and Luvisolics are associated with open grassland and forested areas.

The proportion of wet soils (>30%) and steep topography distinguishes ZAV2 units from the ZAV1 and ZRB4 miscellaneous units. ZAV1 units contain <30% Gleysolics. ZRB4 units contain a larger proportion of steep topography. The areal extent of the scarps within these V-shaped channels exceeds the floodplain area.

ZRB1 (Rough Broken) Miscellaneous Unit

The ZRB1 unit is associated with all land systems and agroclimatic zones and is thus defined as an azonal unit. The native vegetation is dominantly grassland and mixed deciduous-conifer forest, depending upon aspect, parent materials, and location within the County. Primary land use is the grazing of cattle, where topographic restraints are not prohibitive.

The ZRB1 unit describes landscapes associated with the slopes flanking glacial spillways or channels, and major rivers. These landscapes are inclined, typically gullied and the slopes are greater than 10%.

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The soils of this unit are dominantly Chernozemics and Luvisolics; Regosolics and Gleysolics are present in minor amounts. These soils are developed on the different parent materials that occur in the County, principally medium textured till, and, coarse and medium textured glaciofluvial sediment. The Chernozemic soils are usually associated with the south aspect slopes, under grassland vegetation. Luvisolic soils are common under forest vegetation. Other minor soils are Regosolics, associated with eroded areas, and Gleysolics, associated with depressional areas.

The absence of rotational slumps and overall morphology distinguishes the ZRB1 unit from the other ZRB map units. The ZRB5 landscape designation delineates areas containing many slumps which indicates that the area is susceptible to mass movement. The ZRB4 unit delineates narrow V-shaped erosional channels in which the individual side slopes are too small to be separately mapped at this scale.

ZRB4 (Rough Broken) Miscellaneous Unit

The ZRB4 map unit is associated with all land systems and agroclimatic zones and is thus defined as an azonal unit. The native vegetation is diverse. Grassland areas and mixed deciduous-conifer forest occur on the side slopes. Hydrophyllic vegetation, commonly willows, sedges, mosses and Black spruce, inhabit the lower slope depressional areas.

The ZRB4 unit describes V-shaped, minor meltwater channel landscape features. These channels are obvious features on aerial photographs but are of minor areal extent. Due to the limited width of these channels, the individual side slopes and floodplain can not be delineated separately at this map scale. Consequently, these units are depicted as being narrow and sinuous on the map.

A variety of soils are present within this miscellaneous unit. Chernozemics and Luvisolics are dominant on the side slopes of the unit. Gleysolics are present along the channel floodplain. All of these soils are developed on a variety of parent materials that occur within the County. The upland soils are developed on till and glaciofluvial materials, whereas the Gleysolics are developed on glaciofluvial and slopewash deposits.

The distinctive V-shape of the ZRB4 landscape distinguishes this unit from the other miscellaneous map units. The ZAV landscapes are dominated by a floodplain feature that occupies more than 50% of the delineation width. Other ZRB units are used to identify individual side slopes of the larger meltwater channels.

ZRB5 (Rough Broken) Miscellaneous Unit

The ZRB5 map unit is azonal, but within the County of St. Paul, this unit is associated with three land systems, (Gadois Plain, Therien Upland and Whitney Lowland) and agroclimatic zones 2-3H and 3H. The native vegetation of the unit is dominantly grassland and coniferous forest. Land use is limited, basically because of the steep topography.

The ZRB5 map unit describes the slumped landscapes adjacent to the Kehiwin Channel and along the North Saskatchewan River valley. The landscape within these delineations appears as a series of disconnected steps. These steps are formed by the sequential rotational slumping of the walls. The area is susceptible to slumping primarily because weathered, shale bedrock of the Lea Park formation outcrops at these locales. The fine textured material, in conjunction with steep slopes, as well as being in a ground water discharge area, all contribute to the instability of the slopes in this landscape. The slopes of this inclined feature are greater than 10%.

The soils of this unit generally include Chernozemics, Luvisolics, Regosolics with some Gleysolics. The distribution of the Chernozemics and Luvisolics are related to the areas of specific native vegetation, within the stable portion of the landscape. Chernozemics are dominantly found on grassland areas with south aspects. The Luvisolics are associated with coniferous forest areas. The Regosolics are developed on 'young' materials associated with areas of recent slumping and soil disturbance. The Gleysolics are found within the basin of the individual slump features.

The distinctive stepped appearance of ZRB5 landscape distinguishes this unit from ZRB1. The ZRB1 unit describes inclined, stable slopes, which may contain gullies.

ZW (Water Bodies) Miscellaneous Unit

The ZW map unit is azonal because it is associated with all land systems and agroclimatic zones.

This miscellaneous unit is used to depict discrete, unnamed bodies of water that are large enough to portray on a 1:50 000 scale map. Some of the features are permanent lakes while others may be ephemeral.

Appendix D. Land capability ratings of soil map units for arable agriculture and range productivity

Map Unit Symbol	Rating for Arable Agriculture	Range Productivity Ratings
ABC1/5	4HME	5B
ABC1/6	5T	5B
ABC2/3	4HME8 6W2	5B
ABC2/4	4HME8 6W2	5B
ABC2/5	4HME8 6W2	5B
ABC2/5-6D	5T8 6W2	6BT
ABC2/6	5T8 6W2	5B
ABC2/6	5T8 6W2	5B
ABC8/6	5T8 6W2	5B
ABGM2/4	4HM8 6W2	5B
ABGM2/5	4HM8 6W2	5B
ABMH2/4	4HME8 6W2	5B
ABMH2/5	4HME8 6W2	5B
ABMH2/5	4HME8 6W2	5B
ABMN1/3-4	4HME6 6W4	6WB (7)
ABNW1/3-4	4HME6 6W4	6BW
ABSB1/3	4HME6 6WX4	6WB (7)
ABWS1/5	4HM	5B
ABWS1/6	5T	5B
ABWS2/3	4HM8 6W2	5B
ABWS2/4	4HM8 6W2	5B
ABWS2/5	4HM8 6W2	5B
ABWS2/6	5T8 6W2	5B
ABWS6/5-6	5TP	5B
ABWS8/5	4HM8 6W2	5B
AGBV1/3	2H	2C
AGBV1/4	3T	2C
AGBV1/4i	4T	2C
AGBV1/5	4T	2C
AGBV2/3	2H8 6W2	2C
AGBV2/4	3T8 6W2	2C
AGBV2/5	4T8 6W2	2C
AGBV3/2-3	2H7 6WN3	3N
AGGB1/3	2H	2C
AGGB1/4i	4T	2C
AGGB2/3	2H8 6W2	2C
AGGB6/3	3P	3M
AGGB8/4	3TP8 6W2	5B
AGGB8/4	3TP8 6W2	2C
AGGB8/5	4T8 6W2	2C
AGMS2/2-3	2H8 6W2	3M
AGNT1/3	2H	2C
AGNT1/5	4T	2C
AGPI2/2	2H6 5W4	2C
AGPI2/3	2H6 5W4	2C
AGPO1/3	2H	2C
AGPO1/5-6	5T	3B
AGPO2/3	2H8 6W2	2C
AGPO2/4	3T8 6W2	2C
AGRD6/5-6	5T	3BM
AGRM6/6	5T	3BM
AGUC1/3	3H	2C
AGUC1/4	3H	2C
AGUC1/5	4T	2C (3B)
AGUC1/6	5T	2C (3B)
AGUC2/3	3H8 6W2	2C
AGUC2/4	3H8 6W2	2C
AGUC2/5	4T8 6W2	2C
AGUC4/4	3H	2C
AGUC4/5	4T	2C

Map Unit Symbol	Rating for Arable Agriculture	Range Productivity Ratings
AGUC4/6	5T	2C
AGUC6/4	3HP	2C
AGUC6/5	4TP	3B (4B)
AGUC6/6	5T	3B (4B)
AGUC7/6	5T8 6W2	3B (4B)
AGUC8/5-6	5T8 6W2	3B (4B)
ATFT1/3	5MP	4M
BLMN1/2	6W	Nil
COGB1/5	4MT	4B
COJV1/4	4ME6 6W4	5BW
COUC1/4	4M	4B
COUC1/4i	4TM	4B
COUC1/5	4TM	4B
COUC1/6	5T	4B
COUC2/4	4M8 6W2	4B
COUC2/5	4MT8 6W2	4B
COUC2/6	5T8 6W2	4B
COUC6/5	4MTP8 6W2	4B
COUC6/6	5T	4B
COUC8/4	4MP8 6W2	4B
COUC8/5	4MTP8 6W2	4B
COUC8/6	5T8 6W2	4B
COUC8/6-7	6T8 6W2	5BT
CTMN1/2	6W	Nil
CTTC1/2	6W	Nil
DDMN1/2	7W	Nil
ELGB1/3	3H	4M
ELGB1/4	3H	4M
ELHO2/3	4ME8 6W2	4B
ELHO8/4	4MEP8 6W2	4B
ELNI1/5D	5TM	6MB
FRSD1/3	3H	2C
FRSD1/6D	5T	3T
FTH1/4-5	6MP	5M
FWUC8/6	5T	4B
GMAB1/3-4	4HM	3C
GOG1/3	4MEP	4B
GOG1/4	4MEP	4B
GONI6/4	5MEP	5M
HLMS4/5	4MT	4M
HYKS4/2	6WN	4WN
KSMN1/2	6W	6W
KSMN4/2	6WK	6W
KSNI1/3	6W6 5M4	5WB
KSY1/2	6W	3W
KSY4/2	6WK	3W
LCGO2/3	4MEP8 6W2	4B
LCGO2/4	4MEP8 6W2	4B
LCON1/4-5	4ME6 6W4	5WB
LCSD1/4	4ME	4B
LCSD1/5	4MET	4B
LCSD1/5D	5T	4B
LCSD1/6	5T	4B
LCSD2/4	4ME8 6W2	4B
LCSD2/5	4MET8 6W2	4B
LCSD2/6	5T8 6W2	4B
LCSD6/4D	4MET	4B
LCSD6/5	4MET	4B
LCSD8/4	4ME8 6W2	4B
LCY6/5	4MET	4B

Appendix D. *(continued)*

Map Unit Symbol	Rating for Arable Agriculture	Range Productivity Ratings
MGFT1/3	5M	4M
MGMS1/3	4M	3M
MGRD6/3	4M	4M
MGRD8/4	4M8 6W2	4M
MGS1/3	4M	4M
MSMG2/3	4M8 6W2	3M
MSNT1/4	3TM	3M
MSNT6/4	3TMP	3M
MSPO8/3-4	3TM8 6W2	3M
MSRD1/5-6	5T	3M
MSRD4/4	3T	3M
MSW1/3	2H	3M
MSW6/3	2H	3M
MSW6/5	4TP	3M
NIED1/4	5MP	6MB
NIED1/5-6i	5TMP	6MB
NIHL1/3	5M	5MB
NIHL2/4-5	5M8 6W2	5MB
NIMG1/4	5M	5MB
NIMS6/5-6	5MPT	5MB
NIRD2/3	5M	5MB
NIT1/5	5MT	6BM
NTGB1/3i	3T	2C
NTGB2/3	2H8 6W2	2C
NTUC8/3-4	4MP8 6W2	2C
ONMP1/2-3	6W	4W
POGR1/3T	3H	2C
POK1/5	4T	2C
POK8/3	2H8 6W2	2C
POMS2/2-3	2H	2C
PORD1/4	3T	2C
SBBL1/2	7W	Nil
SDFR1/4	3H	2C
SDFR2/3	3H8 6W2	2C
SDFR2/4	3H8 6W2	2C

Map Unit Symbol	Rating for Arable Agriculture	Range Productivity Ratings
SDGB1/3	3H	2C
SDGB2/3	3H8 6W2	2C
SDGB2/4	3H8 6W2	2C
SDKH1/3	3H	2C
SDKH1/4	3H	2C
SDKH1/5	4T	2C
SDKH2/3	3H8 6W2	2C
SDKH2/4	3H8 6W2	2C
SDKH2/5	4T8 6W2	2C
SDKH8/4	3HP8 6W2	2C
SDLC1/3	3HM	2C
SDLC2/3	3HM8 6W2	2C
SDMH2/3	4M8 6W2	3B
SDVI2/2-3	3H6 5W4	2C
Town of St. Paul	N/R	N/R
TWMG1/4	4MP	4B
TWMG2/4	4MP8 6W2	4B
UCBO2/3	3H6 5W4	2C
UCCO1/3	3HM8 6W2	2C
UCCO2/3	3HM8 6W2	2C
UCGB1/3	3HM	2C
UCGB6/3	3HMP	2C
UCGB6/4	3HMP	2C
UCMA1/6	5T	4B
UCMA2/5-6	5T8 6W2	4B
UCMA6/6D	6T	5BT
UCPO2/5	4T8 6W2	2C
UCPO8/4	3H	2C
ZAV1	6TW	2C
ZAV2	6WT	3-5TB
ZRB1	6T	4-7WTB
ZRB4	6T	5-7TB
ZRB5	6T	6BT
ZW	7W	Nil

Appendix E. Glossary of terms

Many of the definitions supplied below are taken directly, or are slightly modified from the Glossary of Terms (Agriculture Canada 1976). Other references are supplied where appropriate.

Arable Land that is cultivated or capable of being cultivated.

Atterberg limits The moisture contents, expressed as percent water on an oven dry basis, at which a soil mass will change from one physical state to another. The Atterberg limits most useful for engineering purposes are liquid limit and plastic limit. **Liquid limit** is the moisture content at which a soil mass passes from plastic to liquid state. **Plastic limit** is the moisture content at which a soil mass passes from semisolid to plastic state.

Bedrock The solid (harder than 3 on Moh's scale of hardness) rock that underlies soil and the regolith, or that is exposed at the surface.

Blanket A mantle of unconsolidated material thick enough (usually more than 1 m) to mask minor irregularities in the underlying unit but still conforming to the general underlying topography (E.C.S.S. 1987b).

Bottomland The stream-cut, lower portion of a valley floor; the lowest part of a mountain valley. Bottomland contains a stream, its floodplain, and, in some cases, terraces, some of which may be of glacial origin. Steep erosional banks mark the edge of the bottomland.

Calcareousness classes Six classes that represent the amount of carbonates, expressed as percent calcium carbonate ($CaCO_3$) equivalent, present in the soil or parent material. The classes are noncalcareous (<1%), weakly calcareous (1-5%), moderately calcareous (5-15%), strongly calcareous (15-25%), very strongly calcareous (25-40%), and extremely calcareous (>40%). At the Family level of taxonomy, strongly calcareous means 5-40% $CaCO_3$ equivalent.

Capability Ranking system that expresses the suitability of land for a certain use, and conveys the kind and degree of limitations imposed by climate and physical characteristics of the land.

Cation A positively charged ion. The common soil cations are calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), and hydrogen (H).

Cation exchange capacity (C.E.C.) The total amount of exchangeable cations that a soil can absorb. It is expressed in milliequivalents per 100 grams (centimoles per kilogram) of soil or of other absorbing materials such as clay.

Chroma One of the three variables of color (**Munsell system**); refers to the relative purity, strength or saturation of a color. It is directly related to the dominance of the determining wavelength of light and inversely related to grayness.

Classification, soil The systematic arrangement of soils into categories according to their inherent characteristics, or on some interpretation of those properties for various uses. Broad groupings are made on the basis of general characteristics, subdivisions according to more detailed differences in specific properties.

Clay (i) As a particle size term: a size fraction less than 0.002 mm equivalent diameter, or some other limit (geology or engineering). (ii) As a soil term: a textural class with abundant clay sized particles (refer to Fig. 18).

Claystone An indurated clay having the texture and composition, but lacking the fine lamination and fissility, of shale (Gary *et al.* 1972).

Coarse fragments Rock or mineral particles (harder than 3 on Moh's scale of hardness) larger than 2 mm in diameter but smaller than bedrock. Coarse fragments in soils are: **gravels** or **channers** (up to 8 cm in diameter or 15 cm in length), **cobbles** or **flags** (8-25 cm diameter or 15-38 cm length), and **stones** (greater than 25 cm diameter or 38 cm length).

Coarse textured A broad textural grouping that refers to soils or materials dominated by sand, loamy sand, and sandy loam textural classes.

Comminution The gradual diminution of a substance to a fine powder or dust by crushing, grinding or rubbing; specifically the reduction of a rock to progressively smaller particles by weathering, erosion, or tectonic movements (Gary *et al.* 1972).

Compound unit A soil or map unit that is characterized by two to four major soils or groups of soils.

Consistence (i) The resistance of a material to deformation or rupture. (ii) The degree of cohesion or adhesion of the soil mass.

Control section The vertical section of soil upon which classification is based (E.C.S.S. 1987b). It extends from the mineral or ground surface to a lithic contact if present, or to a depth of 160 cm in Organic soils, or up to 2 m depth in mineral soils. In non-lithic mineral soils the control section reaches from the mineral surface to 25 cm below the top of the C or IIC horizon, or to at least 1 m depth.

Crevasse A deep and nearly vertical split, fissure, crack or rift in a glacier or other mass of land ice, or in a snowfield, caused by stresses resulting from differential movement over an uneven surface (Gary *et al.* 1972).

Curvilinear Consisting of, or bounded by curved lines (Webster dictionary).

Dominant The soil (or other feature) that comprises the majority of a mapping unit or tract of land, ie. generally 30% or more.

Drumlins, Drumlinoids Glacially streamlined landforms characterized in the 'ideal' case as half an ellipsoid, like the inverted bowl of a spoon (Flint 1971). The long axis parallels the direction of glacier flow.

Eluviation The transportation of soil material in suspension or in solution within the soil by the downward or lateral movement of water.

Energy Component (EGDD) The energy component for the assessment of land capability for arable agriculture

Appendix E. *(continued)*

in Alberta is defined in terms of energy growing degree days. Energy growing degree days (EGDD) are defined as the accumulated growing degree days (temperature >5°C) beginning on the first of five consecutive days when the mean temperature is above 5°C after March 15, and ending with the first frost after July 15. Calculations also take into account latitude (day length) and the diurnal temperature range (A.A.A.C. 1987)

Englacial Contained, embedded or carried within the body of a glacier, or ice sheet (Gary *et al.* 1972)

Eolian Well sorted materials, predominantly sand and silt, deposited by wind.

Erosion (i) The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. (ii) Detachment and movement of soil or rock by water, wind, ice, or gravity.

Esker A sinuous ridge of irregularly stratified sand, gravel, cobbles, and stones that was deposited under or in ice by a rapidly flowing glacial stream.

Eutrophic Having concentrations of nutrients optimal or nearly so for plant or animal growth.

Eutrophication The process by which waters become more eutrophic (Gary *et al.* 1972).

Evapotranspiration The loss of water from a given area during a specified time by evaporation from the soil surface and by transpiration from plants. **Potential evapotranspiration** is the calculated maximum evapotranspiration that can occur in a given weather situation with a low-growing crop that is not short of water and does not completely shade the ground.

Fine earth Mineral soil material 2 mm equivalent diameter or smaller.

Fine textured A broad textural grouping that refers to soils or materials dominated by clay, sandy clay, silty clay, and heavy clay textural classes (see Fig. 18).

Flute Ridged (positive element) and grooved (negative element) glacial moraine produced by the erosion and deposition of subglacial material beneath an actively flowing glacier (from Flint, 1971). Flute ridges, and associated inter-ridge furrows, are parallel to glacial flow direction. Flutes can range up to 20 km in length, more than 100 m in width, and up to 25 m in height, although average dimensions are much less. The length to width ratio exceeds a factor of 10.

Fluvial (alluvial) material Sediment deposited primarily by nonglacial flowing water, and by mudflows. The difference between glacial and nonglacial flow regimes is often indistinct, particularly in a historical sense.

Fluviolacustrine material Generally, nongravelly medium textured (CL-SiCL-SiL-L) or finer sediments deposited by slowly moving water, both glacial and nonglacial. Material that is intermediate between fluvial and lacustrine materials as defined by E.C.S.S. (1987b). May also be termed fluvial lacustrine.

Glacial (i) Of or relating to the presence and activities of ice or glaciers, as glacial erosion. (ii) Pertaining to distinctive features and materials produced by or derived from glaciers and ice sheets, as glacial lakes. (iii) Pertaining to an ice age or region of glaciation (Gary *et al.* 1972).

Glacial drift All mineral material carried by glacier ice and glacial meltwater, or rafted by icebergs. The term includes till, stratified drift and scattered rock fragments.

Glacial lobe A large, rounded, tongue-like projection from the margin of the main mass of an ice cap or ice sheet; a short, broad distributary glacier (Gary *et al.* 1972).

Glaciofluvial material Sediment deposited by flowing water in which volume and sediment load are strongly controlled by melting glacier ice.

Glaciolacustrine material Sediment deposited in proglacial lake environments. This sediment is composed of suspended material brought by meltwater streams flowing into lakes bordering glaciers (Gary *et al.* 1972).

Gully A channel caused by erosion and the concentrated but intermittent flow of water during or immediately after heavy rains or snow melt. It is deep enough to interfere with and not be removed by tillage operations.

Gravel (i) As a deposit term used herein: glaciofluvial or fluvial materials with 60% or more coarse fragments, usually subrounded to rounded and of variable size. (ii) As a particle size term: a size fraction between 2 and 75 mm diameter with rounded, subrounded, angular, or irregular shapes.

Highlands Defined here as relatively large areas, generally greater than a township in size, that lie at a higher elevation and which form a prominent positive feature in the regional landscape. Highlands have a greater range in elevation than features within an upland, and are much more extensive. Highlands may have few surface irregularities, or may contain features of high local relief, such as hummocks, ridges, and stream-cut valleys.

Horizon A layer of soil or soil material approximately parallel to the land surface; each horizon differs from genetically related layers in properties such as color, structure, texture, consistence, and chemical, biological, and mineralogical composition. Detailed definitions of the various horizons and layers may be found in *The Canadian System of Soil Classification* (E.C.S.S. 1987b).

Hue The aspect of color that is determined by the wavelengths of light, and changes with the wavelength. Munsell hue notations indicate the visual relationship of a color to red, yellow, green, blue, or purple, or an intermediate of these hues.

Hummocky A very complex sequence of slopes extending from somewhat rounded depressions or kettles of various sizes to irregular to conical knolls or knobs. There is a general lack of concordance between knolls and depressions. Slopes are generally 9-70% (E.C.S.S. 1987b).

Appendix E. *(continued)*

Humus (i) The fraction of the soil organic matter that remains after most of the added plant and animal residues have decomposed. It is usually dark colored. (ii) Humus is also used in a broader sense to designate the humus forms referred to as forest humus, mainly mor, moder, and mull. (iii) All the dead organic material on and in the soil that undergoes continuous breakdown, change, and synthesis.

Illuviation The process of depositing soil material that has been transported in suspension or solution from one horizon in the soil to another, usually from an upper to a lower horizon in the soil profile. Illuviated substances include silicate clay, hydrous oxides of iron and aluminum, and organic matter.

Inclined A sloping, unidirectional surface not broken by marked irregularities. Slopes generally range from 2-30% and are greater than 300 metres in length.

Inclusion A soil (or other feature) that comprises up to 15 or 20% of a soil map unit.

Lacustrine Pertaining to, produced by, or formed in a lake or lakes, eg. "lacustrine sands" deposited on the bottom of a lake, or a "lacustrine terrace" formed along the margin of a lake (Gary *et al.* 1972).

Landform Any physical, recognizable form or feature of the Earth's surface, having a characteristic shape and produced by natural causes (Gary *et al.* 1972). The term 'landform' refers the genetic material plus surface form (E.C.S.S. 1987b).

Landscape A distinct association of landforms plus their natural covering of soils and vegetation, or modified versions thereof, that distinguish one part of the earth's surface from another part (modified from Gary *et al.* 1972).

Leaching The removal of soil materials in suspension or solution from a soil or soil horizon (layer).

Level A flat or very gently sloping, unidirectional surface with a generally constant slope not broken by marked elevations and depressions. Slopes are generally less than 2%.

Liquid limit See **Atterberg limits**.

Lithic A general term referring to soils with consolidated (hard) bedrock within 1 m.

Lobe See glacial lobe.

Loess A homogenous, commonly nonstratified, porous, friable, slightly coherent, usually calcareous material transported and deposited by wind, and consisting of predominantly silt-sized particles (Gary *et al.* 1972).

Major The most general of the apportionment terms with respect to soil map unit components. Term includes the dominant or codominant, significant soils of widely ranging percentage that are necessary to form a mental concept of a soil map unit.

Map/Soil Unit Components (i) **Similar components** (soils or nonsoils) are alike in most properties and have similar interpretations for most common uses. (ii) **Dissimilar components** have many contrasting properties, or have one or two properties that differ widely, and usually affect management differently. (iii) **Nonlimiting components** (soils or nonsoils) do not affect the management of the map or soil unit in a significantly different way than other components. Similar soils and dissimilar soils with less severe restrictions for use than the predominant soil are examples of nonlimiting components. (iv) **Limiting components** require significantly different land use interpretations from the other components of the map unit. (E.C.S.S. 1987a.)

Medium textured A broad textural grouping that refers to soils or materials dominated by loam, silt loam, silt, silty clay loam, clay loam, and sandy clay loam textural classes (see Fig. 18).

Moisture component (P-PE) The moisture component, which is an estimate of available seasonal moisture, used for the assessment of land capability for arable agriculture in Alberta is defined in terms of P-PE. P-PE is calculated by subtracting the total monthly evapotranspiration from the monthly total precipitation, for the time period of May 1 to August 31 (A.A.A.C. 1987).

Modern Recent landforms, formed in the last few hundred to few thousand years, that are still actively developing.

Morainal Of, relating to, forming, or formed by a **moraine** (Gary *et al.* 1972).

Moraine A mound, ridge, or other distinct accumulation of unsorted, unstratified drift, predominantly **till**, deposited chiefly by direct action of glacier ice in a variety of topographic landforms that are independent of control by the surface on which the drift lies (Gary *et al.* 1972). It is now commonly used as a geomorphologic name for a landform composed mainly of till that has been deposited by a glacier.

Morphology, soil (i) The physical constitution, particularly the structural properties, of a soil profile as exhibited by the kinds, thickness, and arrangement of the horizons in the profile, and by the texture, structure, consistence, and porosity of each horizon. (ii) The structural characteristics of the soil or any of its parts.

Mottles Spots or blotches of different color or shades of color interspersed with the dominant color; formed mainly by the affects of impeded drainage.

Munsell color system A color designation system specifying the relative degrees of the three simple variables of color: **hue**, **value** and **chrome**. For example, 10YR $^{6}/_{4}$ is the color of a soil having a hue of 10YR, value of 6, and chrome of 4. These notations can be translated into several different systems of color names.

Outcrop That part of a geologic formation or structure that appears at the surface of the Earth (Gary *et al.* 1972).

Appendix E. *(continued)*

Paralithic Refers to weathered bedrock which is permeable and penetratable by plant roots. The material is "diggable" and is softer than 3 on Moh's hardness scale.

Parent material The unconsolidated and more or less chemically weathered mineral or organic material from which the **solum** of a soil has developed by pedogenic processes.

Particle size The effective diameter (grain size) of a particle measured by sedimentation, sieving, or micrometric methods.

Pedology The aspects of soil science dealing with the origin, morphology, genesis, distribution, mapping, and taxonomy of soils, and classification in terms of their use.

pH, soil The negative logarithm of the hydrogen-ion activity of a soil. The degree of acidity or alkalinity of a soil as determined by means of a suitable electrode or indicator at a specified moisture content or soil-water (or $CaCl_2$ solution) ratio, and expressed in terms of the pH scale.

Plains Defined as areas of comparatively flat, smooth and level, or undulating land with few prominent surface irregularities. Plains can sometimes have a considerable slope and usually, though not always, are at a low elevation with reference to the surrounding areas (Gary *et al.* 1972)

Plastic limit See **Atterberg limits**.

Polygon A map delineation that represents a tract of land with certain landform, soil and vegetation features. The smallest polygon on a 1:50 000 scale map is about 0.4 cm^2 and represents an area of about 10 ha (25 ac) in size.

Proglacial Immediately in front of or just beyond the outer limits of a glacier or ice sheet, generally at or near its lower end; said of lakes, streams, deposits, and other features produced by or derived from the glacier ice (Gary *et al.* 1972).

Profile, soil A cut or exposure through a soil body that reveals its horizons and layers, including parent material.

Recent Deposits of late post-glacial age, ie. within the last few hundred to few thousand years. Soils have had insufficient time to develop "normal" profiles. See **modern**.

Residual material (residuum) Unconsolidated and partly weathered (physically and chemically) mineral materials formed by the disintegration of consolidated rock in place; includes saprolite (E.C.S.S. 1987b).

Ridged A long, narrow elevation of the surface, typically sharp crested with steep sides. Ridges can be parallel, subparallel or intersecting.

Riser The short, steep break in slope that separates successive treads of a terraced landform (Gary *et al.* 1972).

Rolling Long, very regular or smooth, commonly convex slopes with a cycle distance of about 0.5 to 1 km.

Sand (i) As a particle size term: a size fraction between 0.05 and 2.0 mm equivalent diameter, or some other limit (geology or engineering). (ii) As a soil term: a textural class with abundant sand sized particles (refer to Fig. 18).

Seasonal moisture The growing season moisture term described as P - PE from May 1 to August 31 where P(mm) = monthly total precipitation and PE(mm) = potential evapotranspiration (A.A.A.C. 1987).

Series, soil A category (or level) in the Canadian system of soil classification. This is the basic unit of soil classification, and consists of soils that are essentially alike in all major profile characteristics except the texture of the surface.

Significant A major soil (or other feature) that is clearly subordinate (subdominant) to the dominant. Minimum proportions are 15% if the significant soil is **dissimilar** and **limiting** relative to the dominant, 20% if **similar** or **non-limiting**. Maximum percentages are 30 or 40% depending on proportions of dominant soils.

Simple unit A soil or map unit that is characterized, therefore dominated, by one major soil or soil group (E.C.S.S. 1987a).

Silt (i) As a particle size term: a size fraction between 0.002 and 0.05 mm equivalent diameter, or some other limit (geology or engineering). (ii) As a soil term: a textural class with abundant silt sized particles (refer to Fig. 18).

Soil The naturally occurring, unconsolidated mineral or organic material at least 10 cm thick that occurs at the earth's surface and is capable of supporting plant growth. Soil extends from the earth's surface through the genetic horizons, if present, into the underlying material to the depth of the control section (normally about 1-2 m). Soil development involves climatic factors and organisms, conditioned by relief and water regime, acting through time on geological materials, and thus modifying the properties of the parent material (E.C.S.S. 1987b).

Soil drainage classes Seven classes that describe the overall natural drainage of soils, taking into account factors of external (surface runoff) and internal (perviousness) soil drainage in relation to supply of water. The classes from driest to wettest are very rapidly, rapidly, well, moderately well, imperfectly, poorly, and very poorly drained. Each describes water removal from the soil in relation to supply, and can be equated with a range in available water storage capacity (E.C.S.S. 1983).

Soil map A map showing the distribution of soil types, classes, or other soil mapping units in relation to the prominent physical and cultural features of the earth's surface.

Soil survey The systematic examination of an area in order to describe, classify and map its soils. Soil surveys are classified according to the kind and intensity of the field examination.

Solum (plural **sola**) The upper horizons of a soil in which the the parent material has been modified and in

Appendix E. *(continued)*

which most plant roots are contained. It usually consists of A and B master horizons.

Stones See **coarse fragments.**

Streamlined landforms The class of geomorphic features characterized by glacially molded and streamlined material at the base of an actively flowing glacier. See flutes, drumlins, drumlinoid features.

Structure, soil The combination or arrangement of primary soil particles into secondary particles, units, or peds. These peds may be, but usually are not, arranged in the profile in such a manner as to give a distinctive characteristic pattern. The peds are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades.

Supraglacial Situated or occurring at or immediately above the surface of a glacier or ice sheet; said of till, drift, meltwater streams, etc. (Gary *et al.* 1972).

Surface form The assemblage and pattern of slopes within a landscape (E.C.S.S. 1987b).

Syngenetic, till Till deposited by the same glacial ice sheet that created the landform. Term used to differentiate blocks of pre-existing tills which have been displaced and incorporated within more recent glacial landforms.

Terraced A surface form consisting of a **riser** and the horizontal or gently inclined surface **(tread)** above it.

Till Unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by glacial meltwater, and consisting of a heterogeneous mixture of clay, sand, gravel, and boulders varying widely in size and shape (Gary *et al.* 1972).

Texture, soil The relative proportions of the various soil separates (mineral particles of varying diameter) in a soil as described by the thirteen textural classes plus modifiers (refer to Fig. 12).

Tilth The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and impedance to seedling emergence and root penetration.

Topography The physical features of a district or region, such as those represented on a map, taken collectively; especially the relief and contours of the land. On most soil maps topography may also mean topography classes which describe slopes according to standard ranges of percent gradient.

Topsoil (i) The layer of soil moved in cultivation. (ii) The A or Ah horizon. (iii) Presumably fertile soil material used to topdress roadbanks, gardens and lawns.

Tread The flat or gently sloping surface of natural, step-like landforms, as those of a **terraced** landform (Gary *et al.* 1972).

Undulating A wave-like pattern of very gentle slopes with low local relief. Slope length is generally less than 0.5 km and slope gradients are commonly 2-5%.

Uplands Defined here as areas encompassing high relief landforms at the local or section (1 sq. mile) scale. Uplands typically are the higher elevated parts of a region, in contrast to the neighboring plains or lowlands. In some cases uplands, include areas where high local relief landforms lie in a regional low or depression, but in which the elevation of many of the local landforms commonly exceeds that of the landforms in the surrounding plains.

Value, color One of the three variables of color (**Munsell system**); expresses the relative lightness of color, which is approximately a function of the square root of the total amount of light.

Variant A soil which is dissimilar from all existing series but comprises less than 800 ha may be designated as a variant of the most closely related, existing series (E.C.S.S. 1987a). The series name plus a modifier identify the variant which may then be used in naming map/soil units.

Veneer A mantle of unconsolidated material too thin (usually less than 1 m) to mask the minor topographic irregularities of the underlying material.

Water table (groundwater surface or elevation) Elevation at which the pressure in the water is zero with respect to atmospheric pressure.