Agriculture Canada

Saskatchewan Agriculture

THE SOILS OF

MOOSOMIN (121)
MARTIN (122)
ROCANVILLE (151)
SPY HILL (152)

RURAL MUNICIPALITIES

SASKATCHEWAN

Extension Publication 511

Saskatchewan Institute of Pedology
Publication S207

THE SOILS OF

MOOSOMIN (121)
MARTIN (122)
ROCANVILLE (151)
SPY HILL (152)

RURAL MUNICIPALITIES

SASKATCHEWAN

1987

by
Staff, Saskatchewan Soil Survey
with a section on Geology and Groundwater Resources
by the Resources Sector, Saskatchewan Research Council

Copies of this publication are available from

Saskatchewan Institute of Pedology,
John Mitchell Building,
University of Saskatchewan,
Saskatoon, Saskatchewan
S7N OWO

U-Learn Centre,
Division of Extension and
Community Relations,
University of Saskatchewan,
Saskatoon, Saskatchewan
S7N OWO

PREFACE

This publication continues the new R M series of soil survey reports for Saskatchewan initiated with the publication of the Soils of the Wolseley Rural Municipality in 1984 This new series of publications is a continuation of the basic soil survey program in the Province, initiated in the early 1960's, however, the publication format has been substantially changed to include more interpretive information on an R M basis.

The main purpose of a soil survey is to inventory the soil resources of an area, providing a description of the soils and showing their extent and distribution It has become increasingly apparent, however, that many users require additional interpretive information for the resolution of production, conservation and other problems related to a particular set of soil conditions To facilitate this, the new report series contains a number of interpretative maps in addition to the traditional soil inventory map Moreover, to make the publication easier to use and understand, scientific terminology has been minimized, and the area covered has been reduced in size from a National Topographic Series map sheet used in previous publications, to a block of four rural municipalities which facilitates the presentation of more detailed information of local significance

The present report represents the contribution of scientists and technicians of the Saskatchewan Soil Survey Some of these are employed by the Department of Soil Science at the University of Saskatchewan with support from the Saskatchewan Department of Agriculture Others are employed by the Land Resource Research Centre, Research Branch, Agriculture Canada The Saskatchewan Institute of Pedology at the University of Saskatchewan is the co-ordinating body for these provincial, university and federal soil survey projects in Saskatchewan.

J W B Stewart, Director
D F Acton, Associate Director
Saskatchewan Institute of Pedology
1987

STAFF SASKATCHEWAN SOIL SURVEY

Program Directors: J W B Stewart, Director, D F Acton, Associate Director, Saskatchewan Institute of Pedology, Saskatoon
Project Supervisor: H B. Stonehouse
Soil Mapping: S Burton, W D Eilers, L M Kozak, H P W Rostad, W E Souster and R D Stushnoff
Soil Correlation: J G Ellis
Research and Field Staff: A J Anderson, D W Anderson, A K Ballantyne, W D Eilers, G A Padbury and R J St Arnaud
Secretarial: S M Wood and R P Scott
Drafting: A E Kuzub, L Mah, and P M Sardinha
Artwork: F Henry (under contract)
Data Processing: S Johnson and L Pocobelli
Laboratory: C A Evanisky, B G Goetz, J D Key, and B L McCann
Students: R. Bates, W M Beaulieu, C Beeson, F H Bond, L N Chupa, D J. Fontaine, D D Haur and A van Dam

ACKNOWLEDGEMENTS

K B MacDonald and Staff of CanSIS, Land Resource Research Centre, Ottawa, for advice on computerizing soil maps and for facilitating this form of map production
J A. Shields, Western Correlator, Land Resource Research Centre, Ottawa, for his helpful suggestions and critical review of the manuscript
G D Adams and J B Millar, Canadian Wildlife Service, Saskatoon, for providing photographs of wetlands
Cartographic Section, Land Resource Research Centre, Ottawa
Production· B Edwards (Chief)
Drafting R Hoekstra (Supr); G Belohlavek, G Leafloor, R Whitney
Map editing D N Perkins (Supr); B A Davis
Photomechanical R St John (Supr), B E Wollenschlager, R W Davies
Typography: L Routhier
Printing supplied by the Map Reproduction Centre, Reproduction and Distribution Division, Department of Energy, Mines and Resources

TABLE OF CONTENTS

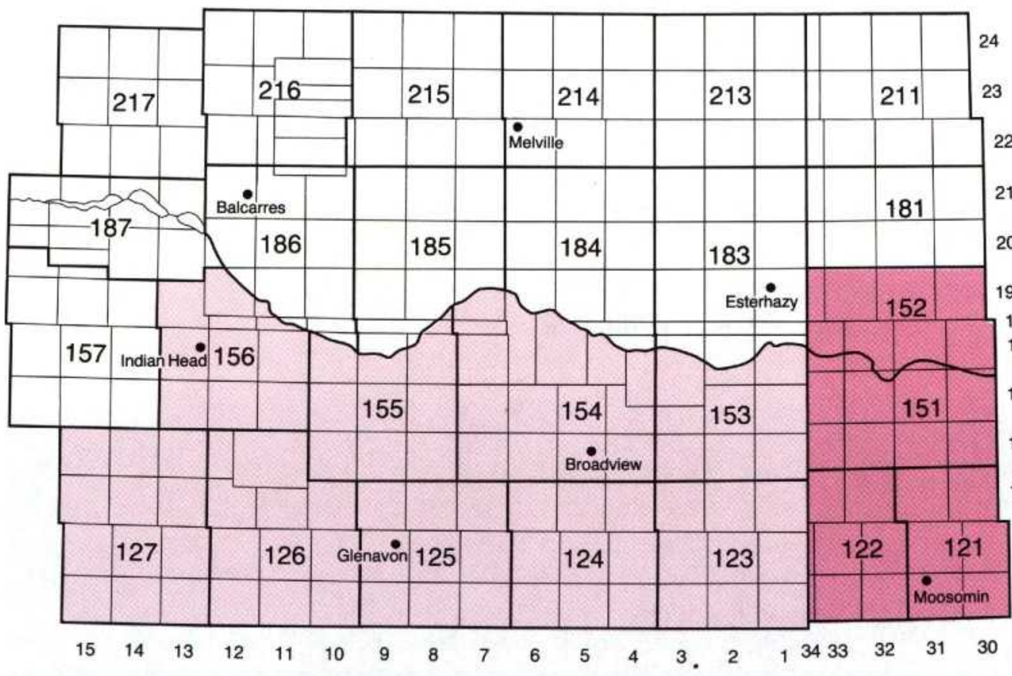


Fig. 1 Index map showing the location of the four municipalities in the map area and availability of published information for adjoining municipalities.

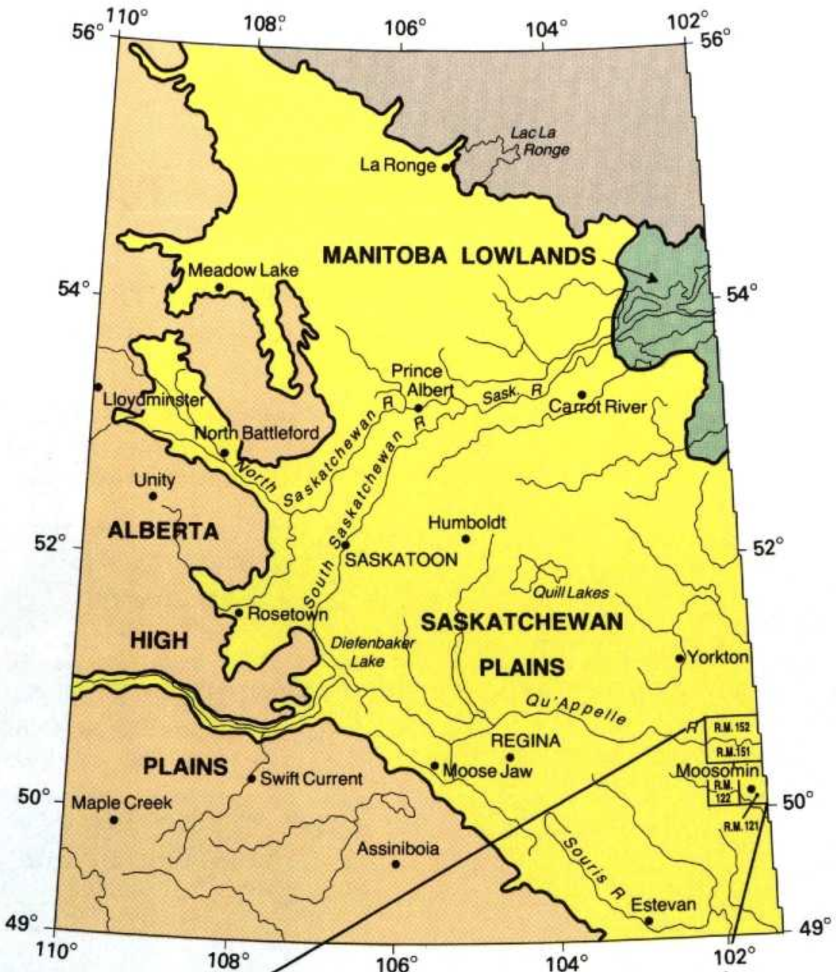


Fig. 2 A physiographic map of southern Saskatchewan.

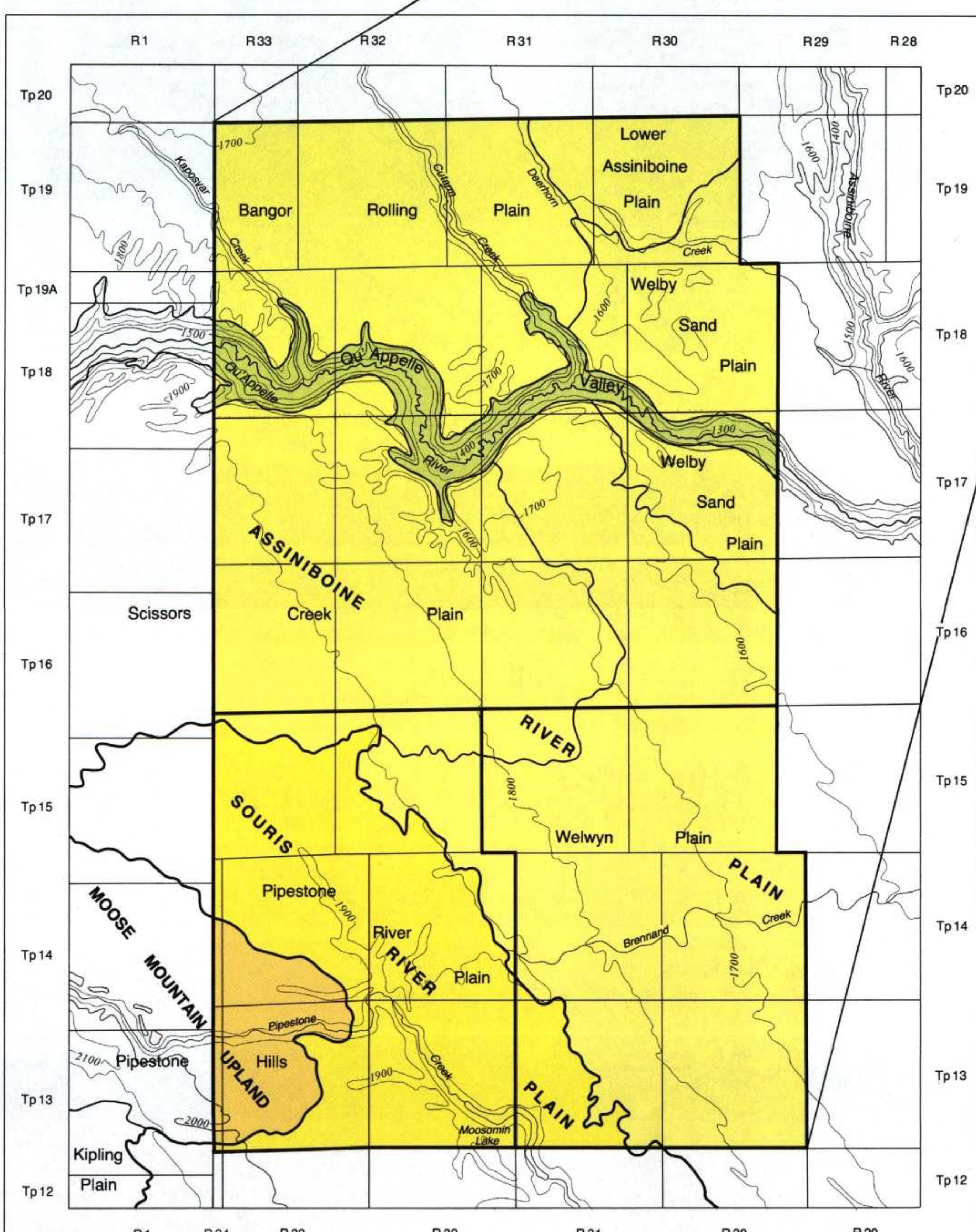


Fig. 3 A physiographic map of the area.

INTRODUCTION

EXTENT AND LOCATION

The map area includes 4 Rural Municipalities in east-central Saskatchewan. The Rural Municipality of Moosomin, No. 121, covers an area of approximately 55 968 ha (138,300 ac.) in Township 13 to 15 in Ranges 30 and 31, as shown in Fig. 1 on the opposite page. The Rural Municipality of Martin, No. 122, covers an area of approximately 57 000 ha (142,080 ac.). It includes all of Townships 13 to 15 in Ranges 32 to 34. The Rural Municipality of Rocanville, No. 151, covers an area of approximately 73 510 ha (181,635 ac.). It includes all of Township 16 in Ranges 30 to 33 and Township 17 in Range 33, as well as those portions of Township 17 in Ranges 30 to 32 and Township 18 in Ranges 30 to 33, that lie south of the Qu'Appelle River. The Rural Municipality of Spy Hill, No. 152, covers an area of approximately 65 415 ha (161,640 ac.). It includes all of Township 19 in Ranges 30 to 33, as well as those portions of Township 17 in Ranges 30 to 32 and Township 18 in Ranges 30 to 33, that lie north of the Qu'Appelle River. All locations are west of the 1st Meridian.

PHYSIOGRAPHY

The map area lies within a large region called the Great Plains province of the Interior Plains of North America. More specifically, it lies within the Saskatchewan Plains region, often referred to as the "second prairie steppe", between the Manitoba Lowlands to the east and the Alberta High Plains to the west (Fig. 2). As shown in Fig. 3, opposite page, all of the Rocanville and Spy Hill municipalities, as well as most of the Moosomin municipality, lie within the Assiniboine River Plain, a large area of generally low relief, drainage from which eventually empties into the Assiniboine River in Manitoba. Most of the Martin and a portion of the Moosomin municipality form part of the Souris River Plain, a region of moderate to low relief that drains to the Souris River. As well, a portion of the west-central part of the Martin municipality lies within the Moose Mountain Upland, a moderate to high relief upland area.

The Assiniboine River Plain, south of the Qu'Appelle Valley, slopes gently from approximately 572 m (1,875 ft.) on its southern boundary to approximately 485 m (1,600 ft.) at the Qu'Appelle Valley. North of the valley it slopes gently to the southeast from approximately 510 m (1,675 ft.) to 485 m (1,600 ft.) at the Qu'Appelle Valley. The Qu'Appelle Valley is deeply entrenched into this plain, with elevations at the river about 85 m (275 ft.) below those at the valley rim. The Assiniboine River Plain is further separated into the Scissors Creek Plain, Welwyn Plain and Welby Sand Plain, south of the valley, and the Bangor Rolling Plain, Lower Assiniboine Plain and Welby Sand Plain, north of the valley. The Scissors Creek Plain is dominantly a gently sloping hummocky morainal area that is externally drained to the Qu'Appelle Valley by Scissors Creek and its many tributaries. The Welwyn Plain is a gently to very gently sloping hummocky morainal plain that is cut by many small drainage channels that carry runoff eastward to the Assiniboine River in Manitoba. South of the Qu'Appelle Valley the Welby Sand Plain is a very gently to gently sloping, undulating fluvial area that is cut by broad, shallow channels. These also carry runoff east to the Assiniboine River. North of the valley, it is nearly level with very little external drainage except along the outer margins. The Lower Assiniboine Plain is a large, gently sloping hummocky and undulating morainal area that extends north of the map area. The Bangor Rolling Plain is also a large morainal area. It extends to the northwest and is characterized by gentle to moderate slopes, a hummocky-ridged surface form and numerous undrained kettles. It is externally drained to the Qu'Appelle River by tributaries such as the Kaposvar and Cutarm Creeks.

The only subdivision of the Souris River Plain that occurs in this area is the Pipestone River Plain. It is a hummocky morainal area with gentle to moderate relief containing numerous undrained depressions, into which the Pipestone Creek is cut. Elevations in the area vary little, ranging from about 572 to 579 m (1,875 to 1,900 ft.), with the Pipestone Creek approximately 30 m (100 ft.) below this.

The Pipestone Hills, part of the Moose Mountain Upland, in this area range from a high of approximately 617 m (2,025 ft.) in the extreme southwestern corner to about 579 m (1,900 ft.) on the edge of the Pipestone Creek. It is generally a gently to moderately sloping, hummocky morainal area containing numerous undrained depressions. Small areas of glaciofluvial materials also occur, primarily associated with some of the creeks and channels.

GLACIAL HISTORY

Much of our knowledge of the glacial history of Saskatchewan has been advanced through publications by Christiansen. He relates that the last glacier advanced across this area about 20,000 years ago and retreated from the area between 14 and 15,000 years ago. Thus, all the surficial deposits in the area, with the exception of those in the bottom of drainage channels, were laid down as a result of glaciation. These deposits can be broadly grouped into: 1) those deposited directly by the ice (glacial till) and 2) those deposited by glacial meltwaters (stratified deposits or water-lain deposits). Glacial till consists of a heterogeneous mixture of stones and gravels in addition to sand-, silt- and clay-sized particles. Stratified sediments, on the other hand, are generally sorted according to particle size as they are deposited, resulting in dominantly gravelly, sandy, silty or clayey deposits. Four significant phases dominate the history of deglaciation of the map area. Each phase is shown in a sketch (Fig. 4) on which the ice margin at a particular time is shown and on which the drainage at that time is depicted.

During Phase 1 (Fig. 4), the Moose Mountain Creek Channel drained the interlobate area, an area between two ice lobes, to the south and west of the area. The meltwater from the ice flowed through this channel southward to the Souris Channel.

During Phase 2 (Fig. 4), the interlobate area expanded. Meltwater from the ice was trapped by the high ground to the south and was forced to run eastward along the ice margin and thereby the sidehill Hillesden and Pipestone Channels came into existence. As the ice retreated from Phase 1 to Phase 4, the materials deposited were usually glacial till although silts and clays were also deposited in small, local glacial lakes at the margin of the glacier or superimposed on the glacier. Stony, sandy and gravelly sediments are common along major drainage channels representing early stages in the downcutting of these channels.

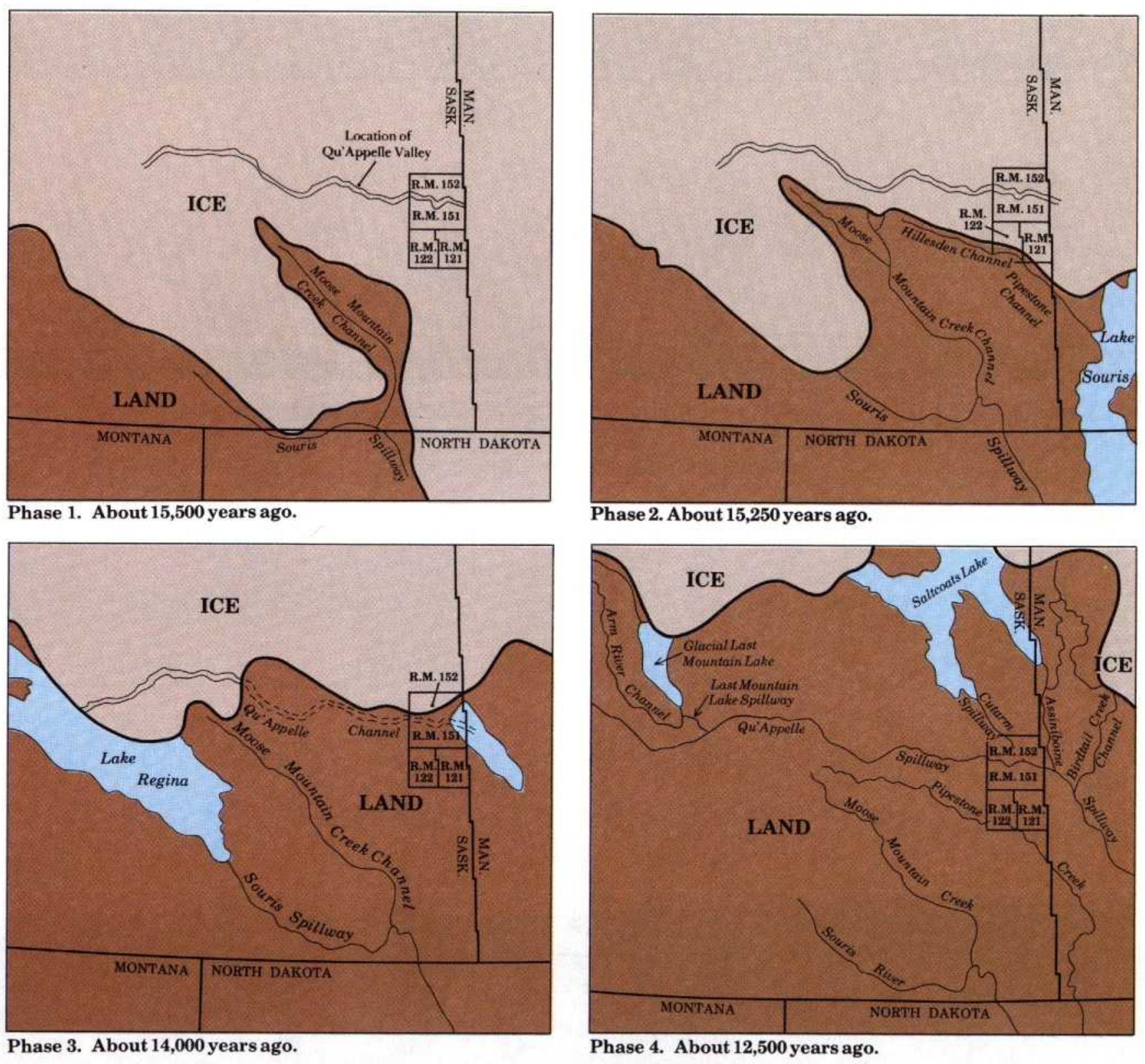
During Phase 3 (Fig. 4), meltwater flowing from the glacier through a subglacial channel (Deerhorn Creek) deposited large amounts of sand and gravel as a delta in a small lake that covered the southeastern portion of the Spy Hill and the northeastern portion of the Rocanville municipalities, forming the Welby Sand Plain. Later, this lake drained through the Assiniboine Spillway to the east. Also during Phase 3, initial cutting of the Qu'Appelle Channel took place as water flowed east along the edge of the glacier. During this initial stage of valley cutting, water sometimes flowed over a much larger surface than that occupied by the valley today. This resulted in many of the flat, eroded surfaces that occur in the Rocanville municipality. As water flowed eastward through the spillway, it eventually cut a deep, wide valley; in this area cutting through the glacial deposits, including those of the Welby Sand Plain, and into the bedrock below.

During Phase 4 (Fig. 4), meltwater flowing from the glacier cut the Kaposvar Creek Channel and water flowing from Saltcoats Lake cut the Cutarm Spillway.

One other glacial feature that is evident in the area today is the series of large ridges that trend in a southwest-northeasterly direction, west of the Kaposvar Creek and south of Esterhazy. These features were formed by the advance of the glacier, and perhaps were formed by a glacier previous to the last one that advanced over this area. As the ice advanced, it greatly disturbed the bedrock surface, thrusting it into large blocks that form the ridges. Subsequent glaciers have smoothed the ridges and deposited a thin layer of glacial debris, but have not obliterated them.

Only minor changes have taken place to the land surface since the final retreat of the ice. Most notable of these are the development of coulees along glacial drainage channels, such as the south side of the Pipestone and Qu'Appelle Channels, and uplands, such as the Moose Mountains, and the infilling of channel bottoms. This latter activity often has led to the formation of lakes in these channel bottoms or to the reversal of drainage from that of glacial times.

by H.B. Stonehouse



Phase 1. About 15,500 years ago.

Phase 2. About 15,250 years ago.

Phase 3. About 14,000 years ago.

Phase 4. About 12,500 years ago.

Fig. 4 Stages in the history of deglaciation of the map area.

GEOLOGY AND GROUNDWATER RESOURCES*

GEOLOGY

All sediments between the bedrock surface and the present surface are considered to be "drift". The drift in the map area ranges in recorded thickness from 0 to 165 m (0 to 540 ft.) (Fig. 5; DD', EE'). The drift is thickest in the area of the Rocanville Valley and in the depression in the shale bedrock south of the Qu'Appelle River. The drift is thinnest in the northwest part of the area where the bedrock surface rises to above 525 m (1800 ft.) above sea level (Fig. 5; DD').

The drift has been divided into three groups: Empress Group, Sutherland Group, and Saskatoon Group. The Saskatoon Group has been further subdivided into the Floral and Battleford Formations and Surficial Stratified Drift. The Sutherland Group as well as the Floral Formation consists of several till units and stratified units which are not formally separated and identified here. The definition of these groups and the description of the typical drift units forming this stratigraphy are provided by Christiansen and Whitaker and Christiansen.

Bedrock

The bedrock that directly underlies the drift is known as the Pierre Shale. This unit is composed of thick, soft, gray noncalcareous silt and clay which was deposited in a shallow sea and has not been consolidated into solid "rock" except for the Odanah Member which is hard, siliceous shale and forms the bedrock surface in the northwestern part of the area.

Empress Group

The Empress Group consists of stratified deposits between the bedrock surface and the Sutherland Group. In the map area, the Empress Group is composed of 0 to 115 m (0 to 375 ft.) of sand or silt, with minor occurrences of gravel and clay interbeds (Fig. 5; BB', EE'). These sediments may be preglacial and/or glacial in origin.

Sutherland Group

The Sutherland Group lies between the Empress and Saskatoon Groups, (Fig. 5; BB'). The unit is from 0 to 65 m (0 to 215 ft.) thick and comprises tills and stratified drift. The tills of the Sutherland Group are commonly harder, clayier and less resistive, electrically, than tills of the Saskatoon Group. These two groups are also differentiated on the basis of carbonate content and the presence of shale fragments in the till. A weathering zone characterized by leaching, oxidation and staining generally separates the two groups. In some locations the top of the group is marked by stratified drift.

Saskatoon Group

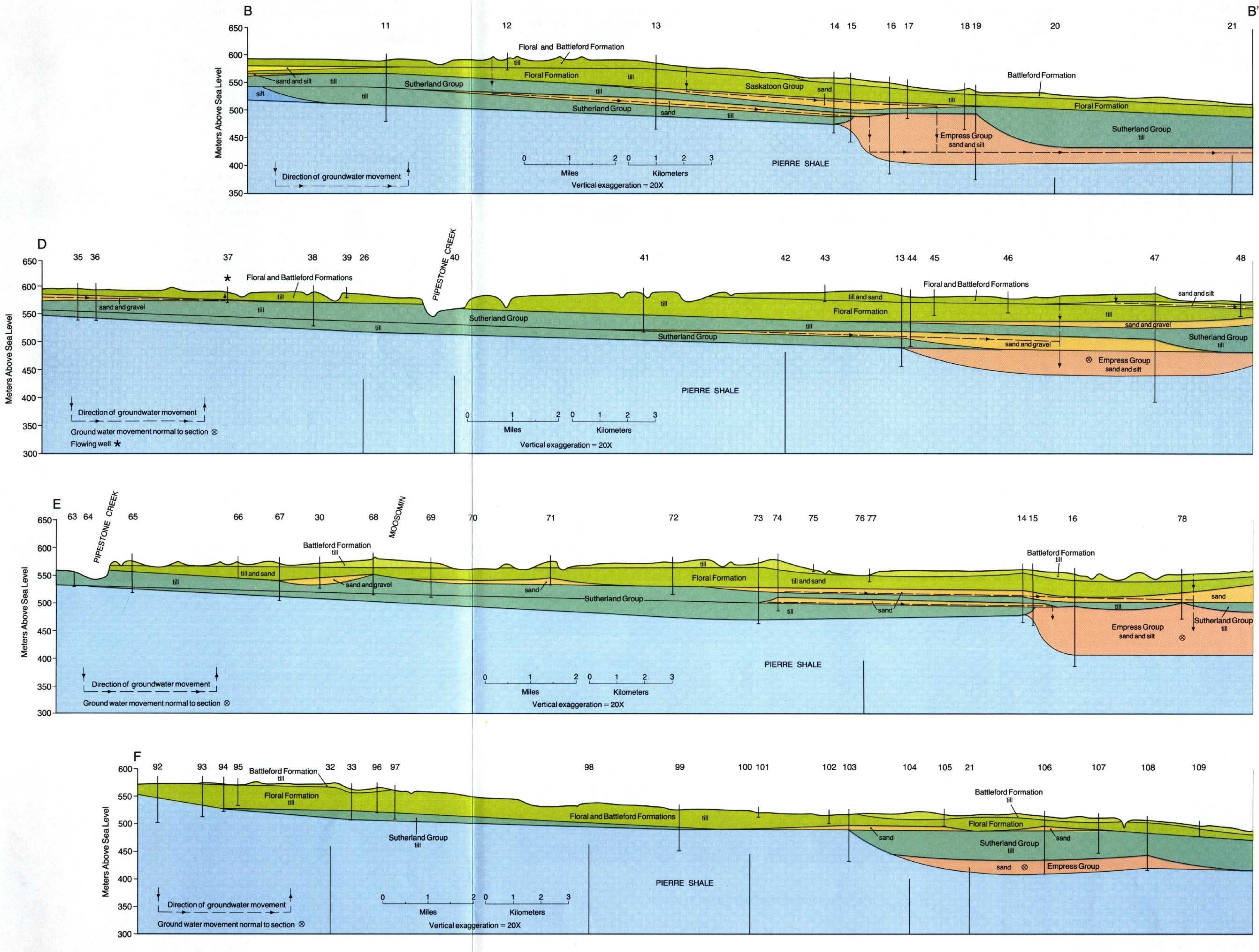
The Saskatoon Group, which comprises all sediments lying between the Sutherland Group and the present surface, ranges in thickness from about 0 to 67 m (0 to 220 ft.) and is composed of tills and stratified drift. The tills of the Saskatoon Group are commonly more sandy, more resistive, electrically, and have a higher carbonate content than the Sutherland Group tills.

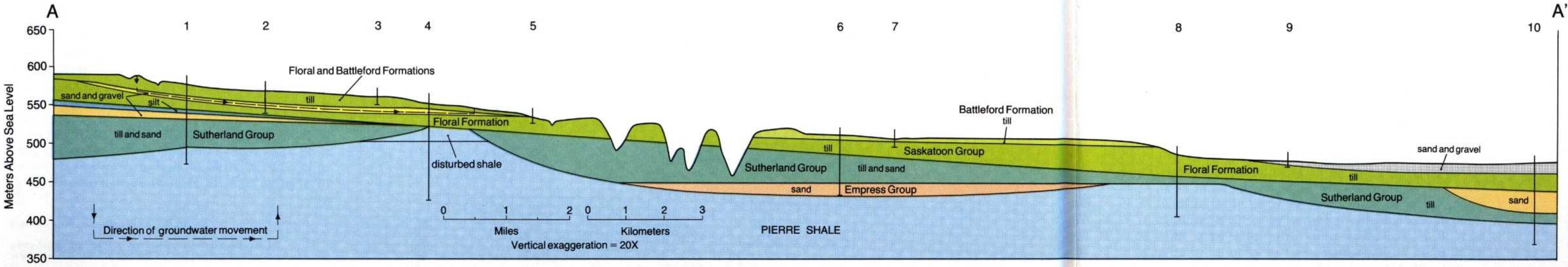
The Saskatoon Group has been further subdivided into the Floral and Battleford Formations and Surficial Stratified Drift. The Floral Formation lies between the Sutherland Group and the Battleford Formation. It ranges in thickness from about 0 to 60 m (0 to 200 ft.) and is composed of till, sand and gravel, sand and silt, and silt and clay interbeds (Fig. 5; DD'). The Floral Formation tills are commonly gray, hard, and more silty than the Sutherland Group tills and less sandy than the Battleford Formation till. The upper part of the Floral Formation is commonly oxidized and stained with iron and manganese oxides.

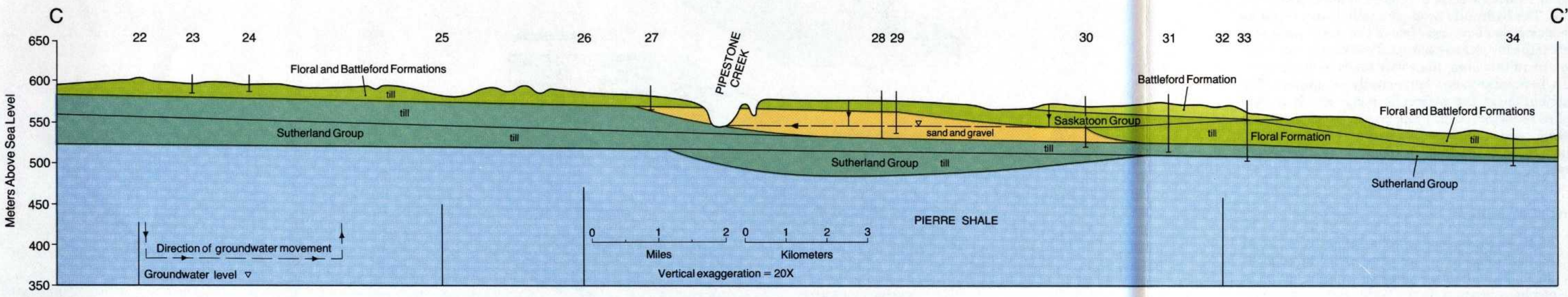
The Battleford Formation ranges from 0 to about 20 m (65 ft.) thick but is commonly less than 10 m (30 ft.) thick. It comprises soft, friable, massive till commonly oxidized and unstained and ranges in color from brownish gray to yellowish brown. The till is commonly sandy and although it has a high carbonate content, it can be less carbonate rich than the Floral Formation. The Battleford Formation is the primary component of the present-day till landscape. The Battleford Formation also includes sporadic, patchy occurrences of stratified drift which are too thin and not extensive enough to differentiate. Where the Battleford Formation is too thin or cannot be separated from the Floral Formation it is not shown on the cross-sections (Fig. 5; DD').

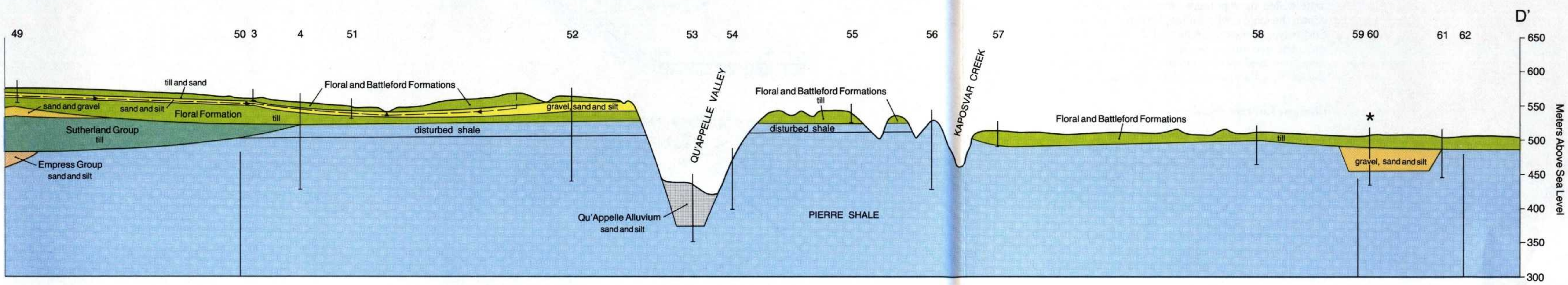
The areal distribution of the Surficial Stratified Drift at the ground surface is shown in the landform map in the following section of this report. As shown in Fig. 5; AA', FF', it is up to 10 m (30 ft.) thick but is absent over much of the transect. The stratified drift that occurs in the northeastern part of the area, along the Qu'Appelle Valley, is outwash sands and gravels which are part of the Welby Sand Plain extending north of the Qu'Appelle Valley. The Qu'Appelle Alluvium occurs within the valley. The valleys containing Kaposvar, Cutarm, and Pipestone Creeks and Moosomin Lake acted as meltwater channels and spillways, while Deerhorn Creek follows a subglacial channel. Stratified sediments are associated with these waterways.

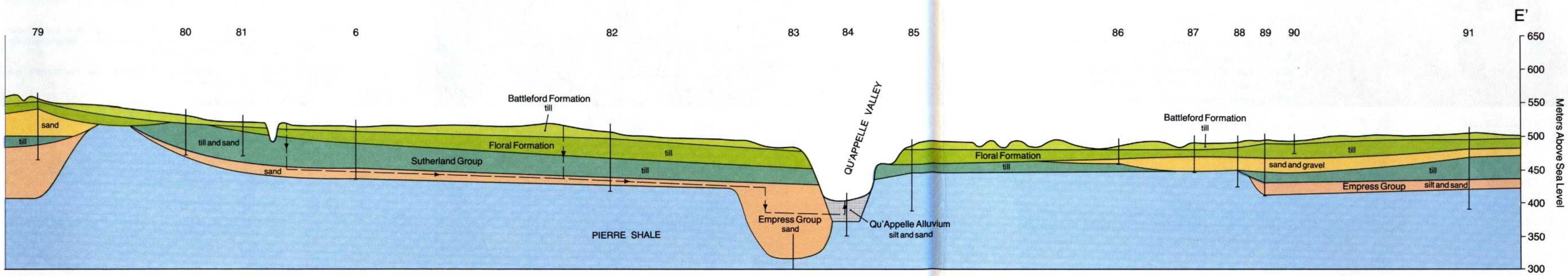
Fig. 5 Vertical cross-sections of the glacial stratigraphy of the map area.

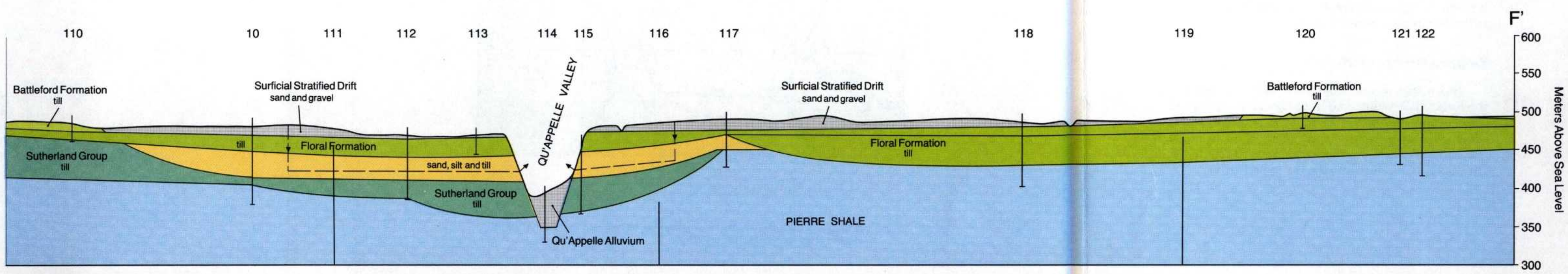



A
A'
1
2
3
4
5
6
7
8
9
10
Meters Above Sea Level
650
600
550
500
450
400
350
Floral and Battleford Formations
sand and gravel
silt
till
till and sand
Sutherland Group
Floral Formation
disturbed shale
Battleford Formation
till
Saskatoon Group
Sutherland Group
till and sand
sand
Empress Group
Floral Formation
sand and gravel
Sutherland Group
sand
Direction of groundwater movement
Miles
Kilometers
Vertical exaggeration = 20X
PIERRE SHALE


C
C'
22
23
24
25
26
27
28 29
30
31
32 33
34
Meters Above Sea Level
650
600
550
500
450
400
350
PIPESTONE CREEK
Floral and Battleford Formations
till
Sutherland Group
Battleford Formation
Saskatoon Group
sand and gravel
Floral Formation
Sutherland Group
Direction of groundwater movement
Groundwater level ▽
Miles
Kilometers
Vertical exaggeration = 20X
PIERRE SHALE


D'
49
50 3
4
51
52
53
54
55
56
57
58
59 60
61
62
Meters Above Sea Level
650
600
550
500
450
400
350
300
till and sand
sand and gravel
sand and silt
Floral and Battleford Formations
Floral Formation
till
Sutherland Group
Empress Group
sand and silt
disturbed shale
gravel, sand and silt
QU'APPELLE VALLEY
Qu'Appelle Alluvium
sand and silt
KAPOSVAR CREEK
*
gravel, sand and silt
PIERRE SHALE


E'
79
80
81
6
82
83
84
85
86
87
88
89
90
91
Meters Above Sea Level
650
600
550
500
450
400
350
300
sand
till
till and sand
Battleford Formation
Floral Formation
Sutherland Group
QU'APPELLE VALLEY
Empress Group
Qu'Appelle Alluvium
silt and sand
sand and gravel
silt and sand
PIERRE SHALE


F'
110
10
111
112
113
114
115
116
117
118
119
120
121 122
Meters Above Sea Level
600
550
500
450
400
350
300
Battleford Formation
till
Surficial Stratified Drift
sand and gravel
Floral Formation
Sutherland Group
sand, silt and till
QU'APPELLE VALLEY
Qu'Appelle Alluvium
PIERRE SHALE

GROUNDWATER RESOURCES

Groundwater originates from precipitation that infiltrates to the water table, moves downward and laterally under the influence of gravity, and eventually discharges back to the ground surface at some point of lower elevation.

An aquifer is a layer in which a well can be constructed, yielding sufficient water for the intended use. In this map area, the Empress Group, intertill sands and gravels, and Surficial Stratified Drift form the aquifers. Aquifers are separated by aquitards which are layers sufficiently permeable to transmit water but not sufficiently permeable to allow completion of a production well. Till units form the aquitards in this map area.

Groundwater moves through the intergranular openings and fractures in the sediments. The water moves under the influence of gravity from regions of higher hydraulic head to regions of lower hydraulic head. The hydraulic head generally is expressed as the elevation above sea level of the water level in a well. If the layers are horizontal and of large areal extent, as in this area, the water tends to move vertically in aquitards and horizontally in aquifers. The distribution of the hydraulic head, which is controlled by factors such as topography, stratigraphical setting and the type of material forming the aquitards and aquifers, determines the direction of flow.

Surficial Aquifers

Many shallow seepage wells, generally less than 10 m (30 ft.) deep, have been constructed throughout the area. The only major surficial aquifer occurs in the northeastern part, in the Welby Sand Plain area. The surface deposit is primarily the Battleford Formation, consisting of till and patches of stratified drift which may produce small amounts of water. Along the Qu'Appelle Valley, Pipestone and Cutarm Spillways, Kaposvar Creek and the Deerhorn Channels, the associated deposits of sands and gravels may form local water supplies. The alluvium within the Qu'Appelle Valley is also a water supply.

Shallow Intertill Aquifers

Along the western part of the area, intertill sands and gravels associated with the upper part of the Floral Formation provide water supplies at depths commonly less than 35 m (120 ft.) (Fig. 6). Where these aquifers are reasonably well defined, they are shown on the cross-sections (Fig. 5; DD'). Where they are interbedded with till or where insufficient data exists, the aquifers are not shown.

In the absence of sufficient, reliable water-level data, the direction of groundwater flow in these shallow intertill aquifers, indicated schematically on the cross-sections, was inferred from the topographical setting.

Deep Intertill Aquifers

Intertill sands and gravels of the lower part of the Floral Formation and Sutherland Group form extensive aquifers commonly at depths between 35 m (120 ft.) and 100 m (330 ft.) throughout the central, northeastern and extreme southwestern part of the area (Fig. 5 and 6). Where insufficient data exists to properly define the aquifers, they are not differentiated.

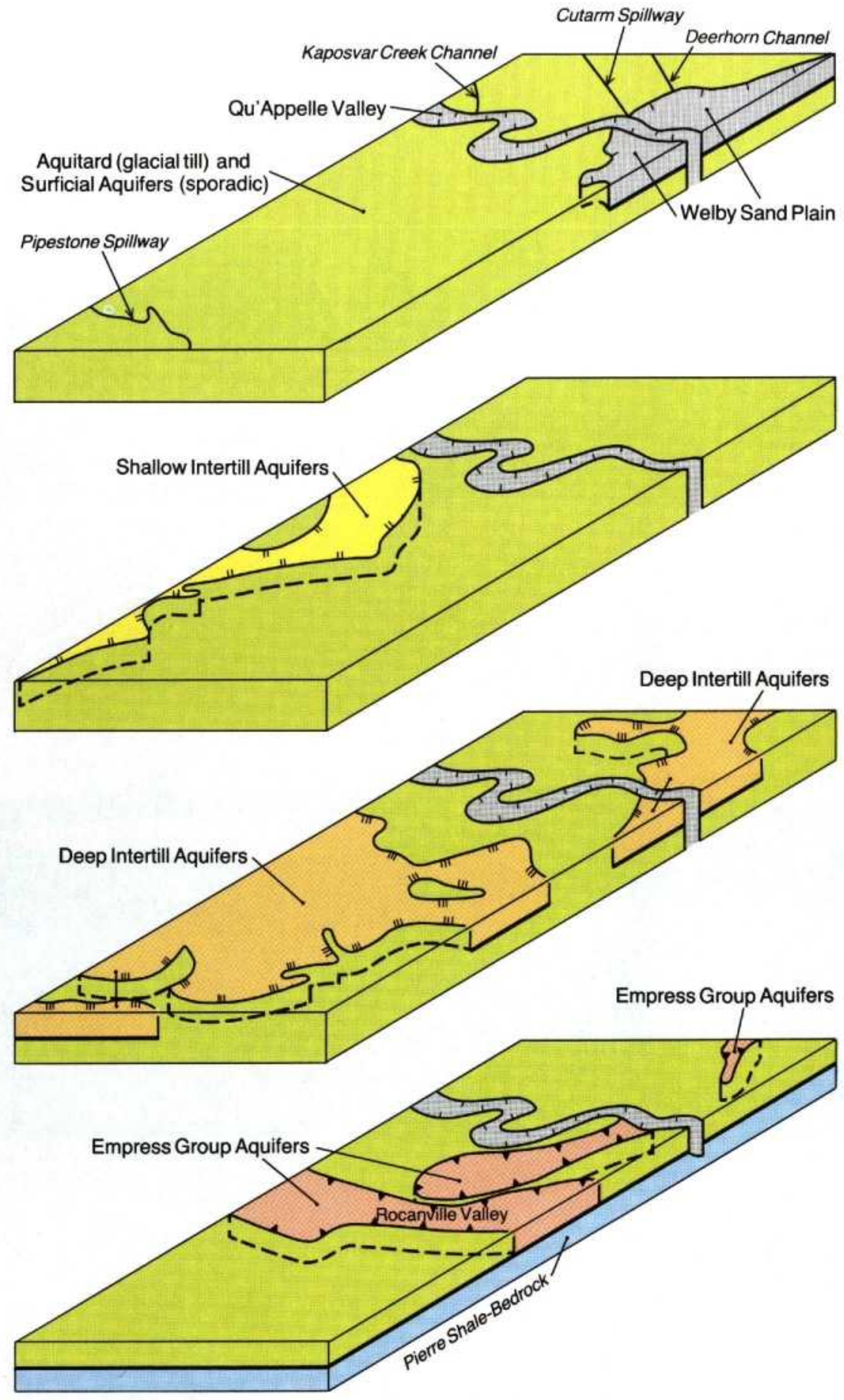
The aquifer in the northeast may extend west of Cutarm Creek, however, the aquifer boundary has been drawn to conform to known occurrences of the aquifer.

The deep intertill aquifers are recharged by downward flow through the overlying sediments. Where possible, and based on the slope of the topography, the direction of groundwater flow in these aquifers has been indicated schematically on the cross-sections.

It should also be noted that the Qu'Appelle Valley acts as a drain where it intersects these aquifers in the northeast part of the area.

Empress Group Aquifers

Sediments of the Empress Group, deposited in the Rocanville Valley and in the bedrock depression south of the Qu'Appelle River, form aquifers, which occur at depths greater than 50 m (165 ft.). The Rocanville Valley aquifer discharges through the Qu'Appelle Alluvium into the Qu'Appelle River.



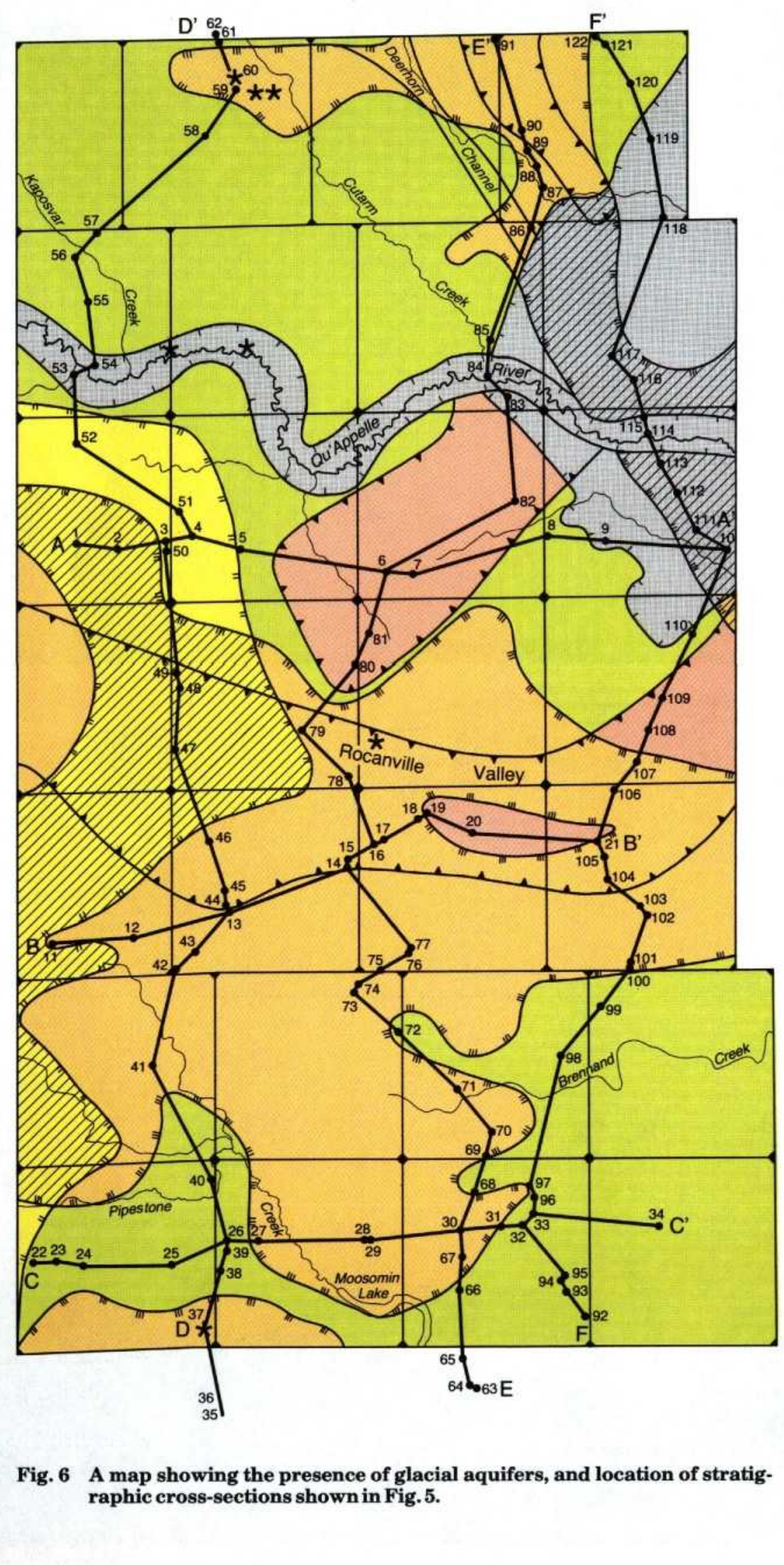


Fig. 6 A map showing the presence of glacial aquifers, and location of stratigraphic cross-sections shown in Fig. 5.

Flowing Wells

Flowing wells, where the water level is above the ground surface, occur in various locations in the area (Fig. 6) and generally indicate an upward groundwater flow. Flowing wells occur southwest of Moosomin in Township 13, Range 33 and southwest of Rocanville in Township 16, Range 31. These wells are completed at shallow depths above 35 m (120 ft.). Flowing wells also occur in the Qu'Appelle Valley near Tantallon. In the northeast part of Township 19, Range 32, the flowing wells are developed in intertill aquifers.

by B.T. Schreiner and H. Maathuis

* Contributed by the Resources Division, Saskatchewan Research Council, Saskatoon.

LEGEND

Surficial Aquifers - occur sporadically throughout the area as stratified drift within the Battleford Formation and within outwash deposits along the Pipestone and Cutarm Spillways and Kaposvar Creek and Deerhorn Channels and in the Welby Sand Plain. Bars indicate areas where Surficial Aquifers are underlain by Deep Intertill Aquifers. The alluvium within the Qu'Appelle Valley is also a water supply.

Shallow Intertill Aquifers - occur along the western part of the area as sand and gravel layers in the upper part of the Floral Formation at depths commonly less than 35m (120 ft). Bars indicate areas where Shallow Intertill Aquifers are underlain by Deep Intertill Aquifers.

Deep Intertill Aquifers - occur throughout the central, northeastern and extreme southwest part of the area as gravel and sand layers in the lower part of the Floral Formation and within the Sutherland Group at depths commonly between 35m (120 ft) and 100m (330 ft).

Empress Group Aquifers - occur as Empress Group silt, sand and gravel in the Rocanville Valley, in the bedrock depression and in the small channel in the northeast, commonly at depths greater than 50m (165 ft).

Aquitards - occur throughout the area above, below and between aquifers as relatively impermeable till layers of the Sutherland Group, Floral and Battleford Formations.

Bedrock - underlies all the above deposits as an impermeable layer of silty clay - Pierre Shale.

A' Cross section transect

12 Cross section log number

A Cross section designation

● Water Well or Testhole - information from records of Family Farm Improvement Branch, Saskatchewan Department of Environment, Saskatchewan Research Council, and private companies.

* Flowing well - water level is above ground surface.

Note: Maps, cross sections, and diagrams presented are schematic representations of available data. Aquifers and other geologic units may not always occur continuously within the area indicated, may not be found at a specific site, or may occur at elevations other than those indicated.

LANDFORMS

The term landform refers to the shape imparted to the land surface by the surface geologic materials and the way in which they were deposited.

There are three classes of landforms in these municipalities: glacial landforms whose formation was directly influenced by the ice sheet; landforms that resulted from lakes and streams near the melting ice sheet; and landforms formed under the influence of wind and water after the ice and glacial meltwater disappeared.

In the accompanying maps, the symbols used to depict the different landforms have three components: the type of surface deposit, the shape and pattern of the land, and the steepness of slopes. The surface deposit, shown in the numerator of the map symbol, is described in terms of its particle size and mode of origin. The shape or pattern of the land is described in terms of the surface expression of the materials, the erosional modification to these materials since their original time of deposition, and the steepness of slopes.

SURFACE DEPOSITS

Alluvial Deposits

Alluvial deposits are materials laid down by streams and rivers in valley bottoms and collection basins, since glaciation. These deposits, as shown in Fig. 7, are stratified and often contain beds or layers that are oblique to the main planes of stratification, indicative of their river or stream origin. In this area, these deposits may be sandy to clayey-textured, such as those associated with the floodplain of the Qu'Appelle River, or silty-textured, such as those that occur in numerous small collection basins scattered throughout the area.

Fig. 7 Alternating dark- and light-colored layers are common in alluvial deposits. They reflect additions of material from a main river or its tributaries during periods of flooding.

Bedrock Deposits

Bedrock deposits are preglacial materials composed of marine clays and silts that have been consolidated into shale. They are exposed in the Qu'Appelle Valley and underlie some glacial deposits in the Rocanville and Spy Hill municipalities, at a shallow depth.

Eolian Deposits

Eolian deposits are sandy fluvial deposits that have been moved and redeposited by the wind, often in the form of dunes. Eolian deposits contain beds or layers that are inclined 32° to the horizontal, formed as the sand slips down the face of the dune.

Fluvial Deposits

Fluvial deposits are materials laid down in rivers and streams carrying glacial meltwater. They are usually sandy or gravelly and, like the alluvial deposits described above, may contain beds or layers that are inclined or oblique to the main planes of stratification. Materials laid down in direct contact with the glacier are termed **glaciofluvial** deposits. They are usually thick but may be thin, like a veneer, and underlain by glacial till or gravel.

Fig. 8 Fluvial deposits are usually sandy or gravelly. They may have structures, such as cross bedding, that reflect the influence of river currents or they may lack structure, as in the glaciofluvial deposits shown in the above photograph.

Lacustrine Deposits

Lacustrine deposits are materials laid down in a glacial lake. These deposits, as depicted in Fig. 9, are often stratified and characterized by dark- and light-colored beds or layers reflecting summer and winter depositional cycles in a glacial lake. Lacustrine deposits usually have a high content of very fine sand-, silt- or clay-sized particles. Those dominated by sand-sized particles are termed **loamy lacustrine** while those dominated by silt- and clay-sized particles are termed **silty** and **clayey lacustrine**, respectively. They are usually thick but may be thin, like a veneer, and underlain by glacial till. Materials laid down in close contact with the glacier are termed **glaciolacustrine** deposits.

Fig. 9 Bands of dark- and light-colored layers are common, at depth, in lacustrine deposits. They reflect alternating summer and winter depositional sequences in the former glacial lakes.

Morainal Deposits

Morainal deposits, often referred to as glacial till, are materials laid down by the glacial ice. These deposits are generally comprised of stones and gravels embedded in a matrix of sand-, silt- and clay-sized materials (Fig. 10). When this matrix contains nearly equal amounts of sand, silt and clay they are called **loamy morainal** deposits. When there is a preponderance of sand or silt, they are referred to as **sandy morainal** or **silty morainal** deposits, respectively. Usually, there are fewer stones and gravels present in silty morainal deposits than in sandy or loamy types. Morainal deposits characterized by an abundance of surface stones are called **bouldery morainal** deposits.

Fig. 10 Morainal deposits typically have stones and gravels embedded in a matrix of sand-, silt-, and clay-sized materials.

Organic Deposits

Organic deposits are materials laid down by the accumulation of plant remains. They are generally 40 cm (15 in.) thick or greater and are comprised of either the remains of mosses or sedges and grasses and often have inclusions of woody materials. When the organic materials are largely undecomposed, so that there is a large amount of well-preserved fiber that is readily identifiable as to botanical origin, they are called **fibric organic** deposits.

Undifferentiated Deposits

Areas where the origin of the materials for the purpose of mapping has not been specified are termed undifferentiated deposits. These deposits, usually consisting of several materials (morainal, fluvial, lacustrine, or others) occur in areas of steeply sloping land such as coulees and valley sides.

SURFACE FORMS

Aprons and Fans

A fan, as the name implies, is a gently sloping fan-shaped area resulting from the accumulation of sediments brought down by a stream descending through a steep ravine (Fig. 11). A series of adjacent, coalescing fans is called an apron. Fans and aprons are common in the Qu'Appelle Valley.

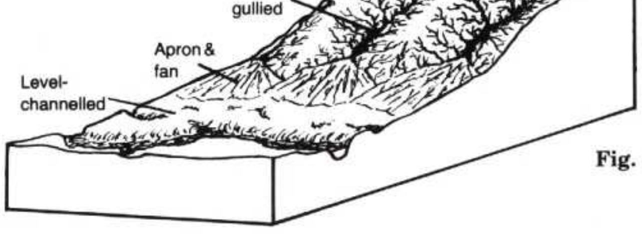


Fig. 11

Hummocky

Landscapes with a complex pattern of generally short, steep slopes extending from prominent knolls to somewhat rounded depressions or kettles are termed hummocky. They are called **hummocky dissected** where shallow gullies join one low area or kettle to the next and **hummocky gullied** where numerous, parallel or subparallel, narrow ravines interrupt the hummocky features of the landscape (Fig. 12). Occasionally, areas have a complex of ridged and hummocky features. They are called **hummocky-ridged.**

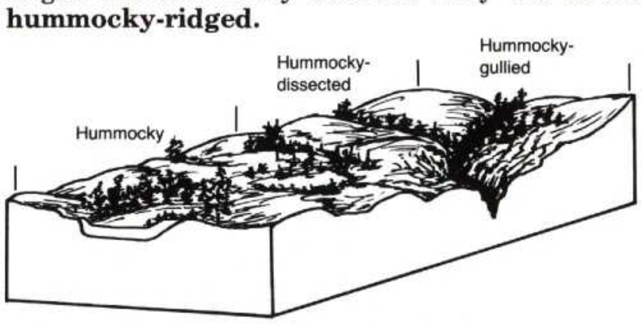


Fig. 12 Landforms with a very irregular surface are termed hummocky. Erosional modification may have resulted in dissected or gullied forms, depending upon the severity of the erosion.

Inclined

Landscapes in which the general slope is in one direction, only, are called inclined. Where shallow gullies occur along the slope, the areas are called **inclined dissected**; where a series of parallel or subparallel, deep gullies or ravines occur, they are called **inclined gullied** (Fig. 13).

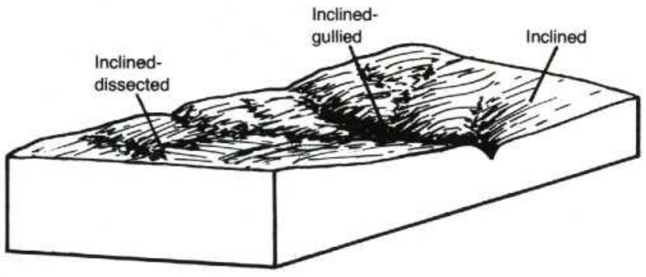


Fig. 13 Landforms with a prevailing slope in one direction are called inclined. They are commonly modified by erosion, resulting in either dissected or gullied forms, depending on the severity of erosion.

Level

Landscapes that are flat or have very gently sloping surfaces are said to be level. Along floodplains of rivers and streams where the level surface is broken by abandoned river channels they are called **level channelled.**

Ridged

Landscapes that have a linear pattern, usually of short and straight parallel ridges but sometimes a single, sinuous ridge or a series of intersecting ridges are termed **ridged.**

Terraced

Areas, usually along a valley, that have a steep, short scarp slope and a horizontal or gently inclined surface above it are called **terraced.**

Undulating

Landscapes that are characterized by a sequence of gentle slopes extending from smooth rises to gentle hollows, that impart a wave-like pattern to the land surface are called undulating (Fig. 14). Where shallow gullies extend from one low area to the next in these landscapes they are called **undulating dissected** and where the undulating surface is broken by abandoned river channels they are called **undulating channelled.**

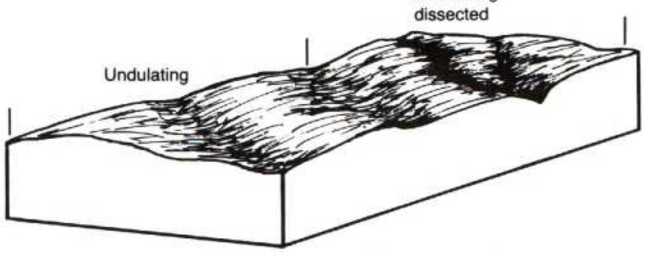


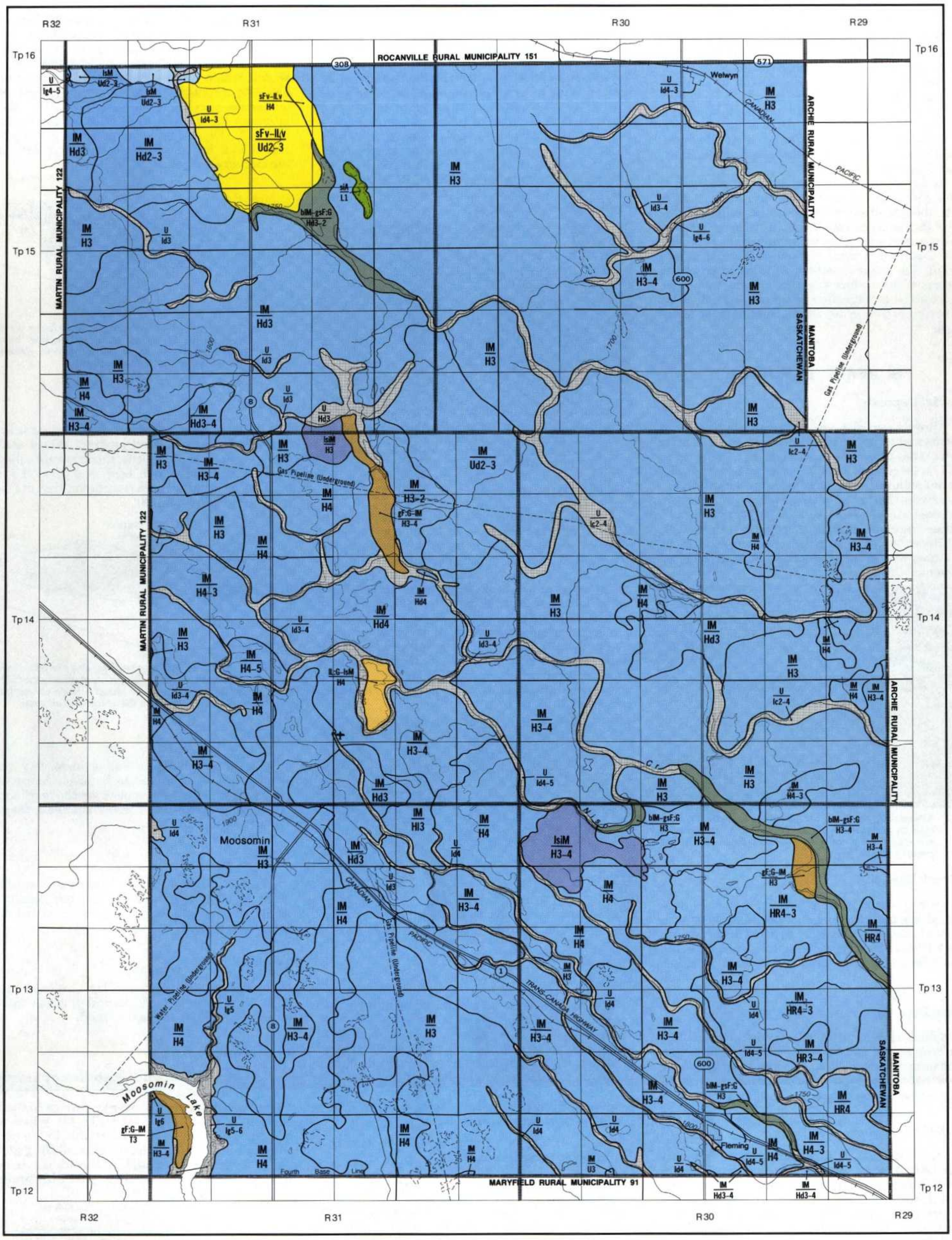
Fig. 14 Landforms with an undulating surface are most common in areas where lacustrine deposits blanket the more irregular surface of underlying morainal deposits. Gully erosion has imparted a dissected character to these forms in some areas.

The Qu'Appelle Valley features landforms that contrast sharply to the glacial landforms on the uplands. Prominent gullied landforms dominate the valley wall with fans and aprons at their base. They blend almost imperceptibly with the nearly level floodplain below. Meander scars of former rivers interrupt this floodplain. Similar features to these, on a smaller scale, can be seen in some of the coulees in the area.

by **D.F. Acton**

MOOSOMIN RM 121 - LANDFORM

by D.F. Acton and by G.A. Padbury



LEGEND

SEQUENCE OF MAP SYMBOLS

Surface Deposit
bIM
Surface Form — Hd4 — Slope Class
Erosional Modifier

SURFACE DEPOSITS

Map Symbol	Name	Map Symbol	Name
siA	Silty alluvial	lsM	Loamy and sandy morainal
gF:G	Gravelly glaciofluvial	lsiM	Loamy and silty morainal
gsF:G	Gravelly and sandy glaciofluvial	U	Undifferentiated
sFv	Sandy fluvial veneer		
lL:G	Loamy glaciolacustrine		
lLv	Loamy lacustrine veneer		
blM	Bouldery and loamy morainal		
lM	Loamy morainal		

SURFACE FORMS

Map Symbol	Name
A	Apron
F	Fan
H	Hummocky
HR	Hummocky and Ridged
HI	Hummocky and Inclined
I	Inclined
L	Level
R	Ridged
T	Terraced
U	Undulating
UT	Undulating and Terraced

1:100,000

Km 2 1 0 2 4 Km
Miles 2 1 0 2 Miles

EROSIONAL MODIFIERS

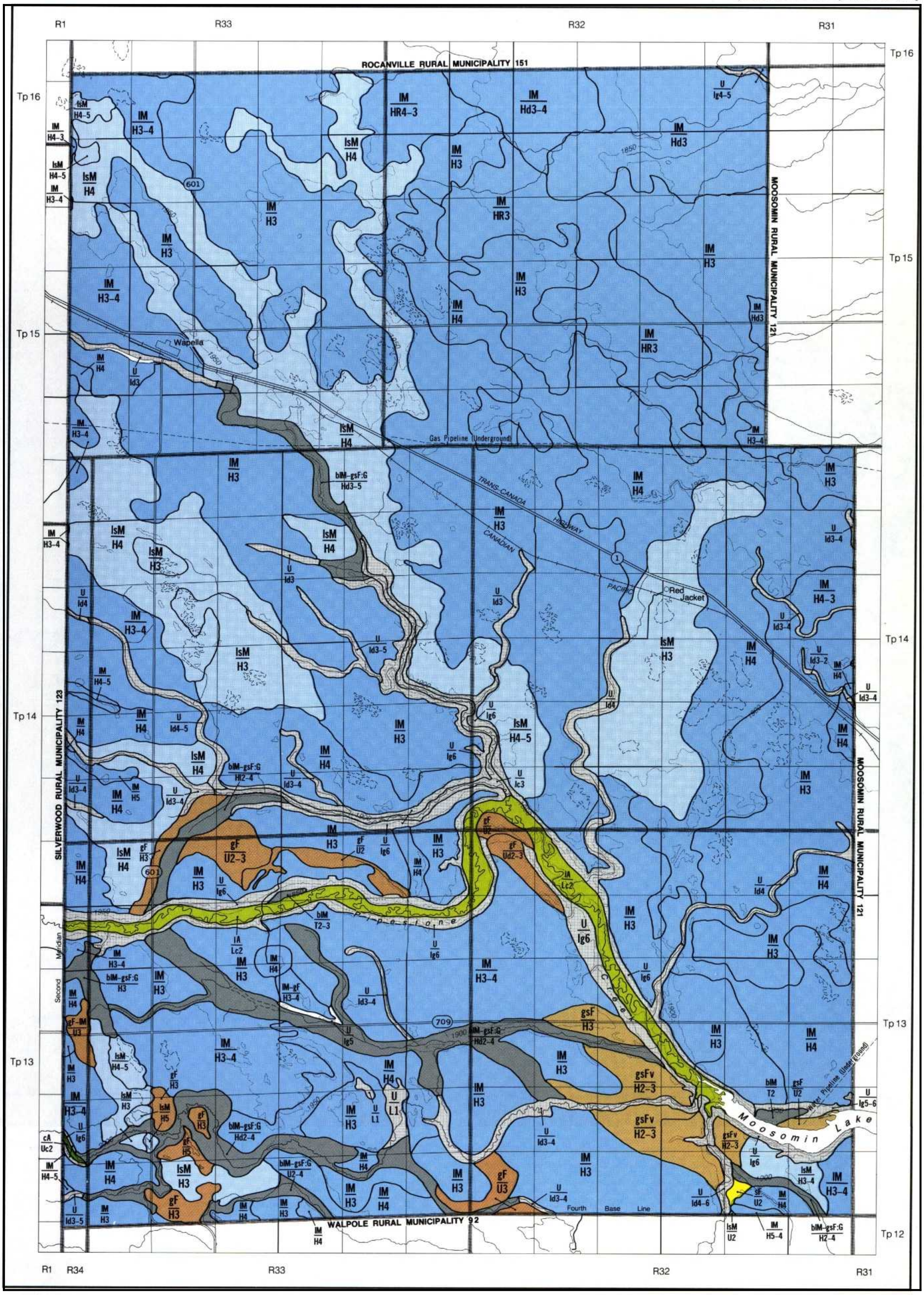
Map Symbol	Name
c	Channelled
d	Dissected
g	Gullied

SLOPE CLASSES

Map Symbol	% Slope	Description
1	0-0.5	Nearly level
2	0.5-2.5	Very gentle slopes
3	2.5-5.0	Gentle slopes
4	5-10	Moderate slopes
5	10-15	Strong slopes
6	15-30	Steep slopes
7	30-45	Very steep slopes

MARTIN RM 122 - LANDFORM

by D.F. Acton and by G.A. Padbury



1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

LEGEND

SEQUENCE OF MAP SYMBOLS

Surface Deposit — bIM

Surface Form — Hd4 — Slope Class

Erosional Modifier

SURFACE DEPOSITS

Map Symbol	Name
cA	Clayey alluvial
lA	Loamy alluvial
gF	Gravelly fluvial
gsF	Gravelly and sandy fluvial
gsF:G	Gravelly and sandy glaciofluvial
sF	Sandy fluvial
gsFv	Gravelly and sandy fluvial veneer
blM	Bouldery and loamy morainal
lM	Loamy morainal
lsM	Loamy and sandy morainal
U	Undifferentiated

SURFACE FORMS

Map Symbol	Name
A	Apron
F	Fan
H	Hummocky
HR	Hummocky and Ridged
HI	Hummocky and Inclined
I	Inclined
L	Level
R	Ridged
T	Terraced
U	Undulating
UT	Undulating and Terraced

EROSIONAL MODIFIERS

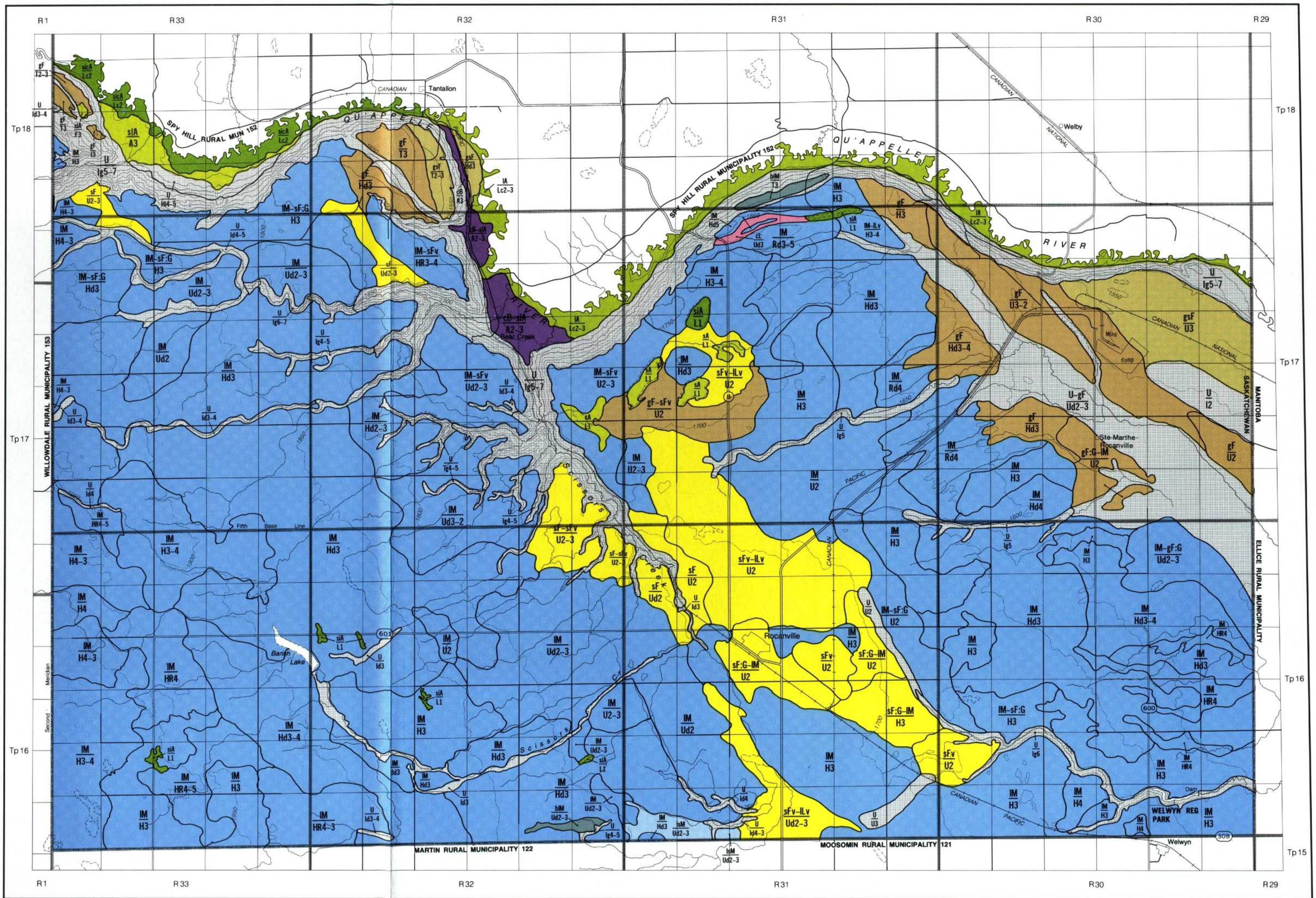
Map Symbol	Name
c	Channelled
d	Dissected
g	Gullied

SLOPE CLASSES

Map Symbol	% Slope	Description
1	0-0.5	Nearly level
2	0.5-2.5	Very gentle slopes
3	2.5-5.0	Gentle slopes
4	5-10	Moderate slopes
5	10-15	Strong slopes
6	15-30	Steep slopes
7	30-45	Very steep slopes

ROCANVILLE RM 151 - LANDFORM

by D.F. Acton and by G.A. Padbury



LEGEND

SEQUENCE OF MAP SYMBOLS

Surface Deposit

Surface Form — bIM / Hd4 — Slope Class

Erosional Modifier

SURFACE DEPOSITS

Map Symbol	Name	Map Symbol	Name
lA	Loamy alluvial	sF:G	Sandy glaciofluvial
sA	Sandy alluvial	sF	Sandy fluvial
slA	Sandy and loamy alluvial	sFv	Sandy fluvial veneer
siA	Silty alluvial	cL	Clayey lacustrine
sicA	Silty and clayey alluvial	lLv	Loamy lacustrine veneer
cB	Clayey bedrock	bIM	Bouldery and loamy morainal
gF	Gravelly fluvial	lM	Loamy morainal
gsF	Gravelly and sandy fluvial	lsM	Loamy and sandy morainal
gF:G	Gravelly glaciofluvial	U	Undifferentiated

SURFACE FORMS

Map Symbol	Name
A	Apron
F	Fan
H	Hummocky
HR	Hummocky and Ridged
HI	Hummocky and Inclined
I	Inclined
L	Level
R	Ridged
T	Terraced
U	Undulating
UT	Undulating and Terraced

EROSIONAL MODIFIERS

Map Symbol	Name
c	Channelled
d	Dissected
g	Gullied

SLOPE CLASSES

Map Symbol	% Slope	Description
1	0-0.5	Nearly level
2	0.5-2.5	Very gentle slopes
3	2.5-5.0	Gentle slopes
4	5-10	Moderate slopes
5	10-15	Strong slopes
6	15-30	Steep slopes
7	30-45	Very steep slopes

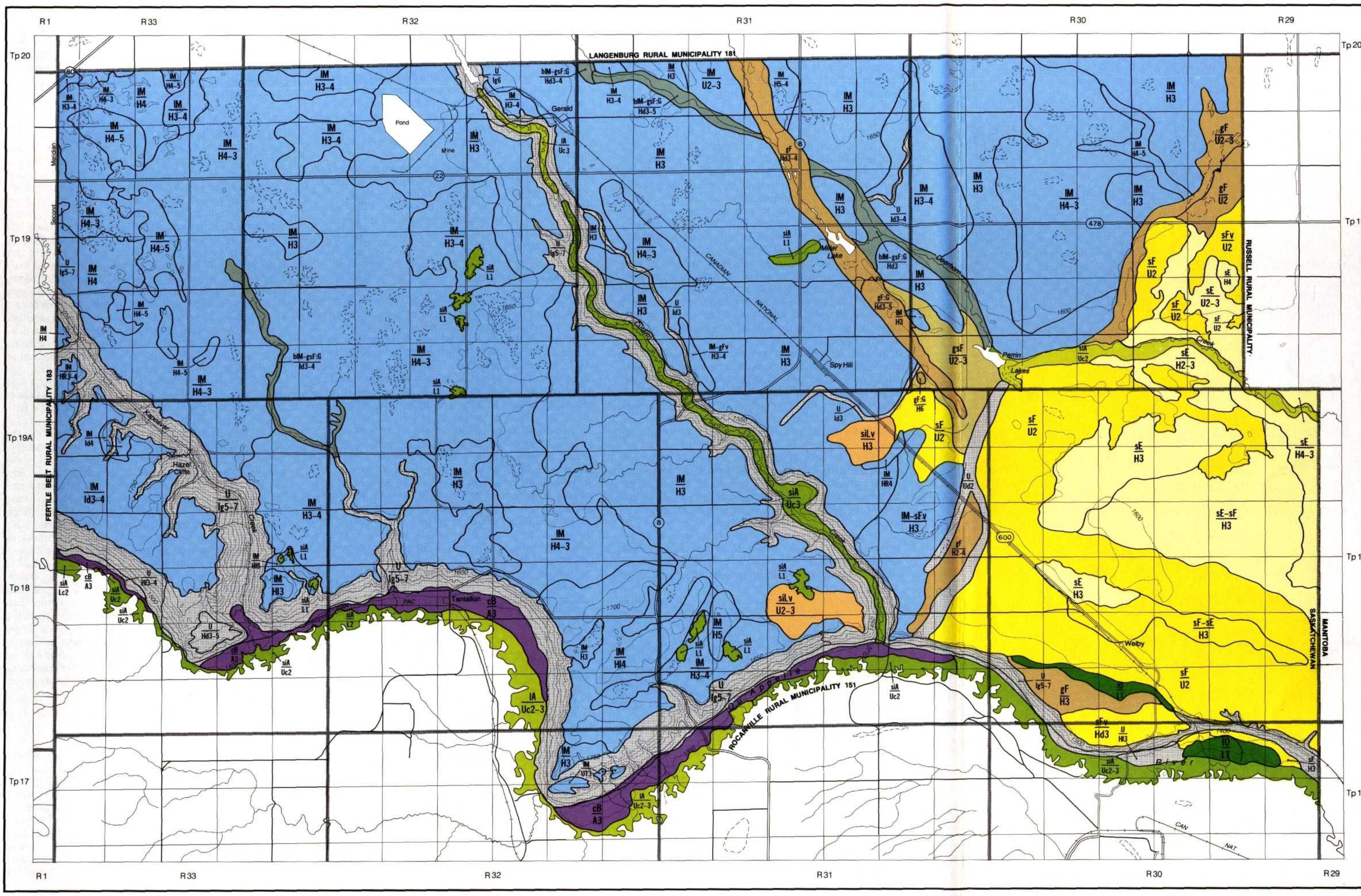
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SPY HILL RM 152 - LANDFORM

by D.F. Acton and by G.A. Padbury



LEGEND

SEQUENCE OF MAP SYMBOLS

Surface Deposit

Surface Form — bIM / Hd4 — Slope Class

Erosional Modifier

SURFACE DEPOSITS

Map Symbol	Name	Map Symbol	Name
lA	Loamy alluvial	sF	Sandy fluvial
slA	Sandy and loamy alluvial	sFv	Sandy fluvial veneer
siA	Silty alluvial	sE	Sandy eolian
cB	Clayey bedrock	siLv	Silty lacustrine veneer
gF	Gravelly fluvial	bIM	Bouldery and loamy morainal
gsF	Gravelly and sandy fluvial	lM	Loamy morainal
gF:G	Gravelly glaciofluvial	fO	Fibric organic
gsF:G	Gravelly and sandy glaciofluvial	U	Undifferentiated

SURFACE FORMS

Map Symbol	Name
A	Apron
F	Fan
H	Hummocky
HR	Hummocky and Ridged
HI	Hummocky and Inclined
I	Inclined
L	Level
R	Ridged
T	Terraced
U	Undulating
UT	Undulating and Terraced

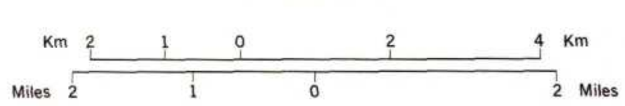
EROSIONAL MODIFIERS

Map Symbol	Name
c	Channelled
d	Dissected
g	Gullied

SLOPE CLASSES

Map Symbol	% Slope	Description
1	0-0.5	Nearly level
2	0.5-2.5	Very gentle slopes
3	2.5-5.0	Gentle slopes
4	5-10	Moderate slopes
5	10-15	Strong slopes
6	15-30	Steep slopes
7	30-45	Very steep slopes

1:100,000



INTRODUCTION TO SOILS

The nature and agriculturally important properties of the soils of the area are described in succeeding sections of this report. The present section, largely adopted from H.C. Moss, in **A Guide to Understanding Saskatchewan Soils**, deals mainly with features common to most prairie soils.

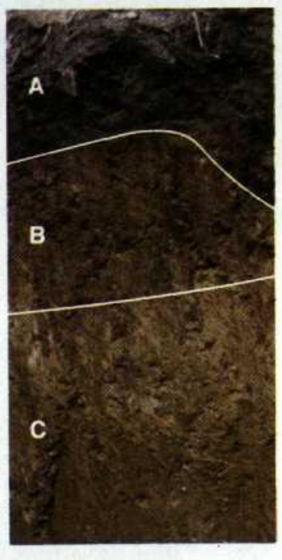
THE SOIL PROFILE

A soil is a natural body that occupies a relatively thin section (usually less than a metre or several feet) of the earth's surface and consists of several layers or horizons which differ in appearance and composition from the underlying material.

Its formation from the original geological deposit involves: the physical breakdown of rock fragments; the chemical weathering of these particles; biological activities including the growth of plants, the decomposition of plant remains, and the production of humus; the transfer of certain materials from one part of the soil to another; and, the development of soil structure. As a result of these processes, which have been operative since deglaciation, changes appear in the original geological deposit in the form of visible layers extending from the surface downward. The whole succession of layers down to and including the original geological deposit is called the **soil profile.** Each individual layer is called a **soil horizon**. A particular soil is recognized and separated from other soils by identifying the various layers or horizons which make up its profile. The recognition of soil profiles forms the basis of soil classification and mapping.

The soils of Saskatchewan are classified according to a national system of soil classification and the names given to the soils are derived, in part, from this system. For example, an orthic profile is a soil whose characteristics are defined as an Orthic Chernozemic soil of the National system.

In profiles of mineral soils, three main horizons are recognized. From the surface downward, these are designated by the letters A, B, and C. The arrangement and general properties of these soil horizons is presented in Fig. 15.



A - All or part of the surface soil. It may be dark colored representing an accumulation of humus, or a light-colored horizon from which clay, humus and other materials have been removed.
B - Occurs immediately below the **A** horizon. It may have an accumulation of clay and may have been altered to give a change in color or structure.
C - Occupies the lower portion of the soil profile and usually represents the parent material. It is relatively unaffected by soil forming processes operative in the **A** and **B** horizons.

Fig. 15 A photograph of a soil profile common to this area and a description of the general characteristics of the major soil horizons.

SOIL FORMING FACTORS

All soils are formed as the result of combined effects of several natural factors, and in many instances the activities of man as well. These factors are parent material, topography, drainage, climate, vegetation, time, and man. These factors are discussed to help our understanding of why soils differ from place to place.

Parent Material

Parent material, which is the name given to the geological deposit from which the soils develop, largely determines soil texture and the original supply of minerals required by plants. It may also contribute to undesirable soil conditions such as salinity, acidity, and alkalinity. It is also partly responsible for the topographic and drainage characteristics of a soil.

Soil texture, which is the proportion of sand-, silt- and clay-sized particles present in a soil, is governed by the soil parent material. Textural classes are defined by means of a **textural triangle** (Fig. 63) in a subsequent section of this report entitled Soil Productivity.

There are many kinds of geological deposits in these, as in most, municipalities in Saskatchewan. The main types of surface geological deposits in these municipalities are described in the Landform section of this report.

Topography and Drainage

These factors are discussed together because they are closely related in their effects on the formation of soils. Topography refers to the features of the surface of the land - differences in relief or height between one place and another, the direction, steepness and frequency of slopes, and the comparative roughness of the surface. Various combinations of these features occur from place to place, forming distinctive landscape patterns. Surface form, erosional patterns and slope gradients, the key elements of topography, are described in the Landform section of this report.

Drainage refers to the conditions of water movement, both over the surface of the land and within the soil. This factor is treated more completely in the Surface Drainage and Wetlands section of the report. Suffice it to say here that drainage is influenced by the climate, the kind of soil and parent material, and the topography.

Climate and Vegetation

Soils throughout Saskatchewan are closely related to the climatic conditions and to the type of vegetation that has prevailed since glacial times. Soils in southwestern Saskatchewan, having developed under a more or less arid climate with sparse grassland vegetation, are characterized by a brown surface horizon reflecting relatively low amounts of organic matter. To the north and east, as the climate becomes less arid and the grassland vegetation more luxuriant, the surface layers of the soil, because of the corresponding increase in the amount of organic matter, become progressively darker. In northern Saskatchewan, where the climate is more suited to the growth of trees than grasses, the surface layers of the soil exhibit a grayish color reflecting an almost total lack of organic matter. These gradual changes in the organic matter content of the surface horizons of Saskatchewan soils, reflected by their color, form the basis of soil zonal separations in the province, namely Brown, Dark Brown, Black, Dark Gray and Gray (Fig. 16).

These zonal characteristics of Saskatchewan soils are so important that constant reference will be made to this feature throughout this report.

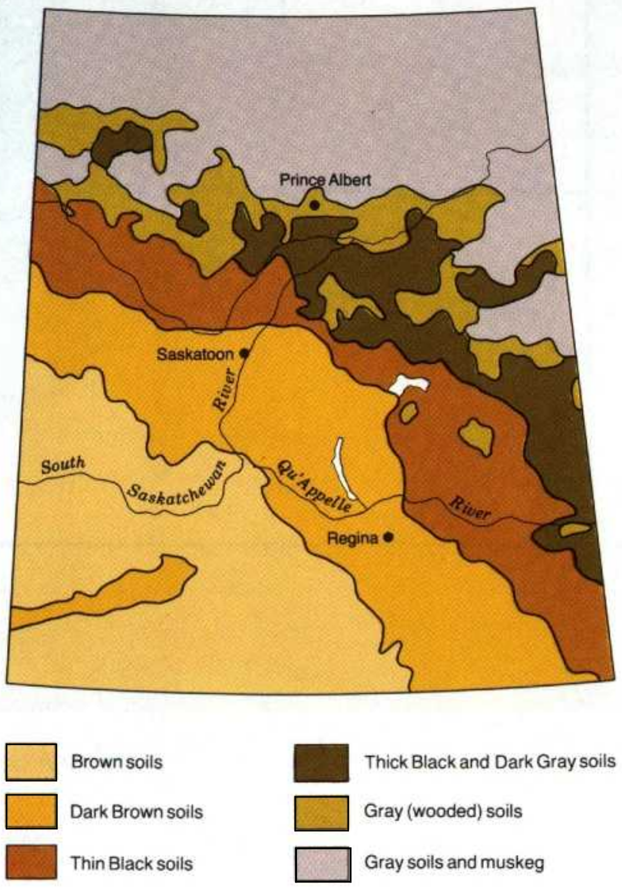


Fig. 16 A map of the major soil zones of Saskatchewan.

Time and Man

Time, as a factor in soil formation, is considered to be a combination of the actual length of time during which a soil has been forming, and the intensity or speed with which the physical, chemical, and biological activities responsible for changing raw parent material into a recognizable soil profile have proceeded. Perhaps the most compelling reason for knowing how long it has taken our soils to form, comes from the desire to predict the extent or rate of change of soil properties induced by the activities of man. Man may act as a favorable or unfavorable factor in soil formation. By good management, he may maintain or even improve soil quality; by neglect or improper management, he may undo activities of soil formation or even destroy the productive capacity of the soil.

KINDS AND DISTRIBUTION OF SOIL PROFILES

As mentioned previously, an understanding of how soils form and the factors involved in their formation is important if we are to understand why soils differ from place to place and if we are to successfully predict the extent and distribution of the various types of soil within the landscape. In this regard, it is important to keep in mind that a soil at a particular site in the landscape is essentially the result of the combined effects of the soil forming factors, and it is thus said to be in equilibrium with the environment in which it was formed. Thus, if one or more of the soil forming factors at a particular site differs from that at another site, the soils at those sites will also differ.

The influence of climate and vegetation in creating broad, regional differences in soil characteristics (Brown, Dark Brown, Black, Dark Gray, Gray) has been mentioned earlier as has the influence of topography and drainage in determining differences in a local area. For instance, within a few metres on a single slope, a succession of soil profiles may be encountered, each reflecting the particular environment in which it was formed. A cross-section from a knoll through an adjacent depression to another knoll, in areas where the virgin vegetation was comprised of grasses and light stands of aspen, would reveal a succession of mainly Black profiles such as illustrated in Fig. 17. In other areas unique drainage conditions have favored a heavier stand of aspen on the lower slopes. This has led to the formation of Dark Gray soils in this portion of the landscape with Black soils prevailing on the original grass covered upper slopes, as depicted in Fig. 18. In some areas the entire landscape was covered by a heavier stand of aspen. This has led to the formation of Dark Gray soils on the upper slopes and knolls, and Gray Wooded soils in more moist and strongly leached portions of the landscape. These sequences of soils may be repeated time after time throughout a soil landscape. Not all soil areas, however, are comprised of a single geological deposit as indicated in the above illustrations. Quite often, two or more deposits occur in close association within an area. As illustrated in Fig. 19, one material may overlay another regularly, throughout lower slopes or as depicted in Fig. 20, one material may overlay the second in an irregular pattern, sometimes on the tops of hills, sometimes on the side slopes and at other times on lower slopes. Thus, a sequence of soils is present whose properties depend not only on relief and drainage aspects, but also on the distribution of materials within the landscape and the broad, regional climatic and vegetation influences previously referred to.

THE SOIL MAP

Ideally, the area represented by each soil profile should be shown on the map. This, however, is only possible where large, uniform areas of a single soil occur, or in detailed soil surveys where small areas can be separated on the map. Since, on the semi-detailed maps, it is rarely possible to delineate areas of a single soil, it is almost always necessary to combine small areas of several soils into a larger area. These larger areas are represented on the map by a map unit that identifies the kinds and distribution of the component soil profiles.

The **soil association** is used to show the relationship between map units that have formed on a similar geological deposit within a particular soil zone. The Oxbow Association, for instance, is the name given to a group of soil profiles formed on loamy glacial till occurring in the black soil zone. The various **map units** of the Oxbow Association reflect variations in the kind and distribution of Oxbow soils from one area to the next.

Where two geological deposits occur within a delineated area on the map, two associations are used. As an example, Meota-Oxbow is the name given to a group of soils of the Meota and Oxbow soil associations. Different map units of this complex are used to reflect variations in the kind and distribution of Meota and Oxbow soils from one area to the next.

As an exception, areas in which several geological deposits occur in a somewhat chaotic and unpredictable pattern throughout the landscape are often given a single association name. For example, Windthorst is the name given to soils formed in a highly complex mixture of loamy glacial till, sandy glacial till and shallow, sandy glaciofluvial materials.

It is possible also to find soils reflecting the characteristics of two soil zones within a local area. Under these circumstances, two associations are used to reflect these different soil properties. For example, Black and Dark Gray soils that occur together are mapped in the Oxbow-Whitewood complex, the Oxbow referring to the Black soils and Whitewood to the Dark Gray soils.

The soil maps, then, attempt to portray the kinds and distribution of various soil profiles throughout the municipalities. The symbols on the maps identify the soil map unit, mentioned earlier, as well as the slope class. The map legend provides a brief description of the soil map unit. Complete descriptions of the soils are provided in the pages to follow.

by **D.F. Acton**

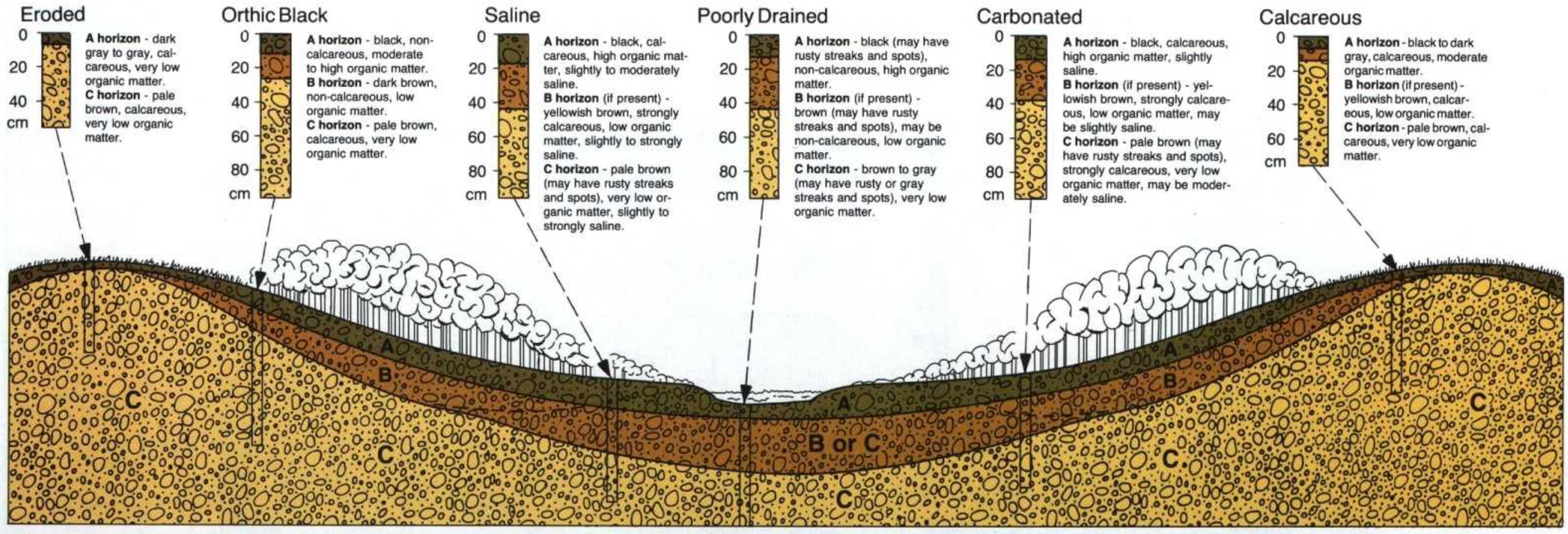


Fig. 17 A cross-section through an area in the Black soil zone showing the succession of soil profiles that may be encountered where the soils have formed in a single geological deposit.

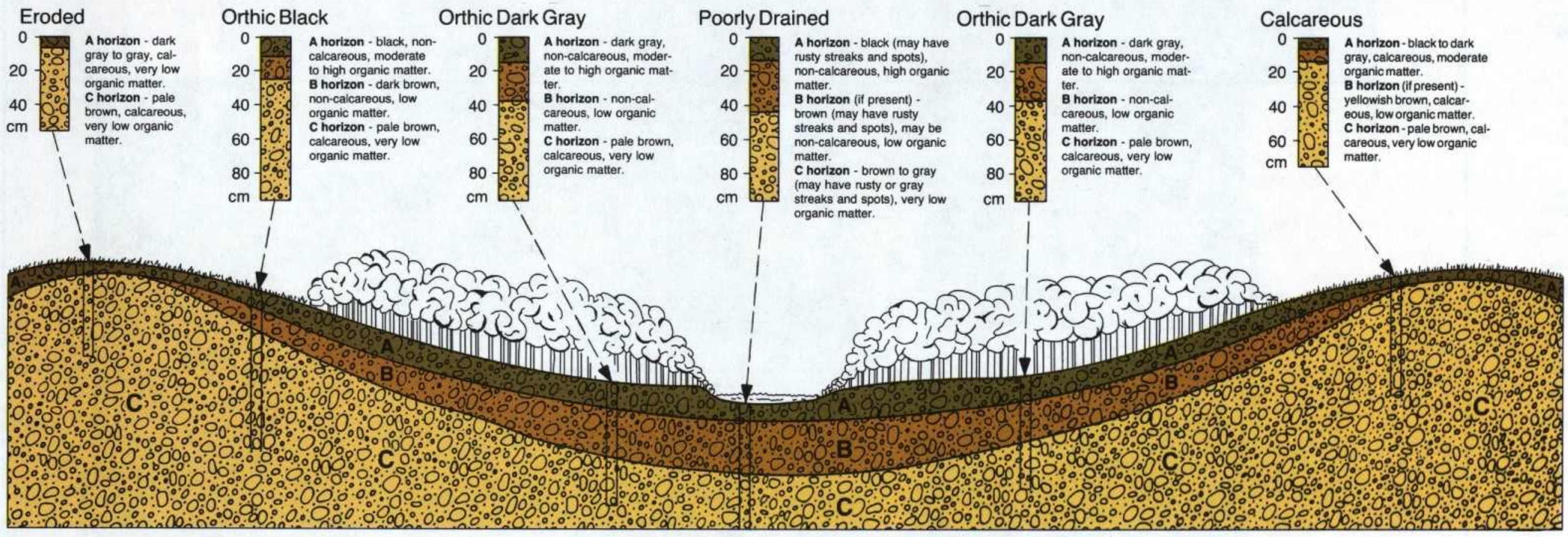


Fig. 18 A cross-section through a more heavily treed area of the Black soil zone showing the succession of soil profiles that may be encountered where the soils have formed in a single geological deposit.

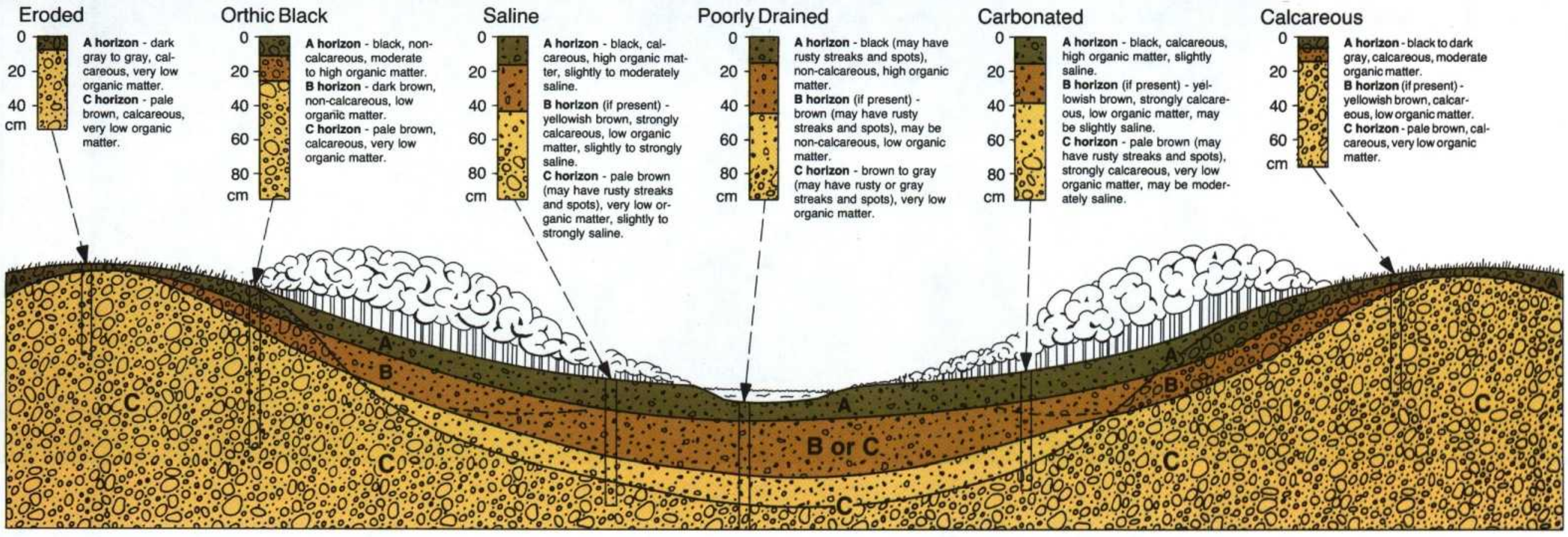


Fig. 19 A cross-section through an area in the Black soil zone showing the succession of soil profiles that may be encountered where the soils have formed in two regularly occurring geological deposits.

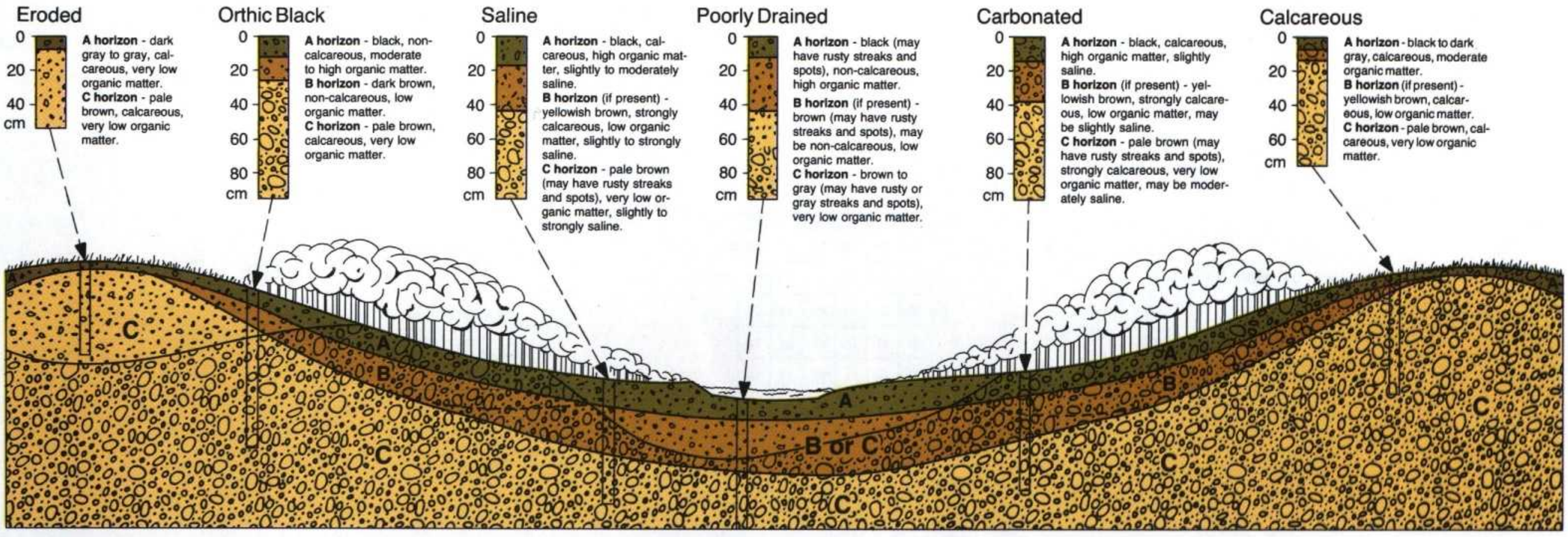
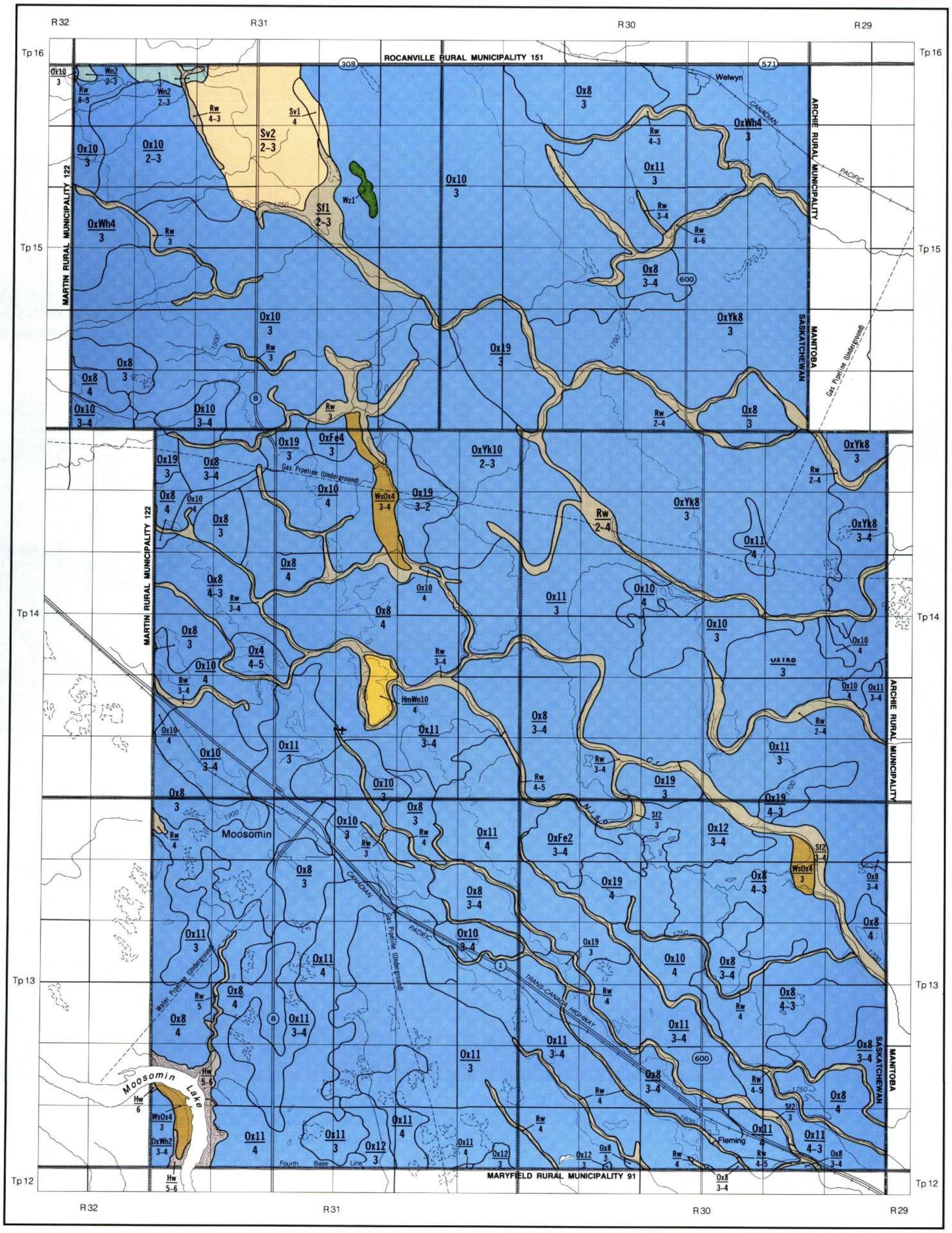


Fig. 20 A cross-section through an area of the Black soil zone showing the succession of soil profiles that may be encountered where two geological deposits are haphazardly distributed.

MOOSOMIN RM 121 - SOILS

by L.M. Kozak, R.D. Stushnoff and H.B. Stonehouse



LEGEND

Map Symbol	Soils
Hamlin-Windthorst	**Black soils formed in a mixture of shallow, loamy glaciolacustrine materials (Hamlin) and sandy to loamy, water-modified glacial till (Windthorst); sandy loam surface textures.**
HmWn10	Mainly a mixture of calcareous and slightly eroded Hamlin soils on mid- and upper slopes, with orthic Hamlin soils on mid- and lower slopes, and a mixture of calcareous Windthorst soils on some mid- and upper slopes and eroded Windthorst soils on knolls.
Hillwash	**Weakly developed soils formed in various deposits associated with steep and eroding valley sides; variable surface textures.**
Hw	Mainly shallow, eroded and weakly developed soils on steep, gullied valley side slopes.
Oxbow	**Black soils formed in loamy glacial till; loam surface textures.**
Ox4	Mainly orthic Oxbow soils, with calcareous and eroded Oxbow soils on knolls and upper slopes.
Ox8	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and poorly drained soils in depressions.
Ox10	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes.
Ox11	Mainly a mixture of orthic and carbonated Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on knolls and upper slopes, with poorly drained soils in depressions.
Ox12	Mainly a mixture of orthic and carbonated Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on knolls and upper slopes, with saline Oxbow soils on some lower slopes, and poorly drained soils in depressions.
Ox19	Mainly calcareous Oxbow soils, with orthic Oxbow soils on lower slopes.
Oxbow-Fremantle	**Black soils formed in a mixture of loamy glacial till (Oxbow) and silty, water-modified glacial till (Fremantle); loam (Ox) and loam to silt loam (Fe) surface textures.**
OxFe2	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, orthic Fremantle soils mainly on lower slopes, and poorly drained soils in depressions.
OxFe4	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls, and orthic Fremantle soils occurring randomly in the landscape.
Oxbow-Whitewood	**A mixture of Black (Oxbow) and Dark Gray (Whitewood) soils formed in loamy glacial till; loam surface textures.**
OxWh2	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, orthic Whitewood soils on lower slopes, and poorly drained soils in depressions.
OxWh4	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and orthic Whitewood soils on lower slopes.
Oxbow-Yorkton	**A mixture of Black (Oxbow) and Thick Black (Yorkton) soils formed in loamy glacial till; loam surface textures.**
OxYk8	Mainly a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, with slightly eroded Oxbow soils on knolls, orthic Yorkton soils on mid- and lower slopes, and poorly drained soils in depressions.
OxYk10	Mainly calcareous Oxbow soils on mid- and upper slopes, with orthic Oxbow soils on midslopes, slightly eroded Oxbow soils on knolls, and carbonated Yorkton soils on mid- and lower slopes.
Runway	**Weakly developed and poorly drained soils formed in various deposits associated with shallow drainage channels and gullies; variable surface textures.**
Rw	Mainly a mixture of poorly drained soils on channel bottoms and eroded or weakly developed soils on channel side slopes.
Swift Creek	**Black soils formed in a mixture of sandy and gravelly glaciofluvial materials and stony glacial till; gravelly sandy loam to loam surface textures.**
Sf1	Mainly orthic Swift Creek soils, with calcareous and eroded Swift Creek soils on high knolls and steep slopes.
Sf2	Mainly orthic Swift Creek soils, with a mixture of calcareous and slightly eroded Swift Creek soils on knolls and steeper slopes, and poorly drained soils in depressions.
Sylvite	**Black soils formed in sandy to loamy, shaly fluvial and lacustrine materials underlain by shale or shaly glacial till; sandy loam to loam surface textures.**
Sv1	Mainly orthic Sylvite soils.
Sv2	Mainly orthic Sylvite soils, with carbonated Sylvite soils on lower slopes and in depressions.
Windthorst	**Black soils formed in sandy to loamy, water-modified glacial till; sandy loam surface textures.**
Wn2	Mainly orthic Windthorst soils, with a mixture of calcareous and slightly eroded Windthorst soils on upper slopes and knolls, and poorly drained soils in depressions.
Whitesand-Oxbow	**Black soils formed in a mixture of gravelly glaciofluvial materials (Whitesand) and loamy glacial till (Oxbow); gravelly sandy loam to sandy loam (Ws) and loam (Ox) surface textures.**
WsOx4	Mainly orthic Whitesand soils, with orthic Oxbow soils on mid- and upper slopes, and calcareous Oxbow soils on knolls.
Wetland	**Poorly drained soils and shallow open water associated with wet, depressional areas; variable surface textures.**
Wz1	Wet meadows. Mainly poorly drained soils, with shallow open water in central areas.

SLOPE CLASSES

Class	Description
1	Nearly level - slopes of 0.5%* or less.
2	Very gently sloping - slopes up to 2% but dominantly 0.5 to 2%.
3	Gently sloping - slopes up to 5% but dominantly 2-5%.
4	Moderately sloping - slopes up to 10% but dominantly 5-10%.
5	Strongly sloping - slopes up to 15% but dominantly 10-15%.
6	Steeply sloping - slopes up to 30% but dominantly 15-30%.
7	Very steeply sloping - slopes dominantly greater than 30%.

* A 1% slope is a 1 metre difference in elevation in a horizontal distance of 100 metres.

SEQUENCE OF MAP SYMBOLS

Map Unit / Slope Class

e.g. Ox10 / 3

DIAGRAM OF TOWNSHIP

31	32	33	34	35	36
30	29	28	27	26	25
19	20	21	22	23	24
18	17	16	15	14	13
7	8	9	10	11	12
6	5	4	3	2	1

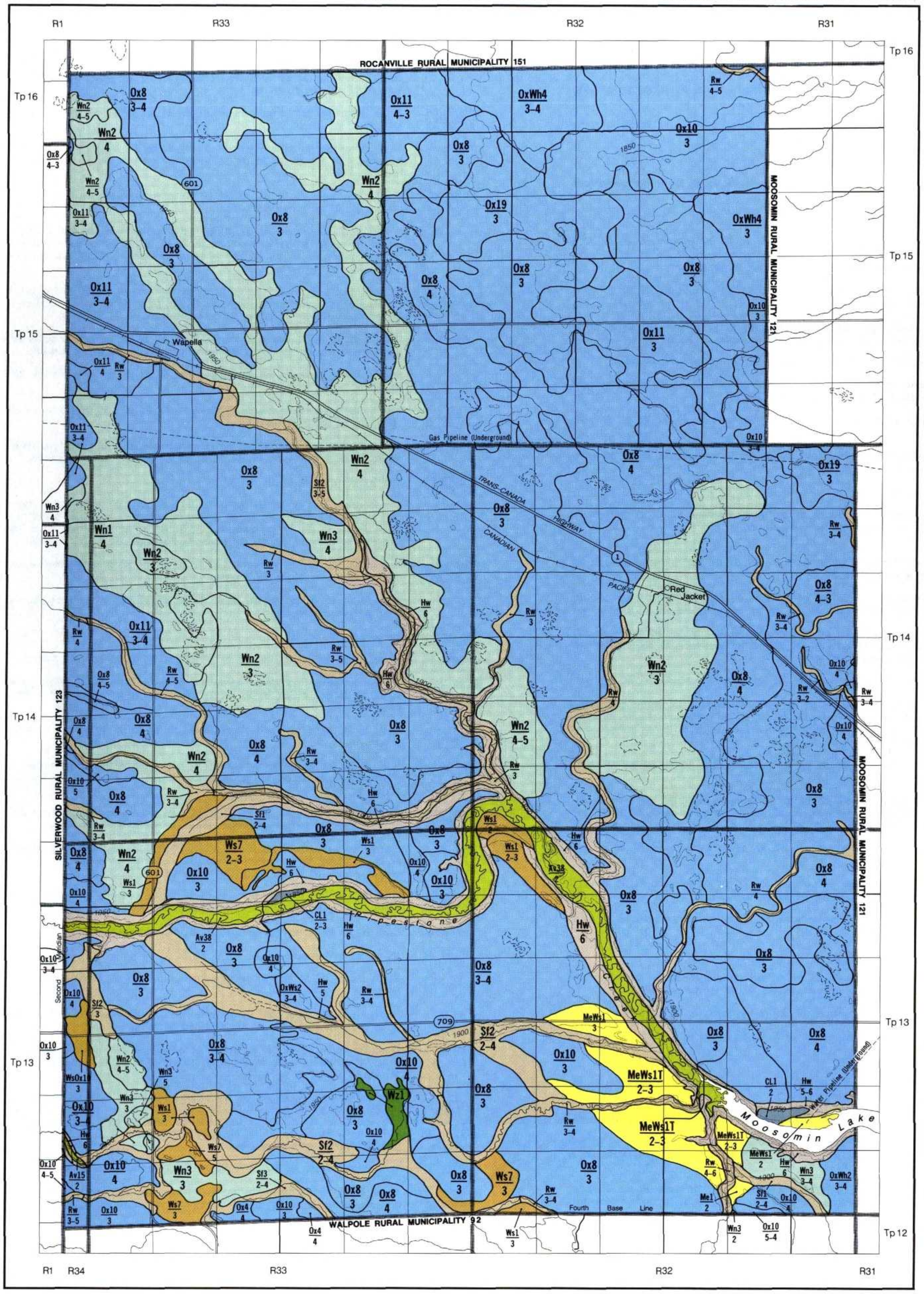
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

MARTIN RM 122 - SOILS

by W.D. Eilers, S.L. Burton and H.B. Stonehouse



LEGEND

SLOPE CLASSES

Class	Description
1	Nearly level - slopes of 0.5%* or less.
2	Very gently sloping - slopes up to 2% but dominantly 0.5 to 2%.
3	Gently sloping - slopes up to 5% but dominantly 2-5%.
4	Moderately sloping - slopes up to 10% but dominantly 5-10%.
5	Strongly sloping - slopes up to 15% but dominantly 10-15%.
6	Steeply sloping - slopes up to 30% but dominantly 15-30%.
7	Very steeply sloping - slopes dominantly greater than 30%.

* A 1% slope is a 1 metre difference in elevation in a horizontal distance of 100 metres.

SEQUENCE OF MAP SYMBOLS

Map Unit / Slope Class

e.g. Ox10 / 3

1:100,000

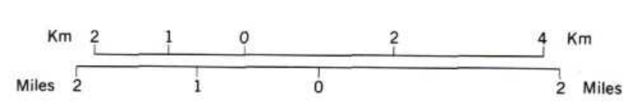


DIAGRAM OF TOWNSHIP

31	32	33	34	35	36
30	29	28	27	26	25
19	20	21	22	23	24
18	17	16	15	14	13
7	8	9	10	11	12
6	5	4	3	2	1

LEGEND

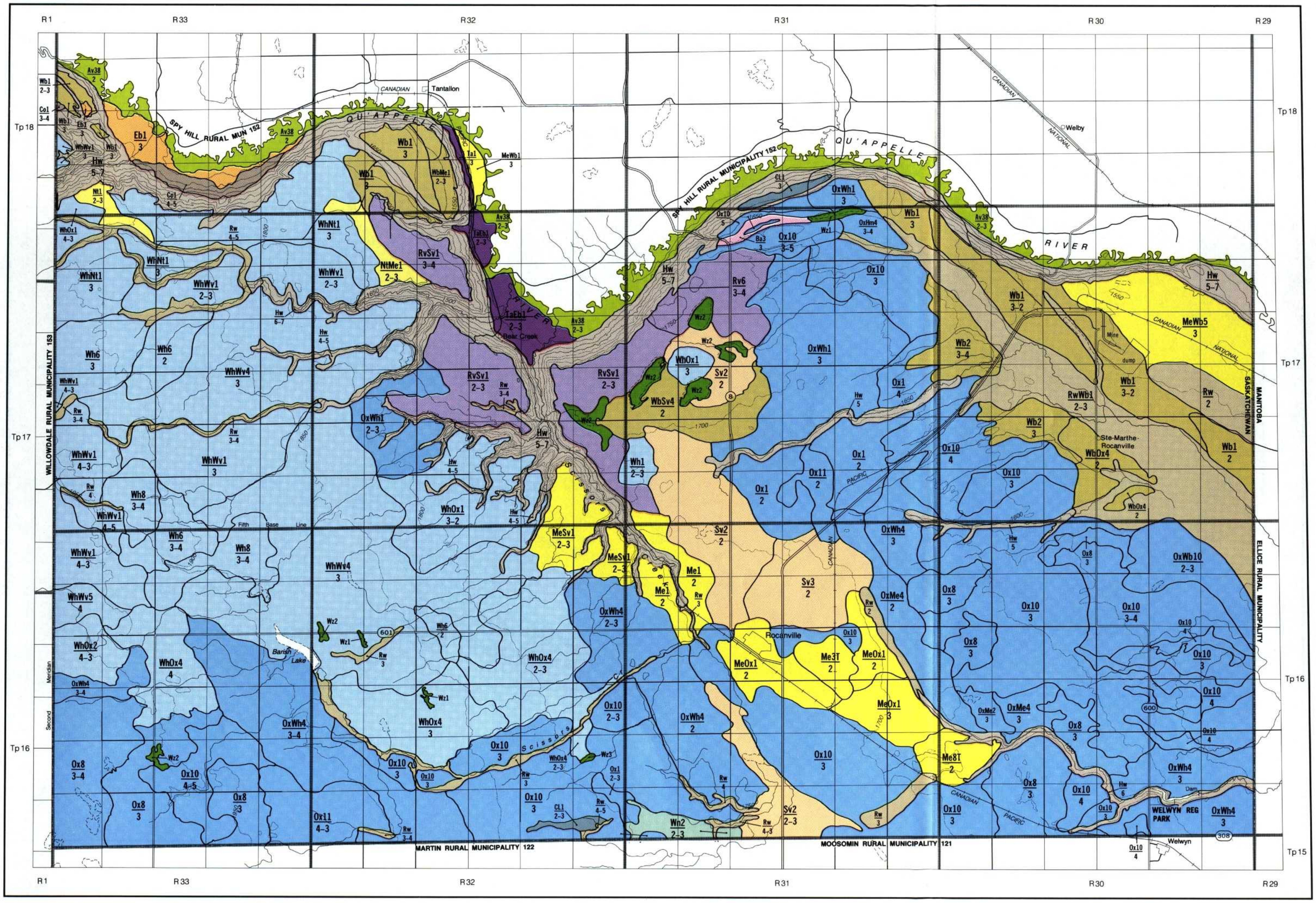
Map Symbol	Soils
Alluvium	**Weakly developed and poorly drained soils formed in recent deposits of streams and rivers; variable surface textures.**
Av15	Mainly a mixture of poorly drained soils and saline and carbonated poorly drained soils.
Av38	Mainly a mixture of orthic and calcareous Alluvium soils, with poorly drained soils in depressions.
Crooked Lake	**Black soils formed in stony, eroded glacial till; sandy loam to loam surface textures; extremely stony.**
CL1	Mainly orthic Crooked Lake soils.
Hillwash	**Weakly developed soils formed in various deposits associated with steep and eroding valley sides; variable surface textures.**
Hw	Mainly shallow, eroded and weakly developed soils on steep, gullied valley side slopes.
Meota	**Black soils formed in sandy fluvial materials; loamy sand to sandy loam surface textures.**
Me1	Mainly orthic Meota soils.
Meota-Whitesand	**Black soils formed in a mixture of sandy (Meota) and gravelly (Whitesand) fluvial materials; loamy sand to sandy loam surface textures.**
MeWs1	Mainly orthic Meota soils, with orthic Whitesand soils occurring randomly in the landscape.
Meota-Whitesand (till substrate)	**Black soils formed in a mixture of shallow, sandy (Meota) and gravelly (Whitesand) fluvial materials underlain by glacial till; loamy sand to sandy loam (Me) and loamy sand to sandy loam and gravelly sandy loam (Ws) surface textures.**
MeWs1T	Mainly orthic Meota soils, with orthic Whitesand soils occurring randomly in the landscape.
Oxbow	**Black soils formed in loamy glacial till; loam surface textures.**
Ox4	Mainly orthic Oxbow soils, with calcareous and eroded Oxbow soils on knolls and upper slopes.
Ox8	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and poorly drained soils in depressions.
Ox10	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes.
Ox11	Mainly a mixture of orthic and carbonated Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on knolls and upper slopes, with poorly drained soils in depressions.
Ox19	Mainly calcareous Oxbow soils, with orthic Oxbow soils on lower slopes.
Oxbow-Whitewood	**A mixture of Black (Oxbow) and Dark Gray (Whitewood) soils formed in loamy glacial till; loam (Ox, Wh) to sandy loam (Ox) surface textures.**
OxWh2	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, orthic Whitewood soils on lower slopes, and poorly drained soils in depressions.
OxWh4	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and orthic Whitewood soils on lower slopes.
Oxbow-Whitesand	**Black soils formed in a mixture of loamy glacial till (Oxbow) and gravelly fluvial materials (Whitesand); loam to sandy loam (Ox) and sandy loam to gravelly sandy loam (Ws) surface textures.**
OxWs2	Mainly orthic Oxbow soils, with calcareous Oxbow soils on upper slopes and knolls, orthic Whitesand soils occurring randomly in the landscape, and poorly drained soils in depressions.
Runway	**Weakly developed and poorly drained soils formed in various deposits associated with shallow drainage channels and gullies; variable surface textures.**
Rw	Mainly a mixture of poorly drained soils on channel bottoms and eroded or weakly developed soils on channel side slopes.
Swift Creek	**Black soils formed in a mixture of sandy and gravelly glaciofluvial materials and stony glacial till; gravelly sandy loam to loam surface textures.**
Sf1	Mainly orthic Swift Creek soils, with calcareous and eroded Swift Creek soils on high knolls and steep slopes.
Sf2	Mainly orthic Swift Creek soils, with a mixture of calcareous and slightly eroded Swift Creek soils on knolls and steeper slopes, and poorly drained soils in depressions.
Sf3	Mainly a mixture of orthic Swift Creek soils on mid- and upper slopes and saline and carbonated Swift Creek soils on lower slopes, with poorly drained soils in depressions.
Windthorst	**Black soils formed in sandy to loamy, water-modified glacial till; sandy loam to loam surface textures.**
Wn1	Mainly orthic Windthorst soils, with calcareous Windthorst soils on upper slopes and knolls, and leached poorly drained soils in depressions.
Wn2	Mainly orthic Windthorst soils, with a mixture of calcareous and slightly eroded Windthorst soils on upper slopes and knolls, and poorly drained soils in depressions.
Wn3	Mainly orthic Windthorst soils, with a mixture of calcareous and slightly eroded Windthorst soils on upper slopes and knolls.
Whitesand	**Black soils formed in gravelly fluvial materials; loamy sand to sandy loam and gravelly sandy loam surface textures.**
Ws1	Mainly orthic Whitesand soils.
Ws7	Mainly orthic Whitesand soils, with calcareous Whitesand soils on upper slopes, and eroded Whitesand soils on knolls.
Whitesand-Oxbow	**Black soils formed in a mixture of gravelly fluvial materials (Whitesand) and loamy glacial till (Oxbow); loamy sand to sandy loam (Ws) and loam to sandy loam (Ox) surface textures.**
WsOx10	Mainly calcareous Whitesand soils over most of the landscape, with orthic Whitesand and orthic Oxbow soils on some mid- and upper slopes.
Wetland	**Poorly drained soils and shallow open water associated with wet, depressional areas; variable surface textures.**
Wz1	Wet meadows. Mainly poorly drained soils, with shallow open water in central areas.

LEGEND

Map Symbol	Soils
Alluvium	**Weakly developed and poorly drained soils formed in recent deposits of streams and rivers; variable surface textures.**
Av38	Mainly a mixture of orthic and calcareous Alluvium soils, with poorly drained soils in depressions.
Balcarres	**Black soils formed in clayey lacustrine materials; clay loam to clay surface textures.**
Ba3	Mainly orthic Balcarres soils.
Crooked Lake	**Black soils formed in stony, eroded glacial till; sandy loam to loam surface textures; extremely stony.**
CL1	Mainly orthic Crooked Lake soils.
Colluvium	**A mixture of Black and Dark Gray soils formed in variable, stabilized colluvial deposits, consisting of glacial and bedrock materials that occur at the base of steep valley side slopes; variable surface textures.**
Col	Mainly orthic Colluvium soils, with calcareous and eroded Colluvium soils on upper slopes and knolls.
Ellisboro	**Black soils formed in alluvial deposits from tributary streams as they enter the Qu'Appelle Valley; sandy loam to loam surface textures.**
Eb1	Mainly a mixture of orthic, calcareous and weakly developed Ellisboro soils.
Hillwash	**Weakly developed soils formed in various deposits associated with steep and eroding valley sides; variable surface textures.**
Hw	Mainly shallow, eroded and weakly developed soils on steep, gullied valley side slopes.
Meota	**Black soils formed in sandy fluvial materials; loamy sand to sandy loam surface textures.**
Me1	Mainly orthic Meota soils.
Meota (till substrate)	**Black soils formed in shallow, sandy fluvial materials underlain by glacial till; loamy sand to sandy loam surface textures.**
Me3T	Mainly orthic Meota soils, with saline and carbonated Meota soils on lower slopes and in depressional areas.
Me8T	Mainly a mixture of calcareous and slightly eroded Meota soils, with orthic Meota soils occurring randomly in the landscape, and poorly drained soils in depressions.
Meota-Oxbow	**Black soils formed in a mixture of shallow, sandy glaciofluvial materials (Meota) and loamy glacial till (Oxbow); fine sandy loam to loamy sand (Me) and loam (Ox) surface textures.**
MeOx1	Mainly orthic Meota soils, with orthic Oxbow soils on upper slopes and knolls.
Meota-Sylvite	**Black soils formed in a mixture of sandy fluvial materials (Meota) and sandy to loamy, shaly fluvial and lacustrine materials underlain by shale or shaly glacial till (Sylvite); loamy sand to sandy loam (Me) and sandy loam to loam (Sv) surface textures.**
MeSv1	Mainly orthic Meota soils, with orthic Sylvite soils occurring randomly in the landscape.
Meota-Welby	**Black soils formed in a mixture of sandy fluvial materials (Meota) and gravelly, shaly fluvial materials (Welby); loamy sand to very fine sandy loam (Me) and sandy loam (Wb) surface textures.**
MeWb1	Mainly orthic Meota soils, with orthic Welby soils occurring randomly in the landscape.
MeWb5	Mainly orthic Meota soils, with orthic Welby soils occurring randomly in the landscape, and poorly drained soils in depressions.
Nisbet	**Dark Gray soils formed in sandy fluvial materials; sandy loam to loamy sand surface textures.**
Nt1	Mainly orthic Nisbet soils.
Nisbet-Meota	**A mixture of Dark Gray (Nisbet) and Black (Meota) soils formed in sandy fluvial materials; sandy loam to loamy sand surface textures.**
NtMe1	Mainly orthic Nisbet soils, with orthic Meota soils on mid- and upper slopes.
Oxbow	**Black soils formed in loamy glacial till; loam surface textures.**
Ox1	Mainly orthic Oxbow soils.
Ox8	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and poorly drained soils in depressions.
Ox10	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes.
Ox11	Mainly a mixture of orthic and carbonated Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on knolls and upper slopes, with poorly drained soils in depressions.
Oxbow-Hamlin	**Black soils formed in a mixture of loamy glacial till (Oxbow) and shallow, loamy lacustrine materials (Hamlin); loam (Ox) to fine sandy loam (Hm) surface textures.**
OxHm4	Mainly orthic Oxbow soils on mid- and upper slopes, with calcareous Oxbow soils on knolls, and orthic Hamlin soils on mid- and lower slopes.
Oxbow-Meota	**Black soils formed in a mixture of loamy glacial till (Oxbow) and shallow, sandy glaciofluvial materials (Meota); loam (Ox) to sandy loam (Me) surface textures.**
OxMe2	Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls, orthic Meota soils on lower slopes, and poorly drained soils in depressions.
OxMe4	Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls, and orthic Meota soils on lower slopes.
Oxbow-Welby	**Black soils formed in a mixture of loamy glacial till (Oxbow) and gravelly, shaly glaciofluvial materials (Welby); sandy loam (Ox, Wb) to loam (Ox) surface textures.**
OxWb10	Mainly calcareous Oxbow soils, with orthic Oxbow soils on lower slopes, and calcareous Welby soils occurring randomly in the landscape.
Oxbow-Whitewood	**A mixture of Black (Oxbow) and Dark Gray (Whitewood) soils formed in loamy glacial till; loam surface textures.**
OxWh1	Mainly orthic Oxbow soils, with orthic Whitewood soils on lower slopes.
OxWh4	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and orthic Whitewood soils on lower slopes.
Rocanville	**A mixture of Black and Dark Gray soils formed in loamy, shaly glacial till; loam surface textures.**
Rv6	Mainly orthic Rocanville soils.
Rocanville-Sylvite	**A mixture of Black and Dark Gray soils formed in loamy, shaly glacial till (Rocanville) and Black soils formed in sandy to loamy, shaly fluvial and lacustrine materials underlain by shale or shaly glacial till (Sylvite); loam to sandy loam (Rv, Sv) surface textures.**
RvSv1	Mainly orthic Rocanville soils on mid- and upper slopes, with orthic Sylvite soils on mid- and lower slopes.
Runway	**Weakly developed and poorly drained soils formed in various deposits associated with shallow drainage channels and gullies; variable surface textures.**
Rw	Mainly a mixture of poorly drained soils on channel bottoms and eroded or weakly developed soils on channel side slopes.
Runway-Welby	**A mixture of weakly developed and poorly drained soils formed in various deposits associated with shallow drainage channels and gullies (Runway) and Black soils formed in gravelly, shaly fluvial materials (Welby); sandy loam (Rw, Ox) surface textures.**
RwWb1	Mainly a mixture of poorly drained soils on channel bottoms and weakly developed Runway soils on channel sides, with orthic Welby soils on mid- and upper slopes, and calcareous Welby soils on upper slopes and knolls.
Sylvite	**Black soils formed in sandy to loamy, shaly fluvial and lacustrine materials underlain by shale or shaly glacial till; sandy loam to loam surface textures.**
Sv2	Mainly orthic Sylvite soils, with carbonated Sylvite soils on lower slopes and in depressions.
Sv3	Mainly calcareous Sylvite soils, with saline Sylvite soils on some lower slopes, and poorly drained soils in depressions.
Tantallon	**A mixture of Dark Gray and Dark Gray Solonetzic soils formed in clayey materials derived from the weathering of bedrock shales; clay surface textures.**
Ta1	Mainly strong solonetzic Tantallon soils.
Tantallon-Ellisboro	**A mixture of Dark Gray and Dark Gray Solonetzic soils formed in clayey materials derived from the weathering of bedrock shales (Tantallon) and Black soils formed in alluvial deposits from tributary streams as they enter the Qu'Appelle Valley (Ellisboro); clay loam (Ta, Eb) to loam (Eb) surface textures.**
TaEb1	Mainly orthic Tantallon soils, with Solonetzic Tantallon soils on some lower slopes, and orthic Ellisboro soils on upper slopes.
Welby	**Black soils formed in gravelly, shaly fluvial materials; sandy loam to loamy sand surface textures.**
Wb1	Mainly orthic Welby soils.
Wb2	Mainly orthic Welby soils, with calcareous Welby soils on upper slopes and knolls.
Welby-Meota	**Black soils formed in a mixture of gravelly, shaly fluvial materials (Welby) and sandy fluvial materials (Meota); sandy loam to loamy sand (Wb, Me) surface textures.**
WbMe1	Mainly orthic Welby soils, with orthic Meota soils occurring randomly in the landscape.
Welby-Oxbow	**Black soils formed in a mixture of gravelly, shaly glaciofluvial materials (Welby) and loamy glacial till (Oxbow); sandy loam (Wb) to loam (Ox) surface textures.**
WbOx4	Mainly orthic Welby soils on mid- and upper slopes, with calcareous Welby soils on upper slopes and knolls, and orthic Oxbow soils on mid- and lower slopes.
Welby-Sylvite	**Black soils formed in a mixture of gravelly, shaly fluvial materials (Welby) and sandy to loamy, shaly fluvial and lacustrine materials underlain by shale or shaly glacial till (Sylvite); sandy loam surface textures.**
WbSv4	Mainly orthic Welby soils on mid- to upper slopes, with calcareous Welby soils on some upper slopes and knolls, and orthic Sylvite soils on mid- and lower slopes.
Whitewood	**Dark Gray soils formed in loamy glacial till; loam surface textures.**
Wh1	Mainly orthic Whitewood soils.
Wh6	Mainly orthic Whitewood soils, with calcareous Whitewood soils on upper slopes and knolls.
Wh8	Mainly orthic Whitewood soils, with calcareous and slightly eroded Whitewood soils on upper slopes and knolls, and poorly drained soils in depressions.
Whitewood-Nisbet	**Dark Gray soils formed in a mixture of loamy glacial till (Whitewood) and sandy glaciofluvial materials (Nisbet); loam (Wh) to sandy loam (Nt) surface textures.**
WhNt1	Mainly orthic Whitewood soils, with orthic Nisbet soils on mid- and lower slopes and in local flat areas.
Whitewood-Oxbow	**A mixture of Dark Gray (Whitewood) and Black (Oxbow) soils formed in loamy glacial till; loam surface textures.**
WhOx1	Mainly orthic Whitewood soils, with orthic Oxbow soils on mid- and upper slopes.
WhOx2	Mainly orthic Whitewood soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes, calcareous Oxbow soils on upper slopes and knolls, and poorly drained soils in depressions.
WhOx4	Mainly orthic Whitewood soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes, and calcareous Oxbow soils on upper slopes and knolls.
Whitewood-Waitville	**A mixture of Dark Gray (Whitewood) and Gray (Waitville) soils formed in loamy glacial till; loam (Wh, Wv) to sandy loam (Wv) surface textures.**
WhWv1	Mainly orthic Whitewood soils on mid- and upper slopes, with dark gray wooded Waitville soils on lower slopes.
WhWv4	Mainly orthic Whitewood soils on mid- and upper slopes, with calcareous Whitewood soils on knolls, and dark gray wooded Waitville soils on lower slopes.
WhWv5	Mainly orthic Whitewood soils on mid- and upper slopes, with dark gray wooded Waitville soils on lower slopes, and leached poorly drained soils in depressions.
Windthorst	**Black soils formed in sandy to loamy, water-modified glacial till; sandy loam to loam surface textures.**
Wn2	Mainly orthic Windthorst soils, with a mixture of calcareous and slightly eroded Windthorst soils on upper slopes and knolls, and poorly drained soils in depressions.
Wetland	**Poorly drained soils and shallow open water associated with wet, depressional areas; variable surface textures.**
Wz1	Wet meadows. Mainly poorly drained soils, with shallow open water in central areas.
Wz2	Marshes. Mainly a mixture of poorly drained soils and shallow open water.
Wz3	Open water wetlands. Mainly shallow open water, with some poorly drained soils in marginal areas.

ROCANVILLE RM 151 - SOILS

by W.E. Souster, H.P.W. Rostad and H.B. Stonehouse



LEGEND

SEQUENCE OF MAP SYMBOLS

Map Unit / Slope Class

e.g. Ox10 / 3

SLOPE CLASSES

Class	Description
1	Nearly level - slopes of 0.5%* or less.
2	Very gently sloping - slopes up to 2% but dominantly 0.5 to 2%.
3	Gently sloping - slopes up to 5% but dominantly 2-5%.
4	Moderately sloping - slopes up to 10% but dominantly 5-10%.
5	Strongly sloping - slopes up to 15% but dominantly 10-15%.
6	Steeply sloping - slopes up to 30% but dominantly 15-30%.
7	Very steeply sloping - slopes dominantly greater than 30%.

* A 1% slope is a 1 metre difference in elevation in a horizontal distance of 100 metres.

DIAGRAM OF TOWNSHIP

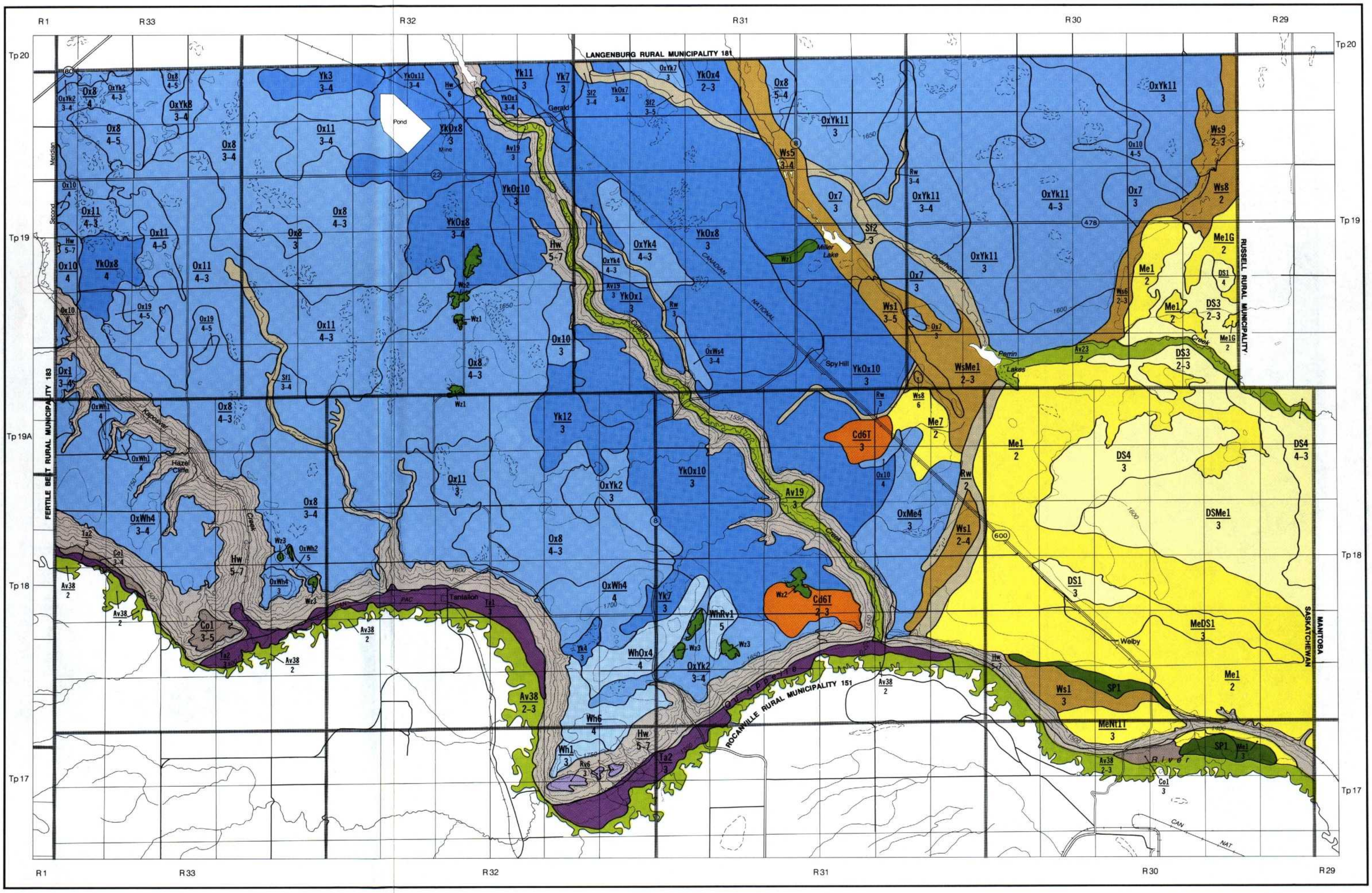
31	32	33	34	35	36
30	29	28	27	26	25
19	20	21	22	23	24
18	17	16	15	14	13
7	8	9	10	11	12
6	5	4	3	2	1

1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

by L.M. Kozak, H.P.W. Rostad and H.B. Stonehouse



LEGEND

SEQUENCE OF MAP SYMBOLS

$\frac{\text{Map Unit}}{\text{Slope Class}}$

e.g. $\frac{\text{Ox10}}{3}$

SLOPE CLASSES

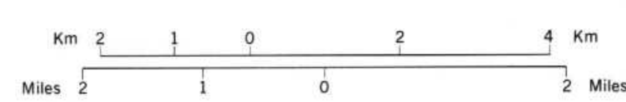
Class	Description
1	Nearly level - slopes of 0.5%* or less.
2	Very gently sloping - slopes up to 2% but dominantly 0.5 to 2%.
3	Gently sloping - slopes up to 5% but dominantly 2-5%.
4	Moderately sloping - slopes up to 10% but dominantly 5-10%.
5	Strongly sloping - slopes up to 15% but dominantly 10-15%.
6	Steeply sloping - slopes up to 30% but dominantly 15-30%.
7	Very steeply sloping - slopes dominantly greater than 30%.

* A 1% slope is a 1 metre difference in elevation in a horizontal distance of 100 metres.

DIAGRAM OF TOWNSHIP

31	32	33	34	35	36
30	29	28	27	26	25
19	20	21	22	23	24
18	17	16	15	14	13
7	8	9	10	11	12
6	5	4	3	2	1

1:100,000



LEGEND

Map Symbol	Soils
Alluvium	**Weakly developed and poorly drained soils formed in recent deposits of streams and rivers; variable surface textures.**
Av19	Mainly calcareous Alluvium soils, with poorly drained and saline poorly drained soils in depressions.
Av23	Mainly calcareous poorly drained soils.
Av38	Mainly a mixture of orthic and calcareous Alluvium soils, with poorly drained soils in depressions.
Cudworth (till substrate)	**Black soils formed in shallow, silty lacustrine materials underlain by glacial till; loam to silt loam surface textures.**
Cd6T	Mainly a mixture of calcareous Cudworth soils on mid- and lower slopes and slightly eroded Cudworth soils on upper slopes and knolls.
Colluvium	**A mixture of Black and Dark Gray soils formed in variable, stabilized colluvial deposits, consisting of glacial and bedrock materials that occur at the base of steep valley side slopes; variable surface textures.**
Co1	Mainly orthic Colluvium soils, with calcareous and eroded Colluvium soils on upper slopes and knolls.
Dune Sand	**Weakly developed soils formed in sandy eolian materials; sand to loamy sand surface textures.**
DS1	Mainly weakly developed Dune Sand soils.
DS3	Mainly a mixture of orthic and weakly developed Dune Sand soils.
DS4	Mainly a mixture of weakly developed, orthic and slightly leached Dune Sand soils.
Dune Sand-Meota	**A mixture of weakly developed soils formed in sandy eolian materials (Dune Sand) and Black soils formed in sandy fluvial materials (Meota); loamy sand (DS, Me) to sand (DS) surface textures.**
DSMe1	Mainly weakly developed Dune Sand soils, with orthic Meota soils on some mid- and lower slopes.
Hillwash	**Weakly developed soils formed in various deposits associated with steep and eroding valley sides; variable surface textures.**
Hw	Mainly shallow, eroded and weakly developed soils on steep, gullied valley side slopes.
Meota	**Black soils formed in sandy fluvial materials; loamy sand to sandy loam surface textures.**
Me1	Mainly orthic Meota soils.
Me7	Mainly saline and carbonated Meota soils.
Meota (gravel substrate)	**Black soils formed in shallow, sandy fluvial materials underlain by gravel; loamy sand to sand surface textures.**
Me1G	Mainly orthic Meota soils.
Meota-Dune Sand	**A mixture of Black soils formed in sandy fluvial materials (Meota) and weakly developed soils formed in sandy eolian materials (Dune Sand); loamy sand (Me, DS) to sand (DS) surface textures.**
MeDS1	Mainly orthic Meota soils, with weakly developed Dune Sand soils occurring randomly in the landscape.
Meota-Nisbet (till substrate)	**A mixture of Black (Meota) and Dark Gray (Nisbet) soils formed in sandy fluvial materials underlain by glacial till; loamy sand surface textures.**
MeNt1T	Mainly orthic Meota soils, with orthic Nisbet soils on lower slopes and in depressions.
Oxbow	**Black soils formed in loamy glacial till; loam surface textures.**
Ox1	Mainly orthic Oxbow soils.
Ox7	Mainly a mixture of orthic and calcareous Oxbow soils.
Ox8	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and poorly drained soils in depressions.
Ox10	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes.
Ox11	Mainly a mixture of orthic and carbonated Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on knolls and upper slopes, with poorly drained soils in depressions.
Ox19	Mainly calcareous Oxbow soils, with orthic Oxbow soils on lower slopes.
Oxbow-Meota	**Black soils formed in a mixture of loamy glacial till (Oxbow) and shallow, sandy fluvial materials (Meota); loam (Ox) to sandy loam (Me) surface textures.**
OxMe4	Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls, and orthic Meota soils on lower slopes.
Oxbow-Whitewood	**A mixture of Black (Oxbow) and Dark Gray (Whitewood) soils formed in loamy glacial till; loam surface textures.**
OxWh1	Mainly orthic Oxbow soils, with orthic Whitewood soils on lower slopes.
OxWh2	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, orthic Whitewood soils on lower slopes, and poorly drained soils in depressions.
OxWh4	Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and orthic Whitewood soils on lower slopes.
Oxbow-Whitesand	**Black soils formed in a mixture of loamy glacial till (Oxbow) and gravelly fluvial materials (Whitesand); loam (Ox) and sandy loam to loamy sand (Ws) surface textures.**
OxWs4	Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on upper slopes and knolls, and a mixture of orthic and calcareous Whitesand soils on mid- and lower slopes.
Oxbow-Yorkton	**A mixture of Black (Oxbow) and Thick Black (Yorkton) soils formed in loamy glacial till; loam surface textures.**
OxYk2	Mainly orthic Oxbow soils on mid- and upper slopes, with calcareous Oxbow soils on knolls, orthic Yorkton soils on lower slopes, and poorly drained soils in depressions.
OxYk4	Mainly orthic Oxbow soils on mid- and upper slopes, with calcareous Oxbow soils on knolls, and a mixture of orthic and calcareous Yorkton soils on lower slopes.
OxYk7	Mainly a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, with a mixture of orthic and calcareous Yorkton soils on lower slopes.
OxYk8	Mainly a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, with slightly eroded Oxbow soils on knolls, orthic Yorkton soils on mid- and lower slopes, and poorly drained soils in depressions.
OxYk11	Mainly a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, with slightly eroded Oxbow soils on knolls, calcareous Yorkton soils on lower slopes, and poorly drained soils in depressions.
Rocanville	**A mixture of Black and Dark Gray soils formed in loamy, shaly glacial till; loam surface textures.**
Rv6	Mainly orthic Rocanville soils.
Runway	**Weakly developed and poorly drained soils formed in various deposits associated with shallow drainage channels and gullies; variable surface textures.**
Rw	Mainly a mixture of poorly drained soils on channel bottoms and eroded or weakly developed soils on channel side slopes.
Swift Creek	**Black soils formed in a mixture of sandy and gravelly glaciofluvial materials and stony glacial till; gravelly sandy loam to loam surface textures.**
Sf1	Mainly orthic Swift Creek soils, with calcareous and eroded Swift Creek soils on high knolls and steep slopes.
Sf2	Mainly orthic Swift Creek soils, with a mixture of calcareous and slightly eroded Swift Creek soils on knolls and steeper slopes, and poorly drained soils in depressions.
Sedge Peat	**Organic soils formed in a mixture of materials derived from sedges, meadow grasses and shrubs.**
SP1F	Mainly fibric Sedge Peat soils less than one metre in depth.
Tantallon	**A mixture of Dark Gray and Dark Gray Solonetzic soils formed in clayey materials derived from the weathering of bedrock shales; clay loam to clay surface textures.**
Ta1	Mainly strong solonetzic Tantallon soils.
Ta2	Mainly strong solonetzic Tantallon soils, with a mixture of orthic Tantallon soils on some upper slopes and weakly developed Tantallon soils in areas of erosion and deposition.
Whitewood	**Dark Gray soils formed in loamy glacial till; loam surface textures.**
Wh1	Mainly orthic Whitewood soils.
Wh6	Mainly orthic Whitewood soils, with calcareous Whitewood soils on upper slopes and knolls.
Whitewood-Oxbow	**A mixture of Dark Gray (Whitewood) and Black (Oxbow) soils formed in loamy glacial till; loam surface textures.**
WhOx4	Mainly orthic Whitewood soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes, and calcareous Oxbow soils on upper slopes and knolls.
Whitewood-Rocanville	**A mixture of Dark Gray soils formed in loamy glacial till (Whitewood) and Black and Dark Gray soils formed in loamy, shaly glacial till (Rocanville); loam surface textures.**
WhRv1	Mainly orthic Whitewood soils, with orthic Rocanville soils occurring randomly in the landscape.
Whitesand	**Black soils formed in gravelly fluvial and glaciofluvial materials; loamy sand to sandy loam and gravelly sandy loam surface textures.**
Ws1	Mainly orthic Whitesand soils.
Ws5	Mainly orthic Whitesand soils, with poorly drained soils in depressions.
Ws6	Mainly saline and carbonated Whitesand soils, with poorly drained and saline poorly drained soils in depressions.
Ws8	Mainly calcareous Whitesand soils.
Ws9	Mainly calcareous Whitesand soils, with orthic Whitesand soils on lower slopes, and poorly drained soils in depressions.
Whitesand-Meota	**Black soils formed in a mixture of gravelly (Whitesand) and sandy (Meota) fluvial materials; loamy sand to sandy loam surface textures.**
WsMe1	Mainly orthic Whitesand soils, with orthic Meota soils occurring randomly in the landscape.
Wetland	**Poorly drained soils and shallow open water associated with wet, depressional areas; variable surface textures.**
Wz1	Wet meadows. Mainly poorly drained soils, with shallow open water in central areas.
Wz2	Marshes. Mainly a mixture of poorly drained soils and shallow open water.
Wz3	Open water wetlands. Mainly shallow open water, with some poorly drained soils in marginal areas.
Yorkton	**Thick Black soils formed in loamy glacial till; loam surface textures.**
Yk3	Mainly calcareous Yorkton soils, with orthic Yorkton soils on lower slopes, and poorly drained soils in depressions.
Yk4	Mainly a mixture of calcareous, weakly developed and carbonated Yorkton soils, with poorly drained soils in depressions.
Yk7	Mainly orthic Yorkton soils, with calcareous Yorkton soils on upper slopes and knolls, and poorly drained soils in depressions.
Yk11	Mainly calcareous Yorkton soils, with orthic Yorkton soils on lower slopes, and weakly developed Yorkton soils on knolls.
Yk12	Mainly a mixture of calcareous and weakly developed Yorkton soils, with orthic Yorkton soils on lower slopes, and poorly drained soils in depressions.
Yorkton-Oxbow	**A mixture of Thick Black (Yorkton) and Black (Oxbow) soils formed in loamy glacial till; loam surface textures.**
YkOx1	Mainly a mixture of orthic and calcareous Yorkton soils, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls.
YkOx4	Mainly a mixture of orthic and calcareous Yorkton soils, with a mixture of orthic and calcareous Oxbow soils on upper slopes and knolls.
YkOx7	Mainly a mixture of calcareous and carbonated Yorkton soils, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls.
YkOx8	Mainly a mixture of calcareous and carbonated Yorkton soils, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls, orthic Yorkton soils on some lower slopes, and poorly drained soils in depressions.
YkOx10	Mainly a mixture of calcareous and carbonated Yorkton soils, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls, and orthic Yorkton soils on some lower slopes.
YkOx11	Mainly a mixture of calcareous and carbonated Yorkton soils, with a mixture of orthic and calcareous Oxbow soils on upper slopes and knolls, orthic Yorkton soils on some lower slopes, and poorly drained soils in depressions.

DESCRIPTION OF SOILS

ALLUVIUM (Av) SOILS

Alluvium soils are dominantly weakly developed and poorly drained soils. In these municipalities, these soils are associated with stream floodplains and drainage channels, occurring primarily along the Pipestone, Deerhorn and Cutarm Creeks and the Qu'Appelle Valley (Fig. 21). These neutral to moderately alkaline soils have formed in materials derived from a variety of sources and thus vary markedly in color, texture and composition. They are usually stone free, however, agricultural use is often affected by salinity or poor drainage.

Kinds of Alluvium Soils

Orthic, carbonated, calcareous, saline and poorly drained are the principal kinds of Alluvium soils that occur in these municipalities. They are mainly a result of the effect of drainage on soil development.

Orthic Alluvium The orthic Alluvium soil occurs in well-drained positions in the landscape and often on coarser textured materials with good drainage. It has a dark-colored A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brown B horizon and light-colored C horizon.

Carbonated Alluvium The carbonated Alluvium soil occurs on lower slopes surrounding poorly drained depressions and abandoned stream meanders. It has a highly calcareous A horizon, 15 to 25 cm (6 to 10 in.) thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have drab colors and reddish spots and stains indicative of poor soil drainage.

Calcareous Alluvium The calcareous Alluvium soil occurs in well-drained positions in the landscape, often on finer textured materials. In some areas it occupies all landscape positions, while in others the lower portions of the landscape are affected by poor drainage and salinity. It is similar in appearance to the orthic Alluvium, except that the B horizon, and often the A horizon, is calcareous.

Saline Alluvium The saline Alluvium soil occurs on lower slopes, often associated with poorly drained depressions and abandoned stream channel segments, where subsurface water leads to the deposition of salts in upper horizons. Consequently, soluble salts are usually present within 50 cm (20 in.) of the surface. The salts occur as a white surface crust or as small, white specks within the soil, although, salts may not always be visible. Saline Alluvium soils often occur intermixed with carbonated Alluvium soils and may have similar features indicative of poor soil drainage.

Poorly Drained Soils Poorly drained soils occur in undrained depressional areas that are subject to flooding and in undrained areas associated with abandoned segments of the Qu'Appelle River and Pipestone Creek channels. They have thick, dark-colored A horizons and drab subsurface colors that often include red spots and streaks. They are wet for all or a significant portion of the growing season and are often flooded. In some areas these soils may be saline.

Map Units of Alluvium Soils

Av15 Mainly a mixture of poorly drained soils and saline and carbonated poorly drained soils. This map unit is associated with a gently sloping floodplain along a tributary to Pipestone Creek in the southern portion of the Martin municipality. This area is affected by salinity and remains wet for much of the growing season.

Av19 Mainly calcareous Alluvium soils, with poorly drained and saline poorly drained soils in depressions. These soils are associated with gently sloping, undulating landscapes, cut by abandoned stream channels on the floodplain of the Cutarm Creek in the Spy Hill municipality. The calcareous Alluvium soils occur on the highest portions of the landscape, with poorly drained soils occurring in abandoned stream channels and other low-lying, intermittently flooded areas.

Av23 Mainly calcareous poorly drained soils. This map unit occurs on the undulating floodplain of Deerhorn Creek, in the eastern portion of the Spy Hill municipality. The soils are generally wet for most of the year.

Av38 Mainly a mixture of orthic and calcareous Alluvium soils occurring randomly over most of the landscape, with poorly drained soils in depressions. These soils are associated with the floodplains of the Qu'Appelle River and Pipestone Creek. They occur on very gently to gently sloping, undulating floodplains cut by meandering stream channels. The orthic and calcareous Alluvium soils occur on the higher portions of the landscape while the poorly drained soils are confined to the abandoned river stream channels, and in some locations may be saline.

Fig. 21 Alluvium soils are common on the floodplain of the Qu'Appelle River.

Agricultural Properties of Alluvium Soils

Alluvium soils range from agricultural capability class 2 to class 6. This wide range in agricultural capability is mainly the result of varying degrees of salinity, erosion, susceptibility to flooding and excess wetness, which are often associated with these soils. Where these factors are not a problem, they are often good agricultural soils. While textures vary, they usually range from loam to clay, consequently, water-holding capacity is adequate. The organic matter content of the surface horizon is usually high in comparison to many other soils, resulting in reasonable fertility and good tilth. Stones are rarely a problem. Because of the association of these soils with lower portions of the landscape and their occurrence in narrow bands in valley bottoms, wind erosion, also, is not usually a serious problem. On the other hand, because of their association with low landscape positions and drainage channels, which receive runoff water in the spring or during periods of intense rainfall, they are susceptible to water erosion and to flooding. They usually occur on favorable topography but areas are often small and irregular, and cut by erosion channels, making cultivation difficult or impractical.

The orthic and calcareous Alluvium soils are limited mainly by the factors mentioned above, and are the best Alluvium soils for crop production. Areas dominated by poorly drained soils and saline poorly drained soils have little potential for crop land and are used mainly for forage production or pasture.

BALCARRES (Ba) SOILS

Balcarres soils are dominantly Black soils that occur inextensively in the north-central portion of the Rocanville municipality. They are neutral to slightly alkaline soils that have formed in clayey lacustrine materials. They are associated with undulating landscapes having gentle slopes and infrequent poorly drained depressions. Surface textures range from clay loam to clay and are often silty. Stones are not normally present in Balcarres soils.

Kinds of Balcarres Soils

Orthic Balcarres is the principal kind of Balcarres soil that occurs in this municipality. It is mainly a result of the effect of drainage on soil development.

Orthic Balcarres The orthic Balcarres soil can occur in any landscape position. It is a well- to moderately well-drained soil with a black A horizon, 10 to 15 cm (4 to 6 in.) thick, that is underlain by a dark-brown B horizon and a brownish-colored C horizon.

Map Units of Balcarres Soils

Ba3 Mainly orthic Balcarres soils occurring over most of the landscape. This map unit is very inextensive in this municipality, occurring in only one area, on a gently sloping, externally drained, undulating landscape.

Agricultural Properties of Balcarres Soils

The Balcarres soils are good agricultural soils of capability class 2. The clay loam and clay textures result in a water-holding capacity of approximately 20 to 25 cm (8 to 10 in.) of water in the upper 1 m (3 to 4 ft.) of soil and thus they have good drought resistance. These soils are naturally fertile, although they will respond to additions of nitrogen and phosphate fertilizers. They have a moderate organic matter content and are reasonably easy to keep in good tilth. Stones are usually absent in these soils. Wind erosion can be a problem unless cultural practices that maintain a cloddy surface and a trash cover are utilized to minimize the risk when surface horizons become dry. Water erosion has not been a problem on these soils, however, gully erosion can occur during periods of high runoff due to the external drainage in the landscape. Also, in flatter portions of the landscape, the low infiltration rate can cause temporary flooding in the spring or after periods of intense rainfall, although flooding is not usually serious.

CUDWORTH Till Substrate (CdT) SOILS

Cudworth soils are dominantly Black soils that occur inextensively in the south-central portion of the Spy Hill municipality. These neutral to slightly alkaline soils have formed in shallow, silty lacustrine materials which overlie glacial till. They occur on very gently to gently sloping, undulating landscapes and gently sloping hummocky landscapes. Surface textures are mostly loam to silt loam. These soils are generally stone free, however, the occasional stone may occur where the lacustrine sediments are very shallow.

Kinds of Cudworth Soils

Calcareous and eroded Cudworth are the principal kinds of Cudworth soils that occur in this municipality. They are mainly the result of the effect topography has in redistributing precipitation and in determining soil drainage.

Calcareous Cudworth The calcareous Cudworth soil occupies the mid- and lower slope positions in the landscape. It is a well- to moderately well-drained soil with a black A horizon, 10 to 15 cm (4 to 6 in.) thick, that is underlain by a brown, calcareous B horizon, or by a strongly calcareous C horizon.

Eroded Cudworth The eroded Cudworth soil, as the name implies, is a Cudworth soil whose topsoil has been partially or totally removed by erosion. It occurs on knolls and upper slopes and can be recognized in cultivated fields by its light surface color.

Map Units of Cudworth Soils

Cd6T Mainly a mixture of calcareous Cudworth soils on mid- and lower slopes and slightly eroded Cudworth soils on upper slopes and knolls. This map unit is associated with undulating and hummocky landscapes having very gentle to gentle slopes. Oxbow soils occur on a few of the higher knolls and saline soils are associated with some lower slopes. Poorly drained soils occur in a few depressions scattered throughout the landscape.

Agricultural Properties of Cudworth Soils

Cudworth soils are good agricultural soils of capability class 2. The loam to silt loam textures result in a water-holding capacity of 14 to 16 cm (6 to 7 in.) of water in the upper 1 m (3 to 4 ft.) of soil. These soils have a moderate amount of organic matter and are reasonably easy to keep in good tilth. Natural fertility of these soils is good, although they will respond to additions of nitrogen and phosphate fertilizers. Stones are generally not a problem, however, due to glacial till being near the surface occasional clearing is required. Wind erosion can be a serious problem unless cultural practices that maintain a trash cover are utilized. Similarly, water erosion can be a problem on these soils during periods of high runoff. This potential for water erosion is highest in areas with long slopes. Tillage practices that promote a rough surface and a high infiltration rate should be utilized.

CROOKED LAKE (CL) SOILS

Crooked Lake soils are dominantly Black soils that occur most commonly along the Qu'Appelle Valley and Pipestone Creek Channel. These neutral to slightly alkaline soils are formed in loamy glacial till that has been eroded by glacial meltwater, presumably during initial stages of cutting of the valleys. Surface textures are mostly sandy loam and loam. Crooked Lake soils are often extremely stony and are associated with undulating or terraced landscapes having gentle to very gentle slopes. Often the landscapes are cut by shallow erosion channels.

Kinds of Crooked Lake Soils

Orthic Crooked Lake is the principal kind of Crooked Lake soil that occurs in these municipalities.

Orthic Crooked Lake The orthic Crooked Lake soil occupies all landscape positions in the gently or very gently undulating and terraced landscapes. It is a well-drained soil with a black A horizon, 8 to 12 cm (3 to 5 in.) thick, underlain by a brown B horizon and a grayish-colored C horizon.

Map Units of Crooked Lake Soils

CL1 This map unit consists almost entirely of orthic Crooked Lake soils and is associated with undulating and terraced landscapes having gentle to very gentle slopes. These areas are usually drained by shallow gullies. Agricultural use of these soils is affected by severe stoniness.

Agricultural Properties of Crooked Lake Soils

Crooked Lake soils are similar to the Oxbow soils in terms of natural fertility and moisture efficiency but differ in stoniness. A dense stone lag has resulted in many areas of Crooked Lake soils being nonarable. To be arable, clearing is always required and, even then, stones usually remain a serious problem. Many areas of Crooked Lake soils are best utilized as grazing land.

In areas where it is possible to cultivate these soils, the orthic Crooked Lake soils have agricultural properties similar to the orthic Oxbow soils, described under Oxbow Soils. The reader is, therefore, referred to that section of this report.

COLLUVIUM (Co) SOILS

Colluvium soils are dominantly a mixture of Black and Dark Gray soils that occur inextensively in the northern portion of the Rocanville and southern portion of the Spy Hill municipalities. These neutral to slightly alkaline soils have formed in variable deposits consisting of mixtures of glacial till and shale bedrock transported by mass movement from unstable steeper slopes to stable positions at the base of the Qu'Appelle Valley sides. Colluvium soils are slightly to moderately stony and have a wide range of surface textures due to the variability of the materials in which they are formed. They occur typically on hummocky landscapes and are usually inclined or dissected. Slopes range from gentle to strong in these municipalities.

Kinds of Colluvium Soils

Orthic, calcareous and slightly eroded Colluvium are the principal kinds of Colluvium soils that occur in these municipalities. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage.

Orthic Colluvium The orthic Colluvium soil occurs on mid- and lower slopes in most Colluvium landscapes, but may extend onto lower knolls in some areas. It is a well-drained soil with a black or grayish-colored A horizon, 10 to 25 cm (4 to 10 in.) thick, underlain by a brownish B horizon and a grayish-colored C horizon that is usually calcareous.

Calcareous Colluvium The calcareous Colluvium soil occurs on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This results in a thinner soil with less organic matter than the orthic soil. It has a thin, usually calcareous A horizon and may have a thin, calcareous B horizon. It has usually been affected by erosion to some degree, but the extent of erosion is less than on the eroded Colluvium soil.

Eroded Colluvium The eroded Colluvium soil, as the name implies, is a Colluvium soil whose topsoil has been partially or totally removed by erosion. It occurs most often on knolls and upper slopes but can occur on midslopes as well. Those on the upper slopes and knolls are eroded by both wind and water while those on midslopes are eroded mainly by water. These soils can usually be recognized in cultivated fields by their light-brown to grayish surface.

Map Units of Colluvium Soils

Co1 Mainly orthic Colluvium soils on mid- and lower slopes, with calcareous and slightly eroded Colluvium soils on upper slopes and knolls. This map unit is associated with hummocky landscapes that are inclined or dissected. Slopes range from gentle to strong. Excess water drains readily from these areas and thus poorly drained depressions occur very infrequently.

Agricultural Properties of Colluvium Soils

Colluvium soils that occur on favorable topography are good agricultural soils of capability class 2. They have a wide range in textures because of the variability of the material in which they have formed, but in general have loamy textures because of the dominance of glacial till in the material. Consequently, water-holding capacities are moderate, usually in the vicinity of 14 cm (6 in.) of water in the top 1 m (3 to 4 ft.) of soil. In many respects these soils are similar to the Oxbow and Whitewood soils which occur extensively in these municipalities. As long as topographic limitations are not severe, these soils are usually arable. Stones may be a problem in some areas, and most areas are susceptible to water erosion because of the nature of the topography and their position in the Qu'Appelle Valley. Cultural practices such as cultivation across slopes should be used to help minimize erosion. Locally dry, infertile knolls, similar to those in most Oxbow areas, are common in most areas of Colluvium soils. Cultural practices that will minimize erosion on these soils and increase organic matter should be utilized. Poorly drained soils occur very infrequently and irregularity of field size and shape is usually controlled by topography.

DUNE SAND (DS) SOILS

Dune Sand soils are weakly developed soils that occur on the Welby Sand Plain in the southeastern corner of the Spy Hill municipality. These neutral soils have formed in very sandy, eolian materials. They are associated with hummocky or 'duned' topography and where vegetation is sparse, some dunes are still actively eroding. Slopes range from gentle to moderate and are occasionally strong. The soils are stone free and surface textures range from sand to loamy sand.

Kinds of Dune Sand Soils

Weakly developed, orthic and slightly leached Dune Sand are the principal kinds of Dune Sand soils that occur in this municipality. They are mainly a result of the effect parent material, erosion and vegetation have had on soil development.

Weakly Developed Dune Sand The weakly developed Dune Sand soil is characterized by a lack of soil development. Where soil development has taken place, it features the formation of a very thin (<3 cm), dark-colored A horizon underlain by light-brown sand which may be weakly calcareous. It is usually associated with areas of sparse vegetation and most areas have been stablizied by vegetation for only a short period. A few active dunes still occur in some areas.

Orthic Dune Sand The orthic Dune Sand soil occurs in areas that have been stabilized by vegetation for relatively long periods of time. It is characterized by a somewhat stronger soil development than the weakly developed Dune Sand. It has a dark-colored A horizon, 2 to 5 cm (1 to 2 in.) thick, underlain by a brown B horizon that is difficult to distinguish from the C horizon. In many areas the only significant difference between the B and C horizons is that the C horizon is weakly calcareous. Often the B horizon may extend to a depth of 1 m (3 to 4 ft.) or more.

Slightly Leached Dune Sand The slightly leached Dune Sand soil occurs in areas that have supported trees and shrubs as the main vegetation type for a long period of time. It is characterized by the formation of a leaf mat on the surface and the presence of a very thin (<2 cm), light-colored leached layer beneath a very thin dark-colored A horizon. This leached layer is, in turn, underlain by a brown, lime-free layer that often extends to 2 m (6 to 7 ft.) or more.

Map Units of Dune Sand Soils

DS1 Mainly weakly developed Dune Sand soils. This map unit is associated with hummocky landscapes having gentle to moderate slopes. A few active dunes occur on the rougher portions of some areas.

DS3 Mainly a mixture of orthic and weakly developed Dune Sand soils. This map unit is associated with undulating and hummocky landscapes having very gentle to gentle slopes. Reworking of the sand by wind, in these areas, has been minimal and large portions of these areas have been covered by thin stands of aspen.

DS4 Mainly a mixture of weakly developed, orthic and slightly leached Dune Sand soils. This map unit is associated with hummocky landscapes having gentle to moderate slopes. It occurs in areas that are dominated by stands of trees but in which open grassland areas occur, some of which have a few active dunes. The slightly leached Dune Sand soil occurs under the heaviest stands of aspen and usually on lower slopes.

Agricultural Properties of Dune Sand Soils

Dune Sand soils are very poor agricultural soils of capability class 6. They have many limitations that restrict their use primarily to areas of native grazing. They are very sandy soils with an extremely low water-holding capacity, low organic matter content and low natural fertility. If cultivated they are very susceptible to wind erosion because of their very sandy nature, weak structure and low organic matter content. Consequently, these areas are best utilized as rangeland. While they do have low carrying capacities, good quality water is usually available from shallow water tables. All areas of Dune Sand soils in this municipality occur within an area that has been set aside as a community pasture and they are being put to optimum use. Some areas have been cleared of trees and seeded to forages for grazing with a fair degree of success. Careful management of these soils, however, must continue to ensure that wind erosion does not become a problem.

DUNE SAND-MEOTA (DSMe) SOILS

Dune Sand-Meota soils are a mixture of weakly developed (Dune Sand) and Black (Meota) soils that occur inextensively in the southeastern corner of the Spy Hill municipality. These neutral soils have formed in a mixture of sandy eolian and fluvial materials, and are typically associated with hummocky landscapes having gentle slopes. The soils are stone free and surface textures range from sand to loamy sand.

Kinds of Dune Sand-Meota Soils

Weakly developed Dune Sand and orthic Meota are the principal kinds of Dune Sand-Meota soils that occur in this municipality. They are mainly a result of the effect parent material, erosion and vegetation have had on soil development. The weakly developed Dune Sand soil has been briefly described under Dune Sand Soils and the orthic Meota soil is briefly described under Meota Soils.

Map Units of Dune Sand-Meota Soils

DSMe1 Mainly weakly developed Dune Sand soils, with orthic Meota soils on some mid- and lower slopes. This map unit is associated with hummocky landscapes having gentle slopes. While all areas are now stabilized by vegetation, wind erosion in the past has altered the topography in some areas. The weakly developed Dune Sand soils occur most often on the higher, most arid portions of the landscape, where vegetation is sparse and soil development has been minimal.

Agricultural Properties of Dune Sand-Meota Soils

Dune Sand-Meota soils are very poor agricultural soils of capability class 6. While the presence of the somewhat better Meota soils in the landscape make these areas slightly more productive in terms of native grazing, they are still very similar to areas of only Dune Sand soils and have similar agricultural properties. The reader is, therefore, directed to the section on agricultural properties of Dune Sand soils.

ELLISBORO (Eb) SOILS

Ellisboro soils are dominantly Black soils that occur at the base of the steep sides of the Qu'Appelle Valley. These neutral to slightly alkaline soils are formed in variable-textured alluvial materials associated with aprons and fans in the Qu'Appelle Valley. These materials have been washed into the valley from areas adjacent to it and deposition of these materials is still taking place in many areas. Surface textures are mainly sandy loam and loam but textures vary widely, with the coarsest textures near points where runoff water enters the valley. Textures become finer with increasing distance from these points. These soils are usually stone free, however, a few stones often occur near the base of the steep valley sides. Landscapes are characterized by long, uniform, very gentle to moderate slopes, extending from the base of the valley side to the floodplain of the river, as shown in Fig. 22. These slopes are often cut by erosion channels that extend from the apex of the fan to the Qu'Appelle River.

Fig. 22 The Ellisboro soils occur in the Qu'Appelle Valley where they occupy the gently sloping fans that extend from the mouth of a tributary coulee to the floodplain of the river.

Kinds of Ellisboro Soils

Orthic, calcareous and weakly developed Ellisboro are the principal kinds of Ellisboro soils that occur in these municipalities. They are mainly a result of the relatively young age of the soils and the continuation of deposition of eroded materials.

Orthic Ellisboro The orthic Ellisboro soil occurs in portions of the landscape where deposition is no longer taking place and usually in the lower portions of the landscape where slightly more water enters the soil. It is a well-drained soil but is usually shallow due to the young age of these soils. It is characterized by a dark A horizon that ranges from a few centimetres (1 to 2 in.) to 10 or 12 cm (4 to 5 in.) in thickness. The A horizon is underlain by a shallow, brown or grayish-brown B horizon, underlain, in turn, by a light-brown, calcareous C horizon.

Calcareous Ellisboro The calcareous Ellisboro soil can occur anywhere in the landscape but usually occurs in areas where deposition is no longer taking place or where it is minimal. It is a well-drained soil with a dark A horizon, ranging from a few centimetres (1 to 2 in.) thick, in most areas, to more than 20 cm (8 in.) in areas where deposition of materials, eroded from other areas, has occurred. The A horizon is underlain by a brown or grayish-brown B horizon that is usually calcareous. The B horizon is, in turn, underlain by a light-brown, calcareous C horizon.

Weakly Developed Ellisboro The weakly developed Ellisboro soil occurs in areas in which deposition of eroded materials is still continuing. It is characterized by a lack of soil development. Where soil development has taken place, it features the formation of a thin, dark-colored A horizon. Often this soil has a series of dark layers in the top several metres (3 to 6 ft.), each separated by a light-colored layer. These dark layers represent old surfaces which have been buried by the deposition of newly eroded materials during periods of high runoff.

Map Units of Ellisboro Soils

Eb1 Mainly a mixture of orthic, calcareous and weakly developed Ellisboro soils. This map unit is associated with gently sloping aprons and fans in the Qu'Appelle Valley. The weakly developed soils occur near the top of the fan and along erosion channels. The calcareous and orthic Ellisboro soils occur mainly on the lower portions of aprons and the outer portions of fans, where deposition is at a minimum. The orthic Ellisboro soils usually occur in slightly lower positions in these areas, where more water enters the soil.

Agricultural Properties of Ellisboro Soils

Ellisboro soils are good agricultural soils of capability class 2. They are variable in texture, both laterally and vertically but textures are normally loamy giving rise to moderate water-holding capacities of approximately 12 to 15 cm (4 to 6 in.) of water in 1 m (3 to 4 ft.) of soil. The moderate organic matter content gives reasonably fertile soils of good tilth. Exceptions to this occur in areas that are actively receiving new material during periods of high runoff. Stones are rarely a problem although a few may occur near the base of the valley sides. Wind erosion has not been serious but could be a problem in areas with sandy textures. Water erosion is a more serious problem as these soils occur in areas that receive excess water during periods of runoff from snowmelt and intense rainfall. As well, the long, uniform slopes associated with these soils contribute to their susceptibility to water erosion. Cultivation practices that leave a cloddy, open surface, which promotes maximum infiltration of water, should be utilized. Also, cultivation across slopes rather than down slopes will help in reducing water erosion. Ellisboro soils usually occur in small, irregular pieces, sometimes with limited accessibility which further detracts from the suitability of these soils for cultivated crops.

The orthic and calcareous soils are the most productive of the Ellisboro soils, being affected least by deposition of new materials. The continual deposition of new materials on weakly developed soils results in soils of lower organic matter content and fertility, poor structure, and, in some areas, sandy textures with low water-holding capacity. However, these limitations are not severe and all areas of Ellisboro soils in these municipalities have been rated as class 2 or 3.

HAMLIN-WINDTHORST (HmWn) SOILS

Hamlin-Windthorst soils are dominantly Black soils that occur inextensively in a single map delineation in the west-central portion of the Moosomin municipality, near the Moosomin airfield. These neutral to slightly alkaline soils are formed in a mixture of loamy glaciolacustrine materials (Hamlin) and sandy to loamy, water-modified glacial till (Windthorst). The glacial till materials have been altered by enrichment with sandier materials, so that in addition to the loamy glacial till these materials contain some sandy glacial till and sandy glaciofluvial materials. The glaciolacustrine soils are usually shallow and are always underlain by glacial till. They usually occur on the lower slope positions. These soils occur on moderately sloping hummocky landscapes. Surface textures are mainly sandy loam.

Kinds of Hamlin-Windthorst Soils

Orthic, calcareous and eroded Hamlin and calcareous and eroded Windthorst are the principal kinds of Hamlin-Windthorst soils that occur in this municipality. The Hamlin soils are described below. The calcareous and eroded Windthorst soils are described under Windthorst Soils.

Orthic Hamlin The orthic Hamlin soil occurs on lower slopes and may extend onto midslopes in some areas. It is a well-drained soil with a black A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brown B horizon and a grayish-colored, calcareous C horizon.

Calcareous Hamlin The calcareous Hamlin soil occurs mainly on midslopes above the orthic. It is similar to the orthic soil described above, except that the A horizon is usually somewhat thinner and the B horizon is calcareous, which imparts a grayish-brown color to it.

Eroded Hamlin The eroded Hamlin soil, as the name implies, is a Hamlin soil whose topsoil has been almost totally removed by erosion. It occurs on upper slopes and can be easily recognized by its light-brown to grayish surface.

Map Units of Hamlin-Windthorst Soils

HmWn10 Mainly a mixture of calcareous and slightly eroded Hamlin soils on mid- and upper slopes, with orthic Hamlin soils on mid- and lower slopes, and a mixture of calcareous Windthorst soils on some mid- and upper slopes and eroded Windthorst soils on knolls. These soils are associated with hummocky landscapes having gentle slopes.

Agricultural Properties of Hamlin-Windthorst Soils

The orthic Hamlin soils are fair agricultural soils of capability class 3. They have a moderate to low water-holding capacity of 10 to 12 cm (4 to 5 in.) of water in the upper 1 m (3 to 4 ft.) of soil. A moderate organic matter content gives reasonably good fertility and tilth. The calcareous Hamlin soils have agricultural properties similar to the orthic Hamlin soils described above except that the A horizon may be thinner and less fertile. These soils are subject to wind and water erosion when the surface is not protected by a trash cover. On some of the more susceptible upper slopes, erosion has taken place giving rise to the eroded Hamlin soils. These soils are locally dry because of rapid runoff and have very low nutrient reserves, particularly phosphorus. Stones are rarely a problem on these soils although a few occur where the Hamlin soils are underlain, at a shallow depth, by glacial till materials, and on higher knolls where the Windthorst soils occur. The agricultural properties of the calcareous and eroded Windthorst soils are described under Windthorst Soils.

HILLWASH (Hw) SOILS

Hillwash soils, as shown in Fig. 23, are formed in various deposits associated with the steep and eroding sides of Scissors, Pipestone, Kaposvar and Cutarm Creeks, Moosomin Lake and the Qu'Appelle Valley. They are a group of neutral to slightly alkaline, shallow eroded and weakly developed soils. Surface textures and amounts of stone are extremely variable because of the association of these soils with steeply sloping, eroded landscapes and the variable nature of the parent material.

Agricultural Properties of Hillwash Soils

Hillwash soils are primarily nonarable due to the nature of the landscape on which they occur. They do, however, have some value as pasture land depending upon steepness of slopes, density of tree cover and availability of water. Nearly all areas of Hillwash soils in these municipalities have been rated as class 6 for agricultural capability with steepness of slope and susceptibility to erosion as the main limitations.

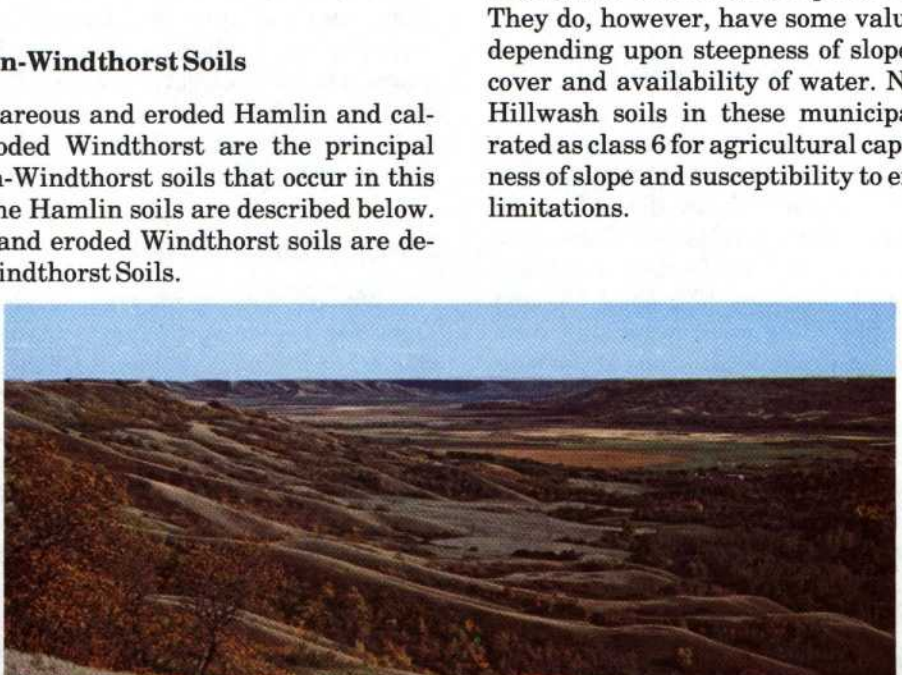


Fig. 23 Hillwash soils predominate the steeply sloping valley sides and coulees throughout the area.

MEOTA (Me) SOILS

Meota soils are dominantly Black soils that occur inextensively in the Martin, Rocanville and Spy Hill municipalities. They are neutral to slightly alkaline soils that have formed in sandy fluvial materials. In some areas these materials are shallow and underlain by glacial till or gravel. These conditions are indicated on the map by the addition of T or G to the map symbol. Surface textures range from loamy sand to sandy loam. Stones are not normally present in these soils, however, a few stones occur in some areas because of the close proximity of the underlying glacial till. Meota soils are associated mainly with undulating landscapes and in these municipalities have mainly very gentle slopes.

Kinds of Meota Soils

Orthic, calcareous, eroded, carbonated, and saline Meota, as well as poorly drained, are the principal kinds of Meota soils that occur in these municipalities. They are mainly a result of the effect internal soil drainage has on soil development. A better understanding of the relationship of these soils to one another in the landscape may be obtained by referring to Fig. 17 in the Introduction to Soils section of this report.

Orthic Meota The orthic Meota soil occupies all slope positions in most Meota landscapes in these municipalities with the exception of the depressions and lower slopes in some areas and knolls in others. It is a well to rapidly drained soil with a black A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brownish B horizon and a light-brown, weakly calcareous C horizon.

Calcareous Meota The calcareous Meota soil occurs mainly on upper slopes and knolls and occasionally on midslopes. It is very similar to the orthic Meota soil except that the B horizon, and often the A horizon, is calcareous. Some of these soils in knoll positions have been affected slightly by wind erosion.

Eroded Meota The eroded Meota soil, as the name implies, is a Meota soil whose topsoil has been almost totally removed by erosion. It occurs most often on knolls and upper slopes, but can occur almost anywhere in the landscape. It can be easily recognized by its light-brown surface color and in severely eroded areas may occupy 20 to 30% or more of the landscape.

Carbonated Meota The carbonated Meota soil occurs in lower slope positions, often surrounding sloughs. It is a moderately well-drained to imperfectly drained soil with a black, usually calcareous A horizon, 10 to 20 cm (4 to 8 in.) thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have drab colors and reddish spots and stains, indicative of poor soil drainage. Salts may also be present in the C horizon of some of these soils.

Saline Meota The saline Meota soil occurs on lower slopes surrounding sloughs or poorly drained depressional areas, often in association with carbonated Meota soils. It is similar in appearance to the carbonated Meota soil and is characterized by the presence of soluble salts, usually within 50 cm (20 in.) of the surface. The salts occur as a white surface crust or as small, white specks within the soil, although salts may not always be visible. Saline Meota soils often occur intermixed with carbonated Meota soils on lower slopes surrounding sloughs and have similar features, indicative of poor soil drainage.

Poorly Drained Soils Poorly drained soils occur mainly in sloughs and occasionally on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt and usually remain wet for much of the growing season. They have thick, dark-colored A horizons and drab subsurface colors that often include red spots and streaks. In some areas these soils may be saline as well.

Map Units of Meota Soils

Me1
Me1G This map unit consists almost entirely of orthic Meota soils and is generally associated with undulating and hummocky landscapes having very gentle slopes with low relief. A few undrained depressions occur but are of minor significance. In some areas a few shallow channels have developed, providing external drainage for the area. As well, gravelly Whitesand soils occur sporadically in a few areas. In two areas, on the east side of the Spy Hill municipality, the sandy Meota soils are underlain at a shallow depth, by gravel. This condition is noted on the soil map by the addition of G to the map symbol. e.g. Me1G.

Me3T Mainly orthic Meota soils on mid- to upper slopes and knolls, with saline and carbonated Meota soils on lower slopes and in depressional areas. This map unit is associated with undulating landscapes having very gentle slopes. These soils are underlain by glacial till which is exposed on some of the higher landscape positions, giving rise to sandy Oxbow soils in some areas. The imperviousness of the underlying glacial till has produced impeded drainage in many of the lower landscape positions, which, in turn, has contributed to the saline conditions that affect many of them.

Me7 Mainly saline and carbonated Meota soils. This map unit is associated with undulating landscapes having very gentle slopes. The saline Meota soils occur mainly throughout lowlying, slightly depressional areas and around the few sloughs that occur in some areas. All are affected by imperfect drainage. The carbonated soils occur on the slightly higher portions of the landscape, however, because of the low-lying nature of the whole area, these soils are also affected by imperfect drainage.

Me8T Mainly a mixture of calcareous and slightly eroded Meota soils occurring over most of the landscape, with orthic Meota soils occurring randomly in the landscape, and poorly drained soils in depressions. This map unit is also associated with undulating landscapes having very gentle slopes. These soils are also underlain by glacial till, which may be exposed on some of the higher landscape positions. Weak salinity affects some of the soils on lower slope positions, surrounding a few poorly drained areas.

Agricultural Properties of Meota Soils

Meota soils, particularly the typical or orthic Meota soils, are at best only fair agricultural soils of capability class 3. This is due to their sandy nature. Their loamy sand to sandy loam textures result in a water-holding capacity of approximately 5 to 8 cm (2 to 3 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Their low to moderate organic matter content and sandy nature result in soils of low fertility that are not easily kept in good tilth. The potential for wind erosion is high on these soils because their sandy texture and weak structure make it difficult to keep a cloddy surface that is resistant to wind erosion. Tillage practices that maintain a trash cover and management practices that will maintain or increase the organic matter content of these soils are recommended. Water erosion is generally not a problem because of their high infiltration rate. Also, stones are not a problem on these soils, however, where these soils are shallow and underlain by glacial till, a few stones usually occur and periodic removal may be required. In some areas, salinity is a serious problem with many of the soils in depressions affected to varying degrees. Poorly drained soils have restricted agricultural use as they are usually wet for all or a significant portion of the growing season. Many have little or no value for agriculture while others have only a limited potential as areas for forage production.

MEOTA-DUNE SAND (MeDS) SOILS

Meota-Dune Sand soils are a mixture of Black (Meota) and weakly developed (Dune Sand) soils that occur inextensively in the southeastern corner of the Spy Hill municipality. These neutral soils have formed in a mixture of sandy fluvial and eolian materials, and are typically associated with hummocky landscapes having gentle slopes. The soils are stone free and surface textures range from loamy sand to sand.

Kinds of Meota-Dune Sand Soils

Orthic Meota and weakly developed Dune Sand are the principal kinds of Meota-Dune Sand soils that occur in this municipality. They are mainly a result of the effect parent material, erosion and vegetation have had on soil development. The orthic Meota soil has been briefly described under Meota Soils, and similarly the weakly developed Dune Sand soil is briefly described under Dune Sand Soils.

Map Units of Meota-Dune Sand Soils

MeDS1 Mainly orthic Meota soils, with weakly developed Dune Sand soils occurring randomly in the landscape. This map unit is associated with hummocky landscapes having gentle slopes. While the Dune Sand soils do occur on upper slopes of the landscape with Meota soils in the lower portions, the Dune Sand soils occur more often as small islands, too small to separate on the map from the surrounding Meota soils. In such areas the weakly developed Dune Sand soil occupies all slope positions.

Agricultural Properties of Meota-Dune Sand Soils

Meota-Dune Sand soils are poor agricultural soils of capability class 5. While these areas are dominated by Meota soils, which have a thicker surface horizon and more organic matter than the Dune Sand soils, they are formed on such sandy materials that they are almost as poor agriculturally as the Dune Sand soils. They have a very low water-holding capacity of approximately 2 to 5 cm (1 to 2 in.) of water in the top 1 m (3 to 4 ft.) of soil, and are highly susceptible to wind erosion, because of their very sandy nature and weak structure. Also, they are lower in natural fertility than Meota soils in other areas. Consequently, these soils are best utilized for native grazing or improved pasture, as they are probably too droughty even to be used for hay production, except in years of very high rainfall.

MEOTA-NISBET Till Substrate (MeNtT) SOILS

Meota-Nisbet soils are dominantly a mixture of Black (Meota) and Dark Gray (Nisbet) soils that occur inextensively along the Qu'Appelle Valley in the southeastern corner of the Spy Hill municipality. These neutral soils have formed in sandy fluvial materials. In this municipality, these materials are shallow and underlain by glacial till. Surface textures are mainly loamy sand. Stones are not normally present in these soils, however, stones occur in most areas, because of the close proximity of the underlying glacial till. Some knolls are extremely stony. These soils are typically associated with hummocky landscapes having gentle slopes. In this municipality, external drainage has developed that carries excess water to the Qu'Appelle Valley, consequently, very few sloughs occur.

Kinds of Meota-Nisbet Soils

Orthic Meota and orthic Nisbet are the principal kinds of Meota-Nisbet soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage, and the effect vegetation has on soil development. The orthic Meota soil has been briefly described under Meota Soils, while the orthic Nisbet soil is briefly described below.

Orthic Nisbet The orthic Nisbet soil occupies lower slopes in most landscapes, but often extends to midslopes as well. It is a well- to moderately well-drained soil with a dark-gray A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brownish or grayish-brown B horizon. The B horizon, in turn, is underlain by a brownish-colored, sandy C horizon, or by grayish-colored glacial till.

Map Units of Meota-Nisbet Soils

MeNt1T Mainly orthic Meota soils on mid- and upper slopes, with orthic Nisbet soils on lower slopes and in depressions. This map unit is associated with hummocky landscapes, having gentle slopes, and in which external drainage has developed which carries excess water from the area. The sediments in these areas are thin and underlain by glacial till, resulting in the occurrence of sandy textured, stony Oxbow soils on a few of the highest knolls.

Agricultural Properties of Meota-Nisbet Soils

Meota-Nisbet soils are poor agricultural soils of capability classes 4 and 5. This is due to their sandy nature and the very stony conditions that exist on some upper landscape positions. Their loamy sand to sandy loam textures result in a low water-holding capacity of approximately 5 to 8 cm (2 to 3 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Their low organic matter content and sandy nature result in soils of low fertility that are not easily kept in good tilth. The potential for wind erosion is high, because their sandy texture and weak structure make it difficult to keep a rough surface that is resistant to wind erosion. Tillage practices that maintain a trash cover and management practices that will increase the organic matter content of these soils are recommended. Water erosion is generally not a problem because of their high infiltration rate, however, where the glacial till is at a very shallow depth, there is some potential for water erosion. Stones are a problem on some of the higher knolls and ridges, particularly close to the Qu'Appelle Valley where post-glacial erosion has exposed and eroded the glacial till, leaving a very stony surface.

MEOTA-OXBOW (MeOx) SOILS

Meota-Oxbow soils are dominantly Black soils that occur inextensively near Rocanville. They are neutral to slightly alkaline soils that have formed in a mixture of sandy glaciofluvial materials (Meota) and loamy glacial till (Oxbow). In these areas, the sandy sediments have been deposited in the lower portion of very gently sloping undulating and gently sloping hummocky morainal landscapes. The sandy materials are usually shallow and are always underlain by glacial till. Surface textures vary from loamy sand and fine sandy loam on the Meota soils to loam on the Oxbow soils. Stones occur mainly on the higher portions of the landscape and are largely confined to the Oxbow soils.

Kinds of Meota-Oxbow Soils

Orthic Meota and orthic Oxbow are the principal kinds of Meota-Oxbow soils that occur in this municipality. They are briefly described under Meota Soils and Oxbow Soils. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Meota-Oxbow Soils

MeOx1 Mainly orthic Meota soils on mid- and lower slopes, with orthic Oxbow soils on upper slopes and knolls. This map unit is associated with undulating landscapes having very gentle slopes and hummocky landscapes having gentle slopes. Calcareous or slightly eroded Oxbow soils occur on a few knolls and a few poorly drained depressions occur scattered throughout most areas.

Agricultural Properties of Meota-Oxbow Soils

Meota-Oxbow soils are good to fair agricultural soils of capability classes 2 and 3. The agricultural properties of the Meota soils have been described under Meota Soils, and similarly, the agricultural properties of the Oxbow soils have been described under Oxbow Soils. The reader is, therefore, directed to those sections of this report.

MEOTA-SYLVITE (MeSv) SOILS

Meota-Sylvite soils are dominantly Black soils that occur inextensively along the west side of Scissors Creek in the Rocanville municipality. They are neutral to slightly alkaline soils that have formed in a mixture of sandy fluvial materials (Meota) and shallow, sandy to loamy shaly fluvial and lacustrine materials, underlain by shale or shaly glacial till (Sylvite). Surface textures range from loamy sand to sandy loam on the Meota soils, to sandy loam and loam on the Sylvite soils. Stones are not normally present on Meota soils, however, varying degrees of stoniness are associated with Sylvite soils. Consequently, surface stones occur in some areas of these soils, mainly on higher landscape positions. These soils are typically associated with undulating landscapes and have very gentle to gentle slopes.

Kinds of Meota-Sylvite Soils

Orthic Meota and orthic Sylvite are the principal kinds of Meota-Sylvite soils that occur in this municipality. They are mainly a result of the effect parent material has on soil development. The orthic Meota soil has been briefly described under Meota Soils, while the orthic Sylvite soil is briefly described under Sylvite Soils.

Map Units of Meota-Sylvite Soils

MeSv1 Mainly orthic Meota soils, with orthic Sylvite soils occurring randomly in the landscape. This map unit is associated with undulating landscapes having very gentle to gentle slopes. While these soils are not externally drained by shallow gullies, the sandy nature of the soils and their close proximity to Scissors Creek has resulted in very few undrained depressions in the landscape. In some areas the underlying glacial till has been exposed on higher landscape positions, giving rise to a few sandy Rocanville soils.

Agricultural Properties of Meota-Sylvite Soils

Meota-Sylvite soils are poor agricultural soils of capability class 4. This is due to their sandy nature. The agricultural properties of the Meota-Sylvite soil complex are similar to those of Meota and Sylvite soils, which are briefly described under Meota Soils and Sylvite Soils, respectively. The reader is therefore referred to these latter two sections.

MEOTA-WELBY (MeWb) SOILS

Meota-Welby soils are dominantly Black soils that occur inextensively in areas adjacent to the Qu'Appelle Valley in the Rocanville municipality. They are neutral to slightly alkaline soils that have formed in a mixture of sandy fluvial materials (Meota) and gravelly fluvial materials that have been modified by inclusions of shale (Welby). In these areas the sandy and gravelly fluvial sediments occur intermixed but in general the sands occur in lower landscape positions and the gravels in higher landscape positions. They occur adjacent to the Qu'Appelle Valley, in areas that received coarse-textured fluvial materials during deglaciation and as the Qu'Appelle Valley was being cut. They are associated with hummocky and undulating landscapes, some of which are externally drained to the Qu'Appelle River. Generally they have gentle slopes. Surface textures vary from loamy sand to very fine sandy loam on the Meota soils, to sandy loam and gravelly sandy loam on the Welby soils. Stoniness is variable, ranging from nonstony or slightly stony on the Meota soils, to excessively stony on some of the Welby soils.

Kinds of Meota-Welby Soils

Orthic Meota, orthic Welby and poorly drained are the principal kinds of Meota-Welby soils that occur in this municipality. They are mainly a result of the effect parent material and topography have on soil development. The orthic Meota and poorly drained soils have been briefly described under Meota Soils, while the orthic Welby soil is briefly described under Welby Soils. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Meota-Welby Soils

MeWb1 Mainly orthic Meota soils, with orthic Welby soils occurring randomly in the landscape. This map unit is associated with gently sloping hummocky landscapes, which are externally drained to the Qu'Appelle River. Slightly eroded Meota soils occur on a few knolls.

MeWb5 Mainly orthic Meota soils, with orthic Welby soils occurring randomly in the landscape, and poorly drained soils in depressions. This map unit occurs in one area and is associated with undulating landscapes having gentle slopes. Calcareous Meota soils occur on a few knolls and weak salinity is associated with lower slope soils adjacent to a few poorly drained depressions. Many of the Welby soils in this area are excessively stony.

Agricultural properties of Meota-Welby Soils

Meota-Welby soils are poor agricultural soils of capability class 4, due to their sandy and gravelly nature. The agricultural properties of the Meota-Welby soil complex are similar to those of Meota and Welby soils. The reader is, therefore, directed to the sections on agricultural properties of Meota Soils and Welby Soils.

MEOTA-WHITESAND (MeWs) SOILS

Meota-Whitesand soils are dominantly Black soils that occur on very gently to gently sloping, hummocky and very gently sloping, undulating landscapes in the western portion of the Martin municipality. They are neutral to slightly alkaline soils that have formed in a mixture of sandy (Meota) and gravelly (Whitesand) fluvial materials. They are generally stone free and have surface textures ranging from sandy loam to gravelly sandy loam.

Kinds of Meota-Whitesand Soils

Orthic Meota and orthic Whitesand are the principal kinds of Meota-Whitesand soils occurring in this municipality. They are mainly a result of the effect parent material has on soil development. The properties of each of these soils have been briefly described under Meota Soils and Whitesand Soils.

Map Units of Meota-Whitesand Soils

MeWs1 Mainly orthic Meota soils, with orthic Whitesand soils occurring randomly throughout the landscape. These soils are associated with very gently sloping, undulating and very gently to gently sloping hummocky landscapes. In some areas the fluvial sediments are thin and are underlain by glacial till (Fig. 24). This condition is indicated on the soil map by the addition of T to the map symbol (i.e. MeWs1T).

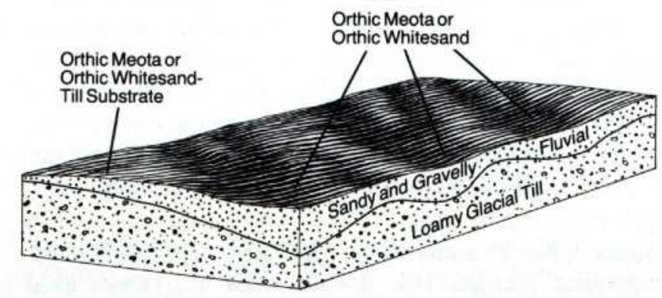


Fig. 24 Sketch of the MeWs1T map unit showing a random distribution of orthic Meota and orthic Whitesand soils, associated with a veneer of sandy and gravelly fluvial deposits over glacial till.

Agricultural Properties of Meota-Whitesand Soils

Meota-Whitesand soils are fair to poor agricultural soils of capability class 4. The agricultural properties of the orthic Meota and the orthic Whitesand soils are described under Meota Soils and Whitesand Soils, respectively.

NISBET (Nt) SOILS

Nisbet soils are dominantly Dark Gray soils that occur inextensively in the northwestern corner of the Rocanville municipality. These neutral soils have formed in sandy fluvial materials, in areas where the native vegetation was dominantly trees. Hence, the surface color of the soils is dark gray as opposed to the black surface color of the majority of soils in this municipality, reflecting the influence of trees on soil development. Surface textures range from sandy loam to loamy sand. These soils are normally stone free and are typically associated with undulating landscapes having very gentle to gentle slopes.

Kinds of Nisbet Soils

Orthic Nisbet is the principal kind of Nisbet soil that occurs in this municipality. It is mainly a reflection of the effect vegetation has on soil development.

Orthic Nisbet The orthic Nisbet soil occupies all slope positions in Nisbet landscapes in this municipality. It is a well-drained soil that is characterized by a dark-gray A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brown B horizon and a light-brown, weakly calcareous C horizon. In some lower slope positions this soil has a gray surface horizon, which is separated from the underlying B horizon by a thin, very light-gray, leached horizon. This horizon is indicative of the greater leaching that takes place in the soil, in these more moist landscape positions, under the influence of wooded vegetation. Also, these lower slope soils often have reddish spots and stains in the lower horizons, indicative of more moist conditions.

Map Units of Nisbet Soils

Nt1 This map unit consists almost entirely of orthic Nisbet soils. It is associated with undulating landscapes having very gentle to gentle slopes with low relief, and very few undrained depressions.

Agricultural Properties of Nisbet Soils

Nisbet soils are at best only fair agricultural soils of capability class 3, due to their sandy nature. Their sandy loam to loamy sand textures result in a low water-holding capacity of approximately 5 to 8 cm (2 to 3 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Their occurrence in an area of more favorable precipitation compensates slightly for the low water-holding capacity. However, their low organic matter content and sandy nature result in soils of low fertility that are not easily kept in good tilth. The potential for wind erosion is high on these soils because of their sandy texture, weak structure and low organic matter content, which make it difficult to keep a cloddy surface that is resistant to wind erosion. Tillage practices that maintain a trash cover and management practices that will maintain or increase the organic matter content of these soils are recommended. Water erosion is generally not a problem because of their high infiltration rate. Also, stones are generally not a problem although a few occur.

MEOTA-OXBOW (MeOx) SOILS

Meota-Oxbow soils are dominantly Black soils that occur inextensively near Rocanville. They are neutral to slightly alkaline soils that have formed in a mixture of sandy glaciofluvial materials (Meota) and loamy glacial till (Oxbow). In these areas, the sandy sediments have been deposited in the lower portion of very gently sloping undulating and gently sloping hummocky morainal landscapes. The sandy materials are usually shallow and are always underlain by glacial till. Surface textures vary from loamy sand and fine sandy loam on the Meota soils to loam on the Oxbow soils. Stones occur mainly on the higher portions of the landscape and are largely confined to the Oxbow soils.

Kinds of Meota-Oxbow Soils

Orthic Meota and orthic Oxbow are the principal kinds of Meota-Oxbow soils that occur in this municipality. They are briefly described under Meota Soils and Oxbow Soils. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Meota-Oxbow Soils

MeOx1 Mainly orthic Meota soils on mid- and lower slopes, with orthic Oxbow soils on upper slopes and knolls. This map unit is associated with undulating landscapes having very gentle slopes and hummocky landscapes having gentle slopes. Calcareous or slightly eroded Oxbow soils occur on a few knolls and a few poorly drained depressions occur scattered throughout most areas.

Agricultural Properties of Meota-Oxbow Soils

Meota-Oxbow soils are good to fair agricultural soils of capability classes 2 and 3. The agricultural properties of the Meota soils have been described under Meota Soils, and similarly, the agricultural properties of the Oxbow soils have been described under Oxbow Soils. The reader is, therefore, directed to those sections of this report.

MEOTA-SYLVITE (MeSv) SOILS

Meota-Sylvite soils are dominantly Black soils that occur inextensively along the west side of Scissors Creek in the Rocanville municipality. They are neutral to slightly alkaline soils that have formed in a mixture of sandy fluvial materials (Meota) and shallow, sandy to loamy shaly fluvial and lacustrine materials, underlain by shale or shaly glacial till (Sylvite). Surface textures range from loamy sand to sandy loam on the Meota soils, to sandy loam and loam on the Sylvite soils. Stones are not normally present on Meota soils, however, varying degrees of stoniness are associated with Sylvite soils. Consequently, surface stones occur in some areas of these soils, mainly on higher landscape positions. These soils are typically associated with undulating landscapes and have very gentle to gentle slopes.

Kinds of Meota-Sylvite Soils

Orthic Meota and orthic Sylvite are the principal kinds of Meota-Sylvite soils that occur in this municipality. They are mainly a result of the effect parent material has on soil development. The orthic Meota soil has been briefly described under Meota Soils, while the orthic Sylvite soil is briefly described under Sylvite Soils.

Map Units of Meota-Sylvite Soils

MeSv1 Mainly orthic Meota soils, with orthic Sylvite soils occurring randomly in the landscape. This map unit is associated with undulating landscapes having very gentle to gentle slopes. While these soils are not externally drained by shallow gullies, the sandy nature of the soils and their close proximity to Scissors Creek has resulted in very few undrained depressions in the landscape. In some areas the underlying glacial till has been exposed on higher landscape positions, giving rise to a few sandy Rocanville soils.

Agricultural Properties of Meota-Sylvite Soils

Meota-Sylvite soils are poor agricultural soils of capability class 4. This is due to their sandy nature. The agricultural properties of the Meota-Sylvite soil complex are similar to those of Meota and Sylvite soils, which are briefly described under Meota Soils and Sylvite Soils, respectively. The reader is therefore referred to these latter two sections.

MEOTA-WELBY (MeWb) SOILS

Meota-Welby soils are dominantly Black soils that occur inextensively in areas adjacent to the Qu'Appelle Valley in the Rocanville municipality. They are neutral to slightly alkaline soils that have formed in a mixture of sandy fluvial materials (Meota) and gravelly fluvial materials that have been modified by inclusions of shale (Welby). In these areas the sandy and gravelly fluvial sediments occur intermixed but in general the sands occur in lower landscape positions and the gravels in higher landscape positions. They occur adjacent to the Qu'Appelle Valley, in areas that received coarse-textured fluvial materials during deglaciation and as the Qu'Appelle Valley was being cut. They are associated with hummocky and undulating landscapes, some of which are externally drained to the Qu'Appelle River. Generally they have gentle slopes. Surface textures vary from loamy sand to very fine sandy loam on the Meota soils, to sandy loam and gravelly sandy loam on the Welby soils. Stoniness is variable, ranging from nonstony or slightly stony on the Meota soils, to excessively stony on some of the Welby soils.

Kinds of Meota-Welby Soils

Orthic Meota, orthic Welby and poorly drained are the principal kinds of Meota-Welby soils that occur in this municipality. They are mainly a result of the effect parent material and topography have on soil development. The orthic Meota and poorly drained soils have been briefly described under Meota Soils, while the orthic Welby soil is briefly described under Welby Soils. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Meota-Welby Soils

MeWb1 Mainly orthic Meota soils, with orthic Welby soils occurring randomly in the landscape. This map unit is associated with gently sloping hummocky landscapes, which are externally drained to the Qu'Appelle River. Slightly eroded Meota soils occur on a few knolls.

MeWb5 Mainly orthic Meota soils, with orthic Welby soils occurring randomly in the landscape, and poorly drained soils in depressions. This map unit occurs in one area and is associated with undulating landscapes having gentle slopes. Calcareous Meota soils occur on a few knolls and weak salinity is associated with lower slope soils adjacent to a few poorly drained depressions. Many of the Welby soils in this area are excessively stony.

Agricultural properties of Meota-Welby Soils

Meota-Welby soils are poor agricultural soils of capability class 4, due to their sandy and gravelly nature. The agricultural properties of the Meota-Welby soil complex are similar to those of Meota and Welby soils. The reader is, therefore, directed to the sections on agricultural properties of Meota Soils and Welby Soils.

MEOTA-WHITESAND (MeWs) SOILS

Meota-Whitesand soils are dominantly Black soils that occur on very gently to gently sloping, hummocky and very gently sloping, undulating landscapes in the western portion of the Martin municipality. They are neutral to slightly alkaline soils that have formed in a mixture of sandy (Meota) and gravelly (Whitesand) fluvial materials. They are generally stone free and have surface textures ranging from sandy loam to gravelly sandy loam.

Kinds of Meota-Whitesand Soils

Orthic Meota and orthic Whitesand are the principal kinds of Meota-Whitesand soils occurring in this municipality. They are mainly a result of the effect parent material has on soil development. The properties of each of these soils have been briefly described under Meota Soils and Whitesand Soils.

Map Units of Meota-Whitesand Soils

MeWs1 Mainly orthic Meota soils, with orthic Whitesand soils occurring randomly throughout the landscape. These soils are associated with very gently sloping, undulating and very gently to gently sloping hummocky landscapes. In some areas the fluvial sediments are thin and are underlain by glacial till (Fig. 24). This condition is indicated on the soil map by the addition of T to the map symbol (i.e. MeWs1T).

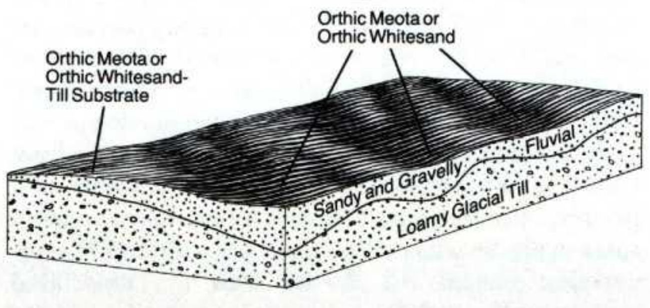


Fig. 24 Sketch of the MeWs1T map unit showing a random distribution of orthic Meota and orthic Whitesand soils, associated with a veneer of sandy and gravelly fluvial deposits over glacial till.

Agricultural Properties of Meota-Whitesand Soils

Meota-Whitesand soils are fair to poor agricultural soils of capability class 4. The agricultural properties of the orthic Meota and the orthic Whitesand soils are described under Meota Soils and Whitesand Soils, respectively.

NISBET (Nt) SOILS

Nisbet soils are dominantly Dark Gray soils that occur inextensively in the northwestern corner of the Rocanville municipality. These neutral soils have formed in sandy fluvial materials, in areas where the native vegetation was dominantly trees. Hence, the surface color of the soils is dark gray as opposed to the black surface color of the majority of soils in this municipality, reflecting the influence of trees on soil development. Surface textures range from sandy loam to loamy sand. These soils are normally stone free and are typically associated with undulating landscapes having very gentle to gentle slopes.

Kinds of Nisbet Soils

Orthic Nisbet is the principal kind of Nisbet soil that occurs in this municipality. It is mainly a reflection of the effect vegetation has on soil development.

Orthic Nisbet The orthic Nisbet soil occupies all slope positions in Nisbet landscapes in this municipality. It is a well-drained soil that is characterized by a dark-gray A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brown B horizon and a light-brown, weakly calcareous C horizon. In some lower slope positions this soil has a gray surface horizon, which is separated from the underlying B horizon by a thin, very light-gray, leached horizon. This horizon is indicative of the greater leaching that takes place in the soil, in these more moist landscape positions, under the influence of wooded vegetation. Also, these lower slope soils often have reddish spots and stains in the lower horizons, indicative of more moist conditions.

Map Units of Nisbet Soils

Nt1 This map unit consists almost entirely of orthic Nisbet soils. It is associated with undulating landscapes having very gentle to gentle slopes with low relief, and very few undrained depressions.

Agricultural Properties of Nisbet Soils

Nisbet soils are at best only fair agricultural soils of capability class 3, due to their sandy nature. Their sandy loam to loamy sand textures result in a low water-holding capacity of approximately 5 to 8 cm (2 to 3 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Their occurrence in an area of more favorable precipitation compensates slightly for the low water-holding capacity. However, their low organic matter content and sandy nature result in soils of low fertility that are not easily kept in good tilth. The potential for wind erosion is high on these soils because of their sandy texture, weak structure and low organic matter content, which make it difficult to keep a cloddy surface that is resistant to wind erosion. Tillage practices that maintain a trash cover and management practices that will maintain or increase the organic matter content of these soils are recommended. Water erosion is generally not a problem because of their high infiltration rate. Also, stones are generally not a problem although a few occur.

NISBET-MEOTA (NtMe) SOILS

Nisbet-Meota soils are dominantly a mixture of Dark Gray (Nisbet) and Black (Meota) soils that occur inextensively in the northwestern portion of the Rocanville municipality. These neutral to slightly alkaline soils have formed in sandy fluvial materials, in areas where the native vegetation was a mixture of grassland and trees. The trees normally grow in lower, more moist positions in the landscape, while the grasslands occur on higher landscape positions. Dark Gray soils have formed under the influence of the trees, while Black soils have formed in areas of grassland. Thus, these areas are complex mixtures of Black and Dark Gray soils. Surface textures range from sandy loam to loamy sand. These soils are normally stone free and are typically associated with undulating landscapes having very gentle to gentle slopes.

Kinds of Nisbet-Meota Soils

Orthic Nisbet and orthic Meota are the principal kinds of Nisbet-Meota soils that occur in this municipality. They are mainly a result of the effect vegetation has on soil development. The orthic Nisbet soil has been briefly described under Nisbet Soils, while the orthic Meota soil has been briefly described under Meota Soils.

Map Units of Nisbet-Meota Soils

NtMe1 Mainly orthic Nisbet soils on lower slopes, with orthic Meota soils on mid- and upper slopes. This map unit is associated with undulating landscapes, in which shallow channels have developed that carry excess water from the area. Slopes range from gentle to very gentle.

Agricultural Properties of Nisbet-Meota Soils

Nisbet-Meota soils are poor agricultural soils of capability class 4 due to their sandy nature. The agricultural properties of the Nisbet-Meota soil complex are similar to those of Nisbet and Meota soils, which have been discussed previously. The reader is, therefore, directed to the sections on agricultural properties of Nisbet Soils and Meota Soils.

OXBOW (Ox) SOILS

Oxbow soils are dominantly Black soils that occur extensively in all of the municipalities. These neutral to slightly alkaline soils have formed in loamy glacial till. Surface textures are mostly loam with sandy loam and clay loam textures occurring less extensively. Oxbow soils are moderately stony and have a variety of surface forms with slopes ranging from very gentle to strong.

Kinds of Oxbow Soils

Orthic, calcareous, eroded, carbonated and saline Oxbow, as well as poorly drained are the principal kinds of Oxbow soils that occur in these municipalities. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage. A better understanding of the relationship of these soils to one another in the landscape may be obtained by referring to Fig. 17 in the Introduction to Soils section of this report.

Orthic Oxbow The orthic Oxbow soil occurs on midslopes in most Oxbow landscapes. It may extend onto upper slopes in gentle landscapes and may also occur on lower slopes. In relatively level Oxbow landscapes, it occupies nearly the entire area. It is a well-drained soil with a black A horizon, 10 to 20 cm (4 to 8 in.) thick, underlain by a brownish B horizon and a grayish-colored C horizon.

Calcareous Oxbow The calcareous Oxbow soil occurs on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This results in a thinner soil with less organic matter than the orthic Oxbow soil. It has a thin, usually calcareous A horizon and may have a thin, calcareous B horizon. It has usually been affected by erosion but the extent of erosion is less than on the eroded Oxbow soil.

Eroded Oxbow The eroded Oxbow soil, as the name implies, is an Oxbow soil whose topsoil has been almost totally removed by erosion. It occurs on extreme knolls and upper slopes and can be easily recognized by its light-brown to grayish surface. It occurs most often in hummocky landscapes with moderate to strong slopes and in severely eroded areas may occupy 30% or more of the landscape.

Carbonated Oxbow The carbonated Oxbow soil occurs on lower slopes below the orthic Oxbow, frequently surrounding sloughs or poorly drained depressions. It has a highly calcareous A horizon, 15 to 25 cm (6 to 10 in.) thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have drab colors and reddish spots and stains, indicative of poor soil drainage. In some areas these soils may be affected to some degree by salinity.

Saline Oxbow The saline Oxbow soil occurs on lower slopes, often surrounding sloughs or poorly drained depressional areas and along drainage channels or gullies. It is characterized by the presence of soluble salts, usually within 50 cm (20 in.) of the surface. The salts occur as a white surface crust or as small, white specks within the soil although salts may not always be visible. It often occurs intermixed with carbonated Oxbow soils on lower slopes surrounding sloughs and has similar features, indicative of poor soil drainage.

Poorly Drained Soils Poorly drained soils occur mainly in sloughs and occasionally on the bottom of small drainage channels and low-lying depressional areas. They occur in areas which collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought.

Map Units of Oxbow Soils

Ox1 This map unit consists almost entirely of orthic Oxbow soils and is generally associated with undulating landscapes having relatively long, very gentle and gentle slopes with low relief, as shown in Fig. 25. Hummocky-ridged landscapes with long, gentle to moderate slopes occur less extensively. These areas are almost devoid of light-colored knolls and only a few poorly drained depressions occur. Dark Gray Whitewood soils occur on a few lower slopes.

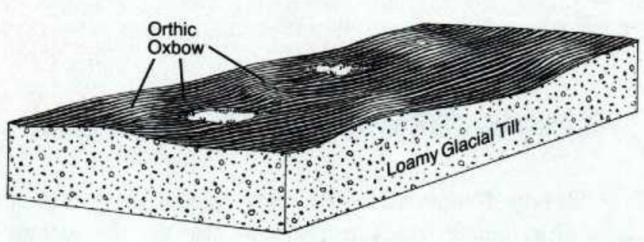


Fig. 25 Sketch of the Ox1 map unit showing the predominance of orthic Oxbow soils throughout most slope positions. These soils are associated with loamy glacial till on gently sloping undulating topography.

Ox4 Mainly orthic Oxbow soils, with calcareous and eroded Oxbow soils on knolls and upper slopes. As illustrated in Fig. 26, these soils are typically associated with hummocky landscapes having moderate to strong slopes. The orthic Oxbow soils generally occur on mid- and lower slopes, extending through depressions in many instances. In the lower slope positions, the orthic Oxbow soils usually have thicker-than-normal A horizons due to accumulations of material eroded from higher positions. Eroded knolls and infrequent undrained depressions are characteristic landscape features.

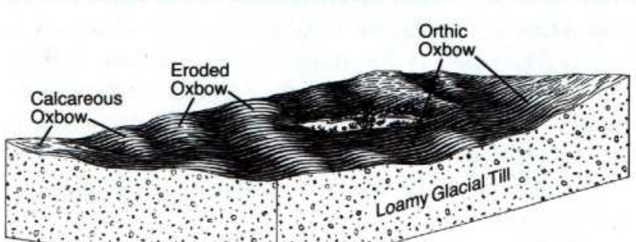


Fig. 26 Sketch of the Ox4 map unit showing calcareous and eroded Oxbow soils on knolls, orthic Oxbow soils on mid- and lower slopes. These soils are associated with loamy glacial till and moderately to strongly sloping topography.

Ox7 Mainly a mixture of orthic Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on upper slopes and knolls. It is associated with hummocky landforms with gentle slopes in which external drainage has developed so that few undrained depressions occur, as shown in Fig. 27. The calcareous soils often extend from the knolls to midslopes, while the orthic soils extend from the midslopes to lower slopes and even through most depressional areas. Occasionally, poorly drained soils occur in depressional areas and Yorkton soils occur on lower slopes in some areas.

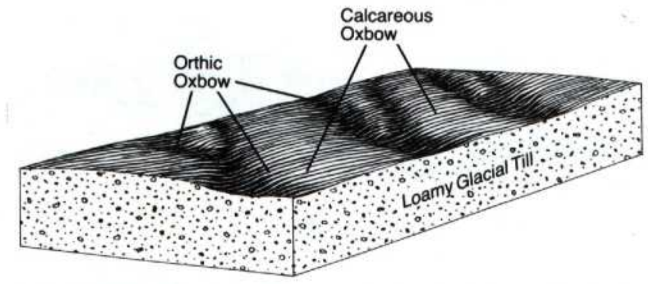


Fig. 27 Sketch of the Ox7 map unit showing calcareous Oxbow soils on knolls and upper slopes and orthic Oxbow soils on side slopes and 'draws' in dissected landscapes.

Ox8 Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes, and poorly drained soils in depressions. It is typically associated with hummocky landscapes having gentle to strong slopes, as shown in Fig. 28. The orthic Oxbow soils generally occur throughout the more gentle slopes and on mid- to lower slope positions of steeper slopes. In many areas, the orthic soils on lower slopes have thicker-than-normal surface horizons due to accumulations of material eroded from higher positions. Landscapes are characterized by light-colored knolls and numerous undrained depressions. Minor, local occurrences of saline Oxbow soils on lower slopes and in depressions are not uncommon.

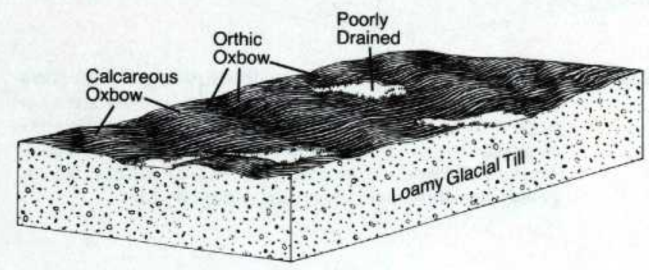


Fig. 28 Sketch of the Ox8 map unit showing calcareous Oxbow soils on knolls, orthic Oxbow soils on mid- and lower slopes and poorly drained soils in sloughs and depressions. These soils are associated with loamy glacial till on gently to moderately sloping hummocky topography.

Ox10 Mainly orthic Oxbow soils, with calcareous Oxbow soils on knolls and upper slopes. It occurs most often on undulating and hummocky landforms, as shown in Fig. 29, with gentle to strong slopes and few undrained depressions. Hummocky-ridged and dissected landscapes occur less frequently. Many areas have a network of shallow channels which provide drainage from the depressions. The orthic Oxbow soils generally occur on mid- and lower slopes, extending through depressions in many instances. In the lower slope positions the orthic Oxbow soils usually have thicker-than-normal A horizons due to accumulations of material eroded from higher positions. In some areas, a few poorly drained soils occur in undrained depressions scattered throughout the landscape. A few areas have minor, local occurrences of saline Oxbow soils on lower slopes and in depressions.

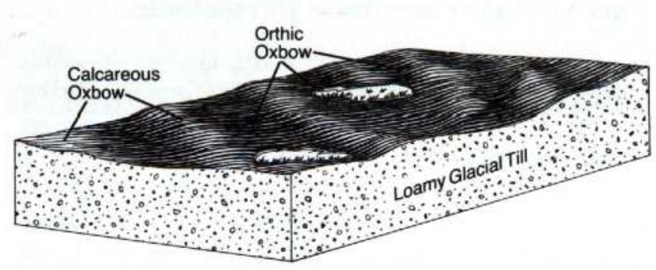


Fig. 29 Sketch of the Ox10 map unit showing calcareous Oxbow soils on knolls and upper slopes and orthic Oxbow soils on mid- and lower slopes. These soils are associated with loamy glacial till on gently to moderately sloping hummocky topography.

Ox11 Mainly a mixture of orthic and carbonated Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on knolls and upper slopes, with poorly drained soils in depressions. It is typically associated with hummocky landscapes having gentle to strong slopes (Fig. 30), but undulating landscapes with very gentle slopes and hummocky-ridged landscapes with gentle to moderate slopes are also present. Soil landscapes are similar to Ox12 soils, shown in Fig. 31, except there are not as many saline soils. In some areas soils on lower slopes have thicker-than-normal surface horizons due to accumulations of materials eroded from higher slope positions. Also, Whitewood soils occur on a few lower slopes in some areas.

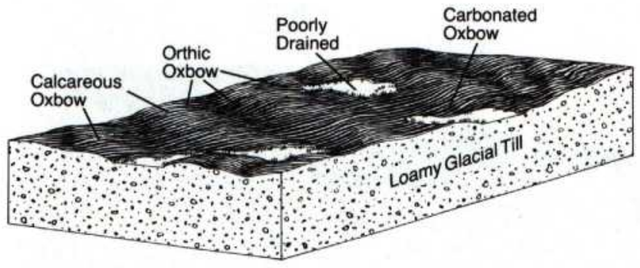


Fig. 30 Sketch of the Ox11 map unit depicting calcareous Oxbow soils on upper slopes and knolls, orthic Oxbow soils on midslopes and some lower slopes with carbonated Oxbow soils also on lower slopes and poorly drained soils in depressions. These soils are associated with loamy glacial till deposits.

Ox12 Mainly a mixture of orthic and carbonated Oxbow soils on mid- and lower slopes and calcareous Oxbow soils on knolls and upper slopes, with saline Oxbow soils on some lower slopes, and poorly drained soils in depressions. It occurs most often on hummocky landforms with gentle and occasionally moderate slopes, as shown in Fig. 31.

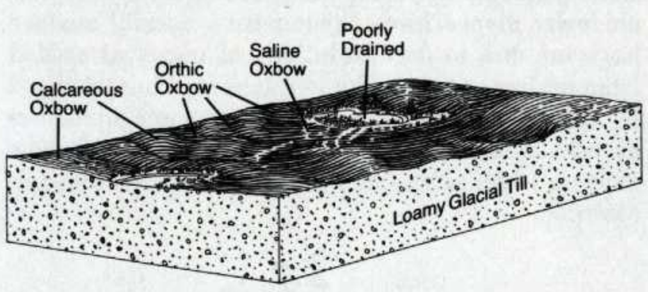


Fig. 31 Sketch of the Ox12 map unit showing calcareous Oxbow soils on upper slopes, orthic Oxbow soils on mid- and lower slopes and saline Oxbow soils surrounding poorly drained soils in depressions. These soils are associated with loamy glacial till on gently to moderately sloping topography.

Ox19 Mainly calcareous Oxbow soils, with orthic Oxbow soils on lower slopes. It is typically associated with hummocky landscapes having gentle to moderate slopes. Soil landscapes are characterized by a dominance of light-colored knolls and upper slopes on which calcareous Oxbow soils occur, and by the occurrence of only a few undrained depressions, as shown in Fig. 32. Soils on lower slopes often have thicker-than-normal surface horizons due to accumulation of materials eroded from higher slopes.

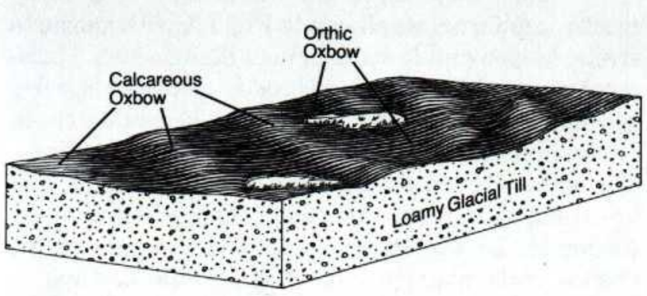


Fig. 32 Sketch of the Ox19 map unit showing calcareous Oxbow soils on knolls and upper slopes and orthic Oxbow soils on mid- and lower slopes. These soils are associated with loamy glacial till on gently to moderately sloping topography.

Agricultural Properties of Oxbow Soils

Oxbow soils, particularly the typical or orthic Oxbow soils, are good agricultural soils of capability class 2. The heavy loam texture results in a water-holding capacity of about 16 cm (6 in.) of water in the upper 1 m (3 to 4 ft.) of soil. The moderate organic matter content gives reasonably fertile soils of good tilth. Most fields require periodic clearing of stones but these are generally not a serious problem. Wind erosion has not been serious but can be expected to worsen as aspen bluffs are cleared from depressional areas. Stubble mulch tillage is recommended. Water erosion is generally not a problem except on sloping lands, particularly areas with long slopes.

Although the orthic Oxbow soils have few agricultural limitations other Oxbow soils are less productive or more difficult to farm. The calcareous Oxbow soils on knolls are locally dry because of rapid runoff, and have low nutrient reserves, particularly phosphorus. Wind and water erosion on these soils can be a serious problem if unprotected by trash covers. The eroded Oxbow soils are common on steep knolls and ridges. They are also locally dry because of the rapid runoff associated with these slopes, and have very low nutrient reserves, particularly phosphorus. They are very susceptible to wind and water erosion. Carbonated Oxbow soils may be wet in the spring and dry to a light and fluffy consistency which makes it difficult to prepare a good seedbed. However, good moisture conditions often result in the best crop being produced on these soils. Saline Oxbow soils have sufficient salinity at or near the surface to depress crop yields in most years, whereas, in the carbonated Oxbow soils, salinity may be low near the surface but sufficiently high at depth to reduce yields in dry years. Poorly drained soils, as shown in Fig. 33, are usually wet for a sufficient portion of the growing season to restrict their agricultural use to forage production. Only those in shallow depressions have a significant capability for cultivated crops. Proper management of these poorly drained soils is an important part of controlling salinity in surrounding cultivated lands. Clearing the native vegetation should only be considered where there is a good assurance that cultivated crops can successfully replace the capacity of the native plants to consume the excess surface water.

Fig. 33 Wet, poorly drained soils hinder cultivation and may lead to the formation of saline soils in many Oxbow soil areas.

OXBOW-FREMANTLE (OxFe) SOILS

Oxbow-Fremantle soils are dominantly Black soils that occur inextensively in the northwestern and southeastern portions of the Moosomin municipality. These neutral to slightly alkaline soils have formed in a mixture of loamy glacial till (Oxbow) and silty, water-modified glacial till (Fremantle). These soils occur where slight sorting of the glacial till by glacial meltwater occurred as the glacial till was deposited, leaving some of the materials in the landscape with larger proportions of silt- and with less sand- and gravel-size particles. They are associated with hummocky landscapes with gentle to moderate slopes and are similar to the Oxbow soils but are somewhat finer in texture and less stony. Surface textures range from loam to silt loam.

Kinds of Oxbow-Fremantle Soils

Orthic and calcareous Oxbow, orthic Fremantle, and poorly drained are the principal kinds of Oxbow-Fremantle soils that occur in this municipality. The properties of the Oxbow and poorly drained soils are briefly described under Oxbow Soils. The Orthic Fremantle soil is described below. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 20 in the Introduction to Soils section of this report.

Orthic Fremantle The orthic Fremantle soil usually occupies lower slopes but extends onto upper slopes in some landscapes. In some areas it also extends through the lower portion of the landscape. It is a well-drained soil with a black A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brownish-colored B horizon and a grayish-colored C horizon.

Map Units of Oxbow-Fremantle Soils

OxFe2 Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls and upper slopes, orthic Fremantle soils mainly on lower slopes but occasionally on mid- or upper slopes, and poorly drained soils in depressions. It is typically associated with hummocky landscapes having gentle to moderate slopes as illustrated in Fig. 34.

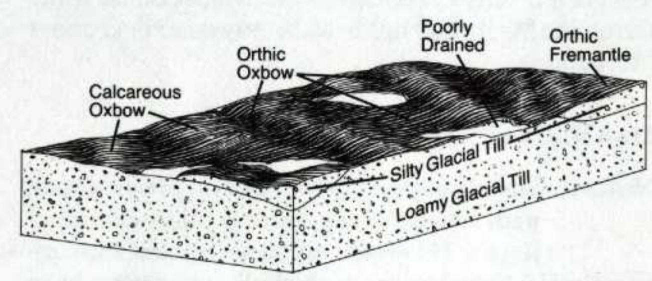


Fig. 34 Sketch of the OxFe2 map unit showing the various kinds of Oxbow and Fremantle soils that occur within this complex of silty and loamy glacial till.

OxFe4 Mainly orthic Oxbow soils on mid- and lower slopes, with calcareous Oxbow soils on knolls, and orthic Fremantle soils occurring randomly in the landscape. It is typically associated with hummocky landscapes having gentle slopes. Landscape features such as broad, light-colored knolls, smooth slopes and few undrained depressions are characteristic.

Agricultural Properties of Oxbow-Fremantle Soils

The agricultural properties of the orthic and calcareous Oxbow soils that comprise the major part of these map units have been described under Oxbow Soils. The agricultural properties of the orthic Fremantle soils are very similar to these soils. The poorly drained soils have agricultural properties similar to those described under Oxbow Soils.

OXBOW-HAMLIN (OxHm) SOILS

Oxbow-Hamlin soils are dominantly Black soils that occur in the north-central portion of the Rocanville municipality. These neutral to slightly alkaline soils have formed in a mixture of loamy glacial till (Oxbow) and loamy lacustrine materials (Hamlin). In these areas, the loamy lacustrine sediments have been deposited in the lower portions of gently to moderately sloping, hummocky morainal landscapes. The lacustrine materials are usually shallow and are always underlain by glacial till. Hamlin soils developed in these deposits are similar to Oxbow soils but occur on smoother landscapes, are somewhat lighter in texture and are less stony. Surface textures range from loam on the Oxbow soils to fine sandy loam on the Hamlin soils.

Kinds of Oxbow-Hamlin Soils

Orthic and calcareous Oxbow, and orthic Hamlin are the principal kinds of Oxbow-Hamlin soils that occur in this municipality. The properties of orthic and calcareous Oxbow soils have been described briefly under Oxbow Soils while the Orthic Hamlin soil is described below. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Orthic Hamlin The orthic Hamlin soil occurs most often on mid- and lower slopes. It is a well- to moderately well-drained soil with a black A horizon, 10 to 18 cm (4 to 7 in.) thick, underlain by a brownish B horizon and a grayish-brown C horizon.

Map Units of Oxbow-Hamlin Soils

OxHm4 Mainly orthic Oxbow soils on mid- and upper slopes, with calcareous Oxbow soils on knolls, and orthic Hamlin soils on mid- and lower slopes. These soils are typically associated with hummocky landscapes having gentle to moderate slopes. A few undrained depressions containing poorly drained soils are scattered throughout the landscape. On some lower slopes, adjacent to these depressions, carbonated Hamlin soils occur that have been affected to some degree by salinity.

Agricultural Properties of Oxbow-Hamlin Soils

Oxbow-Hamlin soils are good to fair agricultural soils of capability classes 2 and 3. The agricultural properties of the orthic and calcareous Oxbow soils that comprise the major part of the Oxbow-Hamlin map units have been described previously under Oxbow Soils, and the reader is, therefore, directed to that section of this report. The orthic Hamlin soil, with textures of loam to sandy loam has a low to moderate water-holding capacity of 8 to 14 cm (3 to 6 in.) of water in the upper 1 m (3 to 4 ft.) of soil. A moderate organic matter content gives reasonable good fertility and tilth. These soils are subject to wind and water erosion when the surface is not protected by a trash cover. Stones are rarely a problem on these soils, but a few occur in these areas because of the close proximity of the underlying glacial till.

OXBOW-MEOTA (OxMe) SOILS

Oxbow-Meota soils are dominantly Black soils that occur inextensively in the Rocanville and Spy Hill municipalities. They are neutral to slightly alkaline soils that have formed in a mixture of loamy glacial till (Oxbow) and sandy fluvial and glaciofluvial materials (Meota). In these areas, the sandy fluvial and glaciofluvial sediments have been deposited in the lower portion of gently to moderately sloping hummocky morainal landscapes. These materials are usually shallow and are always underlain by glacial till. Surface textures vary from loam on the Oxbow soils to sandy loam on the Meota soils. Stones occur mainly on the higher portions of the landscape and are largely confined to the Oxbow soils.

Kinds of Oxbow-Meota Soils

Orthic and calcareous Oxbow, orthic Meota, as well as poorly drained, are the principal kinds of Oxbow-Meota soils that occur in these municipalities. They are mainly a result of the effect topography has on redistributing precipitation and in determining soil drainage, and the effect parent material has on soil formation. The Oxbow and poorly drained soils have been briefly described under Oxbow Soils and the Orthic Meota soil under Meota Soils. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Oxbow-Meota Soils

OxMe2 Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls, orthic Meota soils on lower slopes, and poorly drained soils in depressions. These soils are typically associated with hummocky landscapes having gentle slopes and numerous undrained depressions, as shown in Fig. 35. In some areas minor amounts of soils occurring on lower slopes have been affected by salinity to some degree. These usually occur adjacent to poorly drained depressions.

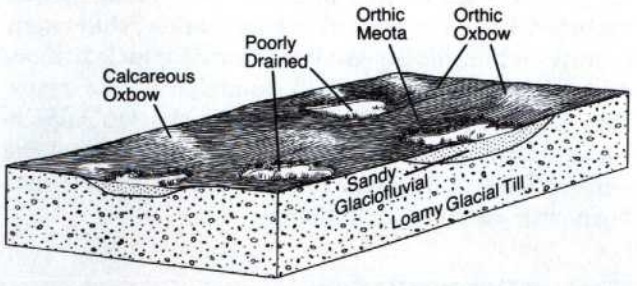


Fig. 35 **Sketch of the OxMe2 map unit showing calcareous and orthic Oxbow soils, associated with loamy glacial till, on knolls and midslopes, respectively, orthic Meota soils, associated with sandy glaciofluvial materials on lower slopes, and poorly drained soils in depressions.**

OxMe4 Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls, and orthic Meota soils on lower slopes. It is typically associated with hummocky landscapes with gentle slopes, as shown in Fig. 36, and undulating landscapes with very gentle slopes. Poorly drained soils occur in a few deeper depressions and calcareous Meota soils on a few upper slopes. On some lower slopes, surface horizons are thicker than normal due to accumulation of materials eroded from higher slope positions.

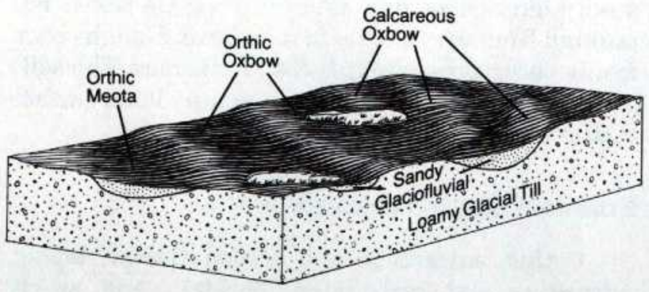


Fig. 36 **Sketch of the OxMe4 map unit showing calcareous and orthic Oxbow soils associated with loamy glacial till on knolls and midslopes, respectively, and orthic Meota soils associated with sandy glaciofluvial materials in lower slope positions.**

Agricultural Properties of Oxbow-Meota Soils

Oxbow-Meota soils are good to poor agricultural soils of capability classes 2 to 4. The agricultural properties of these soils have been described previously under Oxbow Soils and Meota Soils, respectively, and the reader is, therefore, directed to those sections of this report.

OXBOW-WELBY (OxWb) SOILS

Oxbow-Welby soils are dominantly Black soils that occur inextensively on the eastern side of the Rocanville municipality. They are neutral to slightly alkaline soils that have formed in a mixture of loamy glacial till (Oxbow) and gravelly glaciofluvial materials that have been modified by inclusions of shales (Welby). In these areas, the gravelly glaciofluvial materials have been deposited in a complex pattern with glacial till materials. They occur often in lower slope positions but also can occur in higher landscape positions. The glaciofluvial materials are usually shallow and are underlain by glacial till. Surface textures vary from loam on the Oxbow soils to sandy loam on both the Oxbow and Welby soils. Stones occur mainly on the higher portions of the landscape and are largely confined to the Oxbow soils, where stoniness ranges from moderate to excessive. They are associated with undulating landscapes with slopes ranging from very gentle to gentle. External drainage has developed in most landscapes, which carries excess water from the area, thus, sloughs occur infrequently.

Kinds of Oxbow-Welby Soils

Orthic and calcareous Oxbow, and calcareous Welby are the principal kinds of Oxbow-Welby soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and the effect parent material has on soil development. The properties of each of these soils are briefly described under Oxbow Soils and Welby Soils. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Oxbow-Welby Soils

OxWb10 Mainly calcareous Oxbow soils on mid- to upper slopes and knolls, with orthic Oxbow soils on lower slopes, and calcareous Welby soils occurring randomly in the landscape. This map unit is associated with externally drained, undulating landscapes having very gentle to gentle slopes. Orthic Welby soils occur on a few well-drained slopes, poorly drained soils occur in a few depressions, and some soils on lower slopes have been affected by salinity to varying degrees.

Agricultural Properties of Oxbow-Welby Soils

Oxbow-Welby soils are fair to poor agricultural soils of capability classes 3 and 4. Oxbow soils are normally good agricultural soils, however, many adverse soil features are present, which significantly reduce the potential of these areas. The presence of significant amounts of the gravelly Welby soils, with a low water-holding capacity and low fertility is a major factor. Also, these soils occur in an area close to the Qu'Appelle Valley in which post-glacial erosion has left a dense stone lag, particularly on upper landscape positions. These severely reduce the potential for agricultural use. Salinity of varying degrees affects some of the soils in lower landscape positions, also reducing the potential for agricultural use. Additional information on the potential of these areas may be obtained by referring to the agricultural properties of Oxbow Soils and Welby Soils, in other parts of this report.

OXBOW-WHITEWOOD (OxWh) SOILS

The Oxbow-Whitewood soils are dominantly a mixture of Black (Oxbow) and Dark Gray (Whitewood) soils that are scattered throughout the four municipalities. These neutral soils have formed in loamy glacial till where wooded vegetation has had an influence on soil development. The trees normally grow in lower, more moist positions in the landscape. In these positions the Whitewood soils have developed and can be recognized in the field by their grayish surface color (Fig. 37). The dark-colored Oxbow soils occupy the higher positions of the landscape. Oxbow-Whitewood soils are moderately stony soils with mainly loam and sandy loam surface textures, and occur mainly on hummocky landscapes that range from gentle to moderate. Inclined landscapes with gentle to strong slopes occur less frequently.

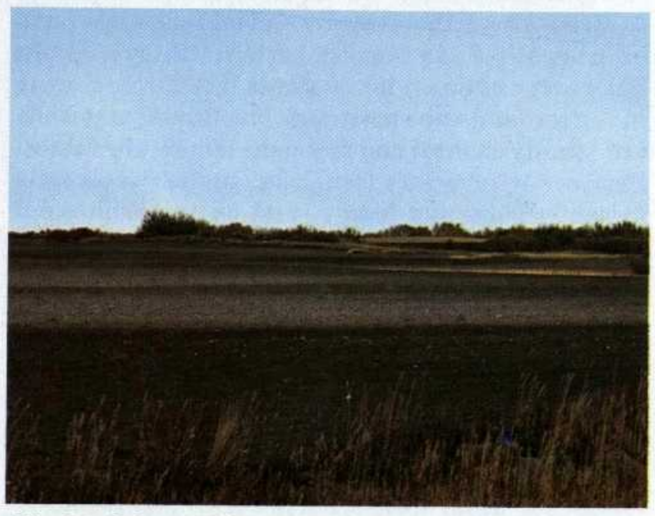


Fig. 37 **Oxbow-Whitewood soils are easily recognized in summerfallow fields by Black Oxbow soils on upper slopes, Dark Gray Whitewood soils on lower slopes and Gray soils in depressions.**

Kinds of Oxbow-Whitewood Soils

Orthic and calcareous Oxbow, orthic Whitewood, and poorly drained soils are the principal kinds of soils that occur in these areas in these municipalities. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage. The properties of each of these soils are described under Oxbow Soils and Whitewood Soils. A better understanding of the relationship of these soils to one another in the landscape may be obtained by referring to Fig. 18 in the Introduction to Soils section of this report.

Map Units of the Oxbow-Whitewood Soils

OxWh1 Mainly orthic Oxbow soils on mid- and upper slopes, with orthic Whitewood soils on lower slopes. It is typically associated with hummocky landscapes having very gentle to gentle slopes, but also occurs on externally drained, inclined landscapes with gentle slopes. Poorly drained soils occasionally occur in some depressional areas, and calcareous Oxbow soils occur on a few knolls.

OxWh2 Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls and upper slopes, orthic Whitewood soils on lower slopes, and poorly drained soils in depressions. As shown in Fig. 38, these soils are typically associated with hummocky landscapes having gentle to moderate slopes, but also occur on hummocky inclined landscapes with moderate slopes.

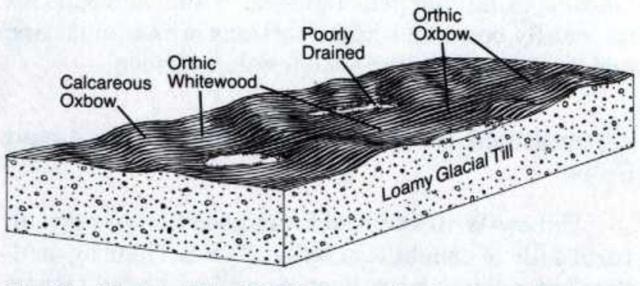


Fig. 38 **Sketch of the OxWh2 map unit showing the complex of Black Oxbow and Dark Gray Whitewood and poorly drained soils on loamy glacial till.**

OxWh4 Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on knolls and upper slopes, and orthic Whitewood soils on lower slopes. A few depressions containing poorly drained soils occur in some areas. It is typically associated with hummocky landscapes with gentle to moderate slopes. These landscapes are similar to OxWh2 soils shown in Fig. 38, except there are fewer undrained depressions and associated poorly drained soils. Eroded soils occur on steeper knolls in some areas.

Agricultural Properties of Oxbow-Whitewood Soils

Oxbow-Whitewood soils are good to fair agricultural soils of capability class 2 and 3. The agricultural properties of the orthic and calcareous Oxbow soils that comprise the major part of these map units have been described previously under Oxbow Soils. Similarly, the agricultural properties of the Orthic Whitewood soils have been described under Whitewood Soils. The poorly drained soils have agricultural properties similar to those described previously under Oxbow Soils.

OXBOW-WHITESAND (OxWs) SOILS

Oxbow-Whitesand soils are dominantly Black soils that occur in the Martin and Spy Hill municipalities. These neutral to slightly alkaline soils have formed in a mixture of loamy glacial till (Oxbow) and gravelly fluvial materials (Whitesand). In these areas, the gravelly fluvial materials have been deposited in a complex pattern with glacial till. They occur often on lower slopes but also can occur in higher landscape positions. The fluvial materials are usually shallow and are underlain by glacial till. Surface textures vary from loam on the Oxbow soils to sandy loam and loamy sand on the Whitesand soils. Stones occur mainly on the higher portions of the landscape and are largely confined to the Oxbow soils. Oxbow-Whitesand soils are typically associated with hummocky landscapes and in these municipalities slopes range from gentle to moderate.

Kinds of Oxbow-Whitesand Soils

Orthic and calcareous Oxbow, and orthic and calcareous Whitesand are the principal kinds of Oxbow-Whitesand soils that occur in these municipalities. The properties of the orthic and calcareous Oxbow have been briefly described under Oxbow Soils, while the orthic and calcareous Whitesand soils have been briefly described under Whitesand Soils. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage.

Map Units of Oxbow-Whitesand Soils

OxWs2 Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on upper slopes and knolls, orthic Whitesand soils occurring randomly over the landscape, and poorly drained soils in depressions. It is typically associated with hummocky landscapes having gentle to moderate slopes, as shown in Fig. 39.

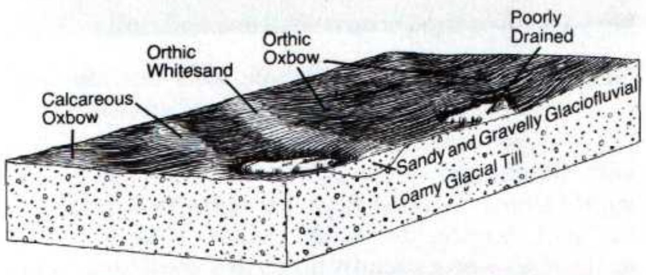


Fig. 39 Sketch of the OxWs2 map unit showing calcareous Whitesand soils on gravelly knolls and low ridges. Calcareous Oxbow soils occur on knolls and upper slopes and orthic Oxbow soils on mid- and lower slopes associated with loamy glacial till. Poorly drained soils are present in the depressions.

OxWs4 Mainly orthic Oxbow soils on midslopes, with calcareous Oxbow soils on upper slopes and knolls, and a mixture of orthic and calcareous Whitesand soils on mid- and lower slopes. They are typically associated with hummocky landscapes having gentle slopes. Whitesand soils occasionally occur in higher portions of the landscape and poorly drained soils in a few depressions.

Agricultural Properties of Oxbow-Whitesand Soils

Oxbow-Whitesand soils are good to poor agricultural soils of capability classes 2 to 4. Their agricultural properties have been described under Oxbow Soils and Whitesand Soils, and the reader is, therefore, directed to those sections of this report.

OXBOW-YORKTON (OxYk) SOILS

Oxbow-Yorkton soils are a mixture of Black (Oxbow) and Thick Black (Yorkton) soils that occur throughout the Moosomin and Spy Hill municipalities. They have formed in more moist areas of the black soil zone where soils with thicker-than-normal surface horizons have formed in much of the lower portions of the landscape. These neutral to moderately alkaline soils have formed in loamy glacial till and are primarily associated with hummocky landscapes having mainly gentle slopes but ranging from very gentle to moderate. Sloughs commonly occur throughout these landscapes. The soils are moderately stony and have mainly loam surface textures.

Kinds of Oxbow-Yorkton Soils

Orthic, calcareous and eroded Oxbow, orthic, calcareous and carbonated Yorkton, and poorly drained are the principal kinds of Oxbow-Yorkton soils that occur in these municipalities. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage. The properties of each of these soils are briefly described under Oxbow Soils and Yorkton Soils.

Map Units of Oxbow-Yorkton Soils

OxYk2 Mainly orthic Oxbow soils on mid- and upper slopes, with calcareous Oxbow soils on knolls, orthic Yorkton soils on lower slopes, and poorly drained soils in depressions. This map unit is associated with hummocky landscapes having gentle to moderate slopes and numerous undrained depressions, as shown in Fig. 40. On some lower slopes adjacent to these areas, the soils are affected to varying degrees by salinity.

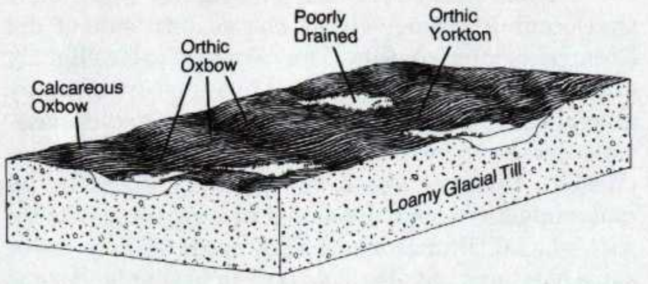


Fig. 40 Sketch of the OxYk2 map unit showing calcareous Oxbow soils on knolls, orthic Oxbow soils on mid- and upper slopes, orthic Yorkton soils on lower slopes, and poorly drained soils in sloughs and depressions. It is associated with loamy glacial till and gently to moderately sloping topography.

OxYk4 Mainly orthic Oxbow soils on mid- and upper slopes, with calcareous Oxbow soils on knolls, and a mixture of orthic and calcareous Yorkton soils on lower slopes. This map unit is associated with hummocky landscapes having slopes ranging from gentle to moderate, but in which gentle slopes dominate (Fig. 41). A few undrained depressions containing poorly drained soils occur scattered throughout the landscape and on some lower slopes adjacent to these areas, the soils are affected to varying degrees by salinity.

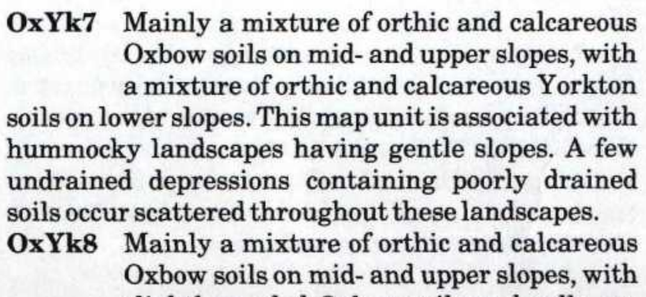


Fig. 41 Sketch of the OxYk4 map unit showing the calcareous Oxbow soils on knolls, orthic Oxbow soils on mid- and upper slopes, and a mixture of orthic and calcareous Yorkton soils on lower slopes. It is associated with loamy glacial till and gently to moderately sloping topography.

OxYk7 Mainly a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, with a mixture of orthic and calcareous Yorkton soils on lower slopes. This map unit is associated with hummocky landscapes having gentle slopes. A few undrained depressions containing poorly drained soils occur scattered throughout these landscapes.

OxYk8 Mainly a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, with slightly eroded Oxbow soils on knolls, orthic Yorkton soils on mid- and lower slopes, and poorly drained soils in depressions. This map unit is associated with hummocky landscapes having gentle to moderate slopes and numerous undrained depressions, similar to those on which OxYk2 soils occur. Light-colored knolls, however, are more prevalent in these landscapes, indicative of the eroded Oxbow soils. A few areas have minor, local occurrences of saline soils on lower slopes and in depressions.

OxYk10 Mainly calcareous Oxbow soils on mid- and upper slopes, with orthic Oxbow soils on midslopes, slightly eroded Oxbow soils on knolls, and carbonated Yorkton soils on mid- and lower slopes. This map unit is associated with an undulating and dissected landscape having very gentle to gentle slopes. Soil landscapes are characterized by an abundance of light-colored knolls and upper slopes on which slightly eroded and calcareous Oxbow soils occur, and by the absence of undrained depressions.

OxYk11 Mainly a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, with slightly eroded Oxbow soils on knolls, calcareous Yorkton soils on lower slopes, and poorly drained soils in depressions. This map unit is associated with hummocky landscapes having gentle to moderate slopes, as shown in Fig. 42. Soil landscapes are similar to those of OxYk8 soils except that they are dominated by calcareous soils.

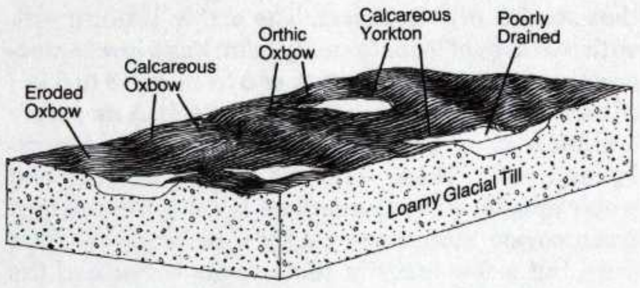


Fig. 42 Sketch of the OxYk11 map unit showing a mixture of orthic and calcareous Oxbow soils on mid- and upper slopes, slightly eroded Oxbow soils on knolls, calcareous Yorkton soils on lower slopes, and poorly drained soils in depressions. It is associated with loamy glacial till and gently to moderately sloping topography.

Agricultural Properties of Oxbow-Yorkton Soils

Oxbow-Yorkton soils are good agricultural soils of capability class 2. The loam texture results in a water-holding capacity of about 14 cm (6 in.) of water in the top 1 m (3 to 4 ft.) of soil. The thick surface horizons with moderate to high organic matter content give reasonably fertile soils of good tilth. Most fields require periodic clearing of stones but these are generally not a serious problem. Wind and water erosion have not been serious but have occurred to some extent on knolls in some landscapes. This has left these areas low in organic matter and nutrient reserves, particularly phosphorus. Attempts should be made to protect these soils from further erosion and to increase their organic matter content. Saline soils occur infrequently, however, where they do occur they have sufficient salinity at or near the surface to depress crop yields in most years. Poorly drained soils are usually wet for a sufficient portion of the growing season to restrict their agricultural use to forage production. Only those in shallow depressions have a significant capability for cultivated crops.

ROCANVILLE (Rv) SOILS

Rocanville soils are dominantly a mixture of Black and Dark Gray soils that occur inextensively along the edge of the Qu'Appelle Valley, in the Rocanville and Spy Hill municipalities. These neutral soils have formed in loamy glacial till that has been modified by the inclusion of large amounts of shale (bedrock). These soils have formed in areas in which the native vegetation was a mixture of grassland and trees. The trees normally grow in lower, more moist positions in the landscape, while the grasslands occur on higher landscape positions. Dark Gray soils have formed under the influence of the trees, while Black soils have formed in areas of grassland. Thus, these areas are complex mixtures of Black and Dark Gray soils. These are moderately stony soils with mainly loam to sandy loam surface textures. In the Rocanville municipality, they occur mainly on hummocky landscapes with gentle to moderate slopes. In the Spy Hill municipality, however, they occur on high terraces along the Qu'Appelle Valley, formed during initial stages of cutting of the valley. These terraces have an undulating surface form with mainly gentle slopes.

Kinds of Rocanville Soils

Two variations of the orthic Rocanville soil occur in these municipalities. These are the black and dark gray orthic Rocanville soils, which are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage, and the effect vegetation has on soil development. A better understanding of the relationship of these soils to one another in the landscape may be obtained by referring to Fig. 18 in the Introduction to Soils section of this report.

Orthic Rocanville The orthic Rocanville soil occurs in most landscape positions but its characteristics vary slightly with topographic position. In upper slope positions the orthic Rocanville is a well-drained soil with a black A horizon, 10 to 20 cm (4 to 8 in.) thick, underlain by a brownish B horizon and a grayish-colored C horizon. In lower slope positions, it is a moderately well-drained soil with a dark-gray A horizon, 10 to 25 cm (4 to 10 in.) thick, underlain by a brownish B horizon which usually has a distinct, angular-nutty structure. The B horizon, in turn, is underlain by a grayish-colored C horizon. In most areas, pieces of shale are often visible on the surface as well as in lower horizons of these soils.

Map Units of Rocanville Soils

Rv6 Mainly orthic Rocanville soils occurring over most of the landscape. This map unit occurs on hummocky landscapes with gentle to moderate slopes in the Rocanville municipality and on high terraces along the Qu'Appelle Valley that have an undulating surface form with gentle slopes in the Spy Hill municipality. The orthic soils on the midslope to knoll positions have dark-colored surface horizons, while those occurring in lower slope positions usually have a grayish surface color. Strongly leached soils, with light-gray surface horizons, occur on some lower slopes.

Agricultural Properties of Rocanville Soils

Rocanville soils are, for the most part, good agricultural soils of capability class 2. Their agricultural properties are much like those of the Whitewood-Oxbow soils. The loam texture results in a water-holding capacity of about 14 cm (6 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Organic matter in the dark gray orthic is slightly lower than in the black orthic, consequently nutrient levels are lower and the soils are harder to keep in good tilth. Most fields require periodic clearing of stones but these are generally not a serious problem. Wind erosion has not been serious but tillage practices that maintain a trash cover and a cloddy surface are recommended. Similarly, water erosion has not been serious, but, because of the topographic position of these soils in the Spy Hill municipality, they are susceptible to erosion by water, particularly near the edges where the landscape drops sharply into the Qu'Appelle Valley. Cultivation practices that leave a cloddy, open surface which promotes maximum infiltration of water should be utilized.

ROCANVILLE-SYLVITE (RvSv) SOILS

Rocanville-Sylvite soils are dominantly a mixture of Dark Gray (Rocanville) and Black (Sylvite) soils that occur inextensively along the Qu'Appelle Valley in the north-central portion of the Rocanville municipality. These neutral to slightly alkaline soils have formed in a mixture of loamy glacial till that has been modified by the inclusion of large amounts of shale (Rocanville) and shallow, sandy to loamy, shaly fluvial and lacustrine sediments that are underlain by shale or shaly glacial till (Sylvite). These soils have also formed in areas in which the native vegetation was a mixture of grassland and trees. Consequently, these areas are a mixture of Black and Dark Gray soils. Surface textures range from loam to sandy loam. The Rocanville soils are moderately stony, while varying degrees of stoniness are associated with Sylvite soils. Consequently, surface stones vary from none or very few to moderate amounts. These soils are typically associated with undulating landscapes, some of which are externally drained by shallow channels. Slopes range from very gentle to gentle in some areas, and gentle to moderate in others.

Kinds of Rocanville-Sylvite Soils

Orthic Rocanville and orthic Sylvite are the principal kinds of Rocanville-Sylvite soils occurring in this municipality. They are mainly a result of the effect parent material and vegetation have on soil development. The orthic Rocanville soil has been briefly described under Rocanville Soils, while the orthic Sylvite soil is briefly described under Sylvite Soils.

Map Units of Rocanville-Sylvite Soils

RvSv1 Mainly orthic Rocanville soils on mid- and upper slopes, with orthic Sylvite soils on mid- and lower slopes. This map unit is associated with both undulating and hummocky landscapes, some of which are externally drained by shallow channels. Slopes range from very gentle to gentle in some areas to gentle to moderate in others. Slightly eroded Rocanville soils occur on some of the higher knolls and poorly drained soils occur in some of the deeper depressions, in the rougher hummocky landscapes. Strongly leached soils occur in some of the shallow depressions of the undulating landscapes.

Agricultural Properties of Rocanville-Sylvite Soils

The Rocanville soils, which occupy a major portion of these areas are good agricultural soils of capability class 2, while the Sylvite soils, which occupy a lesser portion of these areas, are only fair agricultural soils of capability class 3. The agricultural properties of each of these soils are briefly described under Rocanville Soils and Sylvite Soils, respectively. The reader is, therefore, directed to the sections on agricultural properties of the above-mentioned soils.

RUNWAY (Rw) SOILS

Runway soils occur throughout these municipalities and are formed in various deposits associated with the sides and bottoms of shallow drainage channels, as shown in Fig. 43. This group of neutral to slightly alkaline soils range from weakly developed to poorly drained. They are associated with dissected landscapes and thus surface textures and amount of stone are extremely variable.

Agricultural Properties of Runway Soils

Runway soils are usually nonarable in that the bottom lands are poorly drained and the side slopes are usually too steep to permit cultivation. A few areas where slopes permit crossing with field implements have some potential for cultivation. As well, many areas will have little potential for grazing land as they occur as narrow strips cutting through cultivated areas. Where they are large enough to be fenced, they do have some value as pasture land depending upon steepness of slope, density of tree cover and availability of water.

RUNWAY-WELBY (RwWb) SOILS

Runway-Welby soils are dominantly a mixture of weakly developed and poorly drained soils (Runway) and Black soils (Welby) that occur inextensively in the northeastern corner of the Rocanville municipality. These neutral to slightly alkaline soils have formed in a mixture of variable deposits associated with shallow drainage channels and gullies (Runway) and gravelly fluvial materials that have been modified by inclusions of shale (Welby). These soils occur along the Qu'Appelle Valley, in areas where erosion of the gravelly fluvial materials in the Welby Sand Plain occurred as the valley was being cut, leaving a very gently to gently sloping, eroded, undulating fluvial plain, with numerous shallow drainage channels. The present-day Runway soils of this complex area have formed in these channels. Surface textures are variable but are dominantly sandy loam. Stones are numerous, with stoniness ranging from moderately stony or very stony on the Welby soils to excessively stony on the Runway soils.

Kinds of Runway-Welby Soils

Weakly developed Runway, orthic and calcareous Welby, and poorly drained are the principal kinds of Runway-Welby soils that occur in this municipality. They are mainly a result of the effect topography has on redistributing precipitation and determining soil drainage, and the effect parent material has on soil development. The weakly developed Runway soil and poorly drained soils are briefly described below, while the orthic and calcareous Welby soils are briefly described under Welby Soils.

Weakly Developed Runway The weakly developed Runway soil occurs along the sides of the drainage channels. It is characterized by a lack of soil development, due primarily to erosion but also to its slope position which allows little water to enter the soil. Soil profiles feature a thin, dark-colored A horizon underlain by variable brownish-colored, sandy and gravelly materials.

Poorly Drained Soils Poorly drained soils occur mainly along the bottoms of the shallow drainage channels. These areas collect runoff from snowmelt, and usually remain wet or flooded for much of the growing season. They are characterized by relatively thick, dark-colored A horizons and drab subsurface colors that are often dotted with red spots and streaks.

Map Units of Runway-Welby Soils

RwWb1 Mainly a mixture of poorly drained soils on channel bottoms and weakly developed Runway soils on channel sides, with orthic Welby soils on mid- and upper slopes, and calcareous Welby soils on upper slopes and knolls. This map unit is associated with very gently to gently sloping, undulating landscapes in which numerous shallow drainage channels have been cut. Many of these drainage channels have been partially filled with sediment and will only carry water out of the area when water levels are high. Thus, most retain some water and remain wet for much of the growing season. Salinity of varying degrees is associated with the poorly drained soils in some areas.

Agricultural Properties of Runway-Welby Soils

Runway-Welby soils are poor agricultural soils of capability classes 4 and 5. The Runway soils in this complex are affected by excess wetness and salinity and have no potential for arable agriculture. However, they do have a potential as areas of natural grazing, in that they provide easy access to water and usually produce adequate stands of grasses. Some areas that do not remain wet for the whole of the growing season may have some potential for hay production. The areas of Welby soils occur as narrow strips between the poorly drained areas of Runway soils. Areas that are large enough do have a limited potential for arable agriculture, however, these are marginal and, at best, can be considered only as areas for forage production. Their use for cereal production is limited by all the adverse features of gravelly soils such as droughtiness, low fertility and susceptibility to wind erosion, as described under the agricultural properties of Welby Soils.

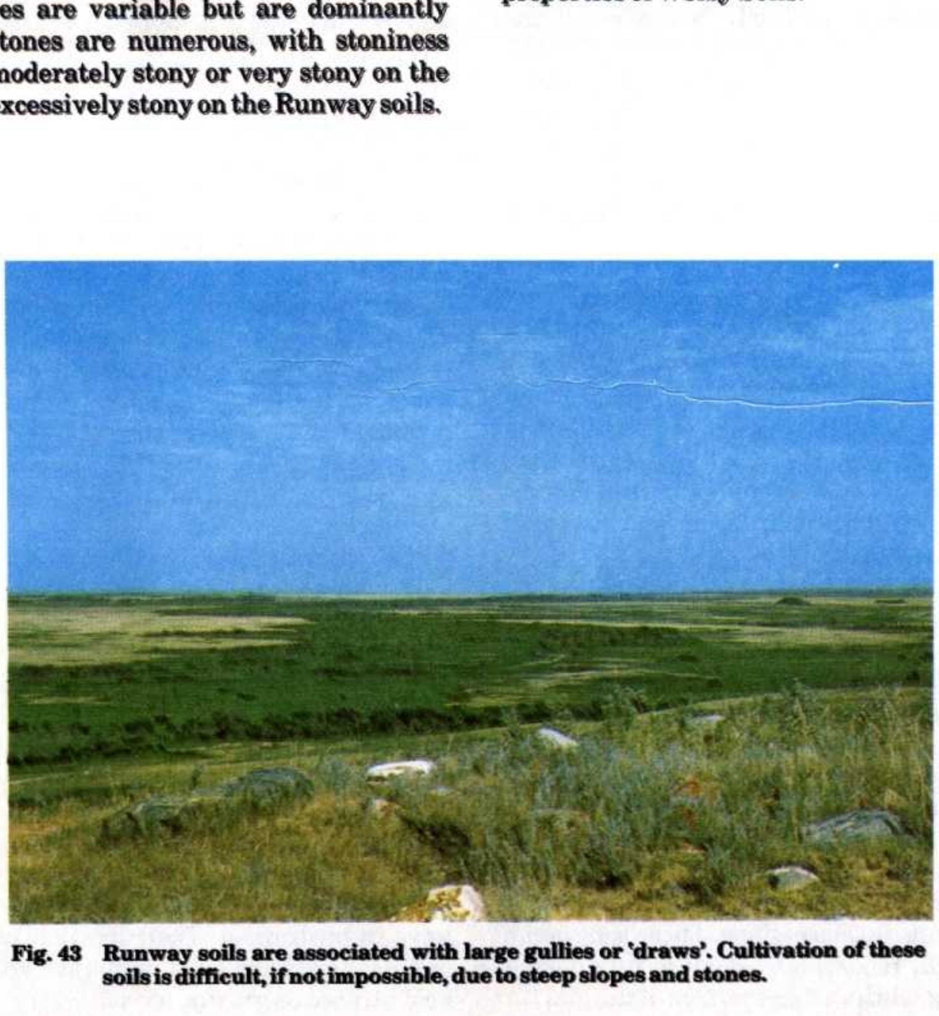


Fig. 43 Runway soils are associated with large gullies or 'draws'. Cultivation of these soils is difficult, if not impossible, due to steep slopes and stones.

SWIFT CREEK (Sf) SOILS

Swift Creek soils are dominantly Black soils that occur inextensively in the Moosomin, Martin and Spy Hill municipalities. These neutral to slightly alkaline soils have formed in a complex mixture of sandy and gravelly glaciofluvial materials and stony, eroded glacial till that occur along stream channels (Fig. 44). They are the result of erosion by glacial meltwaters and are primarily associated with dissected landscapes. Slopes are variable and range from gentle to steep. Surface textures are also variable ranging from sandy loam and gravelly sandy loam to loam. Stones are always present in these soils, with some areas excessively stony.

Kinds of Swift Creek Soils

Orthic, calcareous, carbonated, eroded and saline Swift Creek, as well as poorly drained, are the principal kinds of Swift Creek soils that occur in these municipalities. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage.

Orthic Swift Creek The orthic Swift Creek soil occurs on midslopes in most Swift Creek landscapes but may extend through the lows in some areas as well as onto upper slopes. It is a well-drained soil with a black A horizon of variable thickness due to extremes of erosion and deposition. The A horizon is underlain by a brown-colored B horizon, which in turn is underlain by a light-colored C horizon.

Calcareous Swift Creek The calcareous Swift Creek soil occurs on upper slopes and knolls where runoff reduces the amount of water entering the soil, resulting in a thinner soil with less organic matter than the orthic Swift Creek soil. It has a thin, usually calcareous A horizon and may have a thin, calcareous B horizon. It usually has been affected by erosion, but to a lesser extent than the eroded Swift Creek soil.

Carbonated Swift Creek The carbonated Swift Creek soil occurs on lower slopes below the orthic Swift Creek soil and frequently occurs around sloughs or poorly drained depressions. It has a highly calcareous A horizon that is 15 to 25 cm (6 to 10 in.) thick, underlain by a highly calcareous B or C horizon. The B and C horizon often have drab colors and reddish spots and stains, indicative of poor soil drainage.

Eroded Swift Creek The eroded Swift Creek soil is a shallow soil whose topsoil has been partially or totally removed by erosion. It occurs on extreme knolls and upper slopes and can be easily recognized in the landscape by its light-brown to grayish surface color.

Saline Swift Creek The saline Swift Creek soil occurs on lower slopes, often surrounding sloughs or poorly drained depressional areas and along drainage channels or gullies. It is characterized by the presence of soluble salts, usually within 50 cm (20 in.) of the surface. The salts occur as a white surface crust or as small, white specks within the soil although salts may not always be visible. It often occurs intermixed with carbonated Swift Creek soils on lower slopes surrounding sloughs and has similar features, indicative of poor soil drainage.

Poorly Drained Soils Poorly drained soils occur mainly in sloughs, on the bottom of small, intermittent drainage channels and in other low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt and usually remain wet for much of the growing season. They have relatively thick, dark-colored A horizons and drab subsurface colors that are often dotted with red spots and streaks.

Map Units of Swift Creek Soils

Sf1 Mainly orthic Swift Creek soils on mid- and lower slopes, with calcareous and eroded Swift Creek soils on knolls and steeper slopes. It is typically associated with dissected landscapes that have slopes ranging from very gentle to steep. Poorly drained soils occur in a few depressions and intermittently in stream channels.

Sf2 Mainly orthic Swift Creek soils on midslopes, with a mixture of calcareous and slightly eroded Swift Creek soils on knolls and steeper slopes, and poorly drained soils in depressions and intermittent stream channels. It is typically associated with hummocky dissected landscapes that have very gentle to steep slopes. Salinity occurs sporadically in some areas in association with poorly drained soils.

Sf3 Mainly a mixture of orthic Swift Creek soils on mid- and upper slopes and saline and carbonated Swift Creek soils on lower slopes, with poorly drained soils in depressions. These soils occur on very gently to moderately sloping, undulating landscapes in the southwestern portion of the Martin municipality.

Fig. 44 Swift Creek soils consist of a complex mixture of sandy and gravelly glaciofluvial materials and stony, eroded glacial till that occur along stream channels.

Agricultural Properties of Swift Creek Soils

Some Swift Creek soils are fair to poor agricultural soils of capability classes 3 and 4, whereas others, considered to be unsuitable for sustained cultivation, are capability class 5. Their sandy textures result in low water-holding capacities of only 10 to 12 cm (4 to 5 in.) of water, or less, in the upper 1 m (3 to 4 ft.) of soil. Those characterized by gravelly subsurface textures are very droughty. Their low to moderate organic matter content and sandy nature result in soils of low to moderate fertility that are not easily kept in good tilth. Most fields will require periodic clearing of stones and, in some instances, stones are a serious handicap to cultivation. These soils are susceptible to both wind and water erosion because of their sandy nature, weak structure and dissected landscapes in which they occur. Tillage practices that maintain a trash cover and that will maintain or increase the organic matter content of these soils are recommended. Poorly drained soils are usually wet for all or a sufficient portion of the growing season to restrict their agricultural use. Many have little or no value for agriculture while others have only a limited potential as areas for forage production.

SEDGE PEAT (SP) SOILS

Sedge Peat soils are organic soils that occur in the southeast corner of the Spy Hill municipality. These soils have developed from the partially decayed residues of plants that have accumulated on very wet portions of the Qu'Appelle River floodplain and in other tributaries. Except for scattered willows and other shrubs, these areas have a vegetative cover of cattails, rushes, sedges, reeds and other grasses. The peat is derived from the accumulation of this vegetative material and is usually saturated at or near the surface. The deposits are mostly less than 1 m (3 to 4 ft.) thick with very little decomposition of the material having occurred. The surface of these deposits is usually level but there is a strong, hummocky micro-relief.

Kinds of Sedge Peat Soils

Fibric Sedge Peat is the principal kind of Sedge Peat soil that occurs in this municipality.

Fibric Sedge Peat The fibric Sedge Peat soil occurs throughout all areas of Sedge Peat soils. It is characterized by an accumulation of relatively undecomposed organic materials derived mainly from sedges and grasses. Decomposition of the materials has been limited to the extent that the fibric materials are readily identifiable as to their origin.

Map Units of Sedge Peat Soils

SP1F Mainly fibric Sedge Peat soils less than 1 m (3 to 4 ft.) thick. It is associated with level organic landscapes that have a strong, hummocky micro-relief. A few poorly drained mineral soils occur near the edges or as islands in most areas of these soils.

Agricultural Properties of Sedge Peat Soils

Sedge Peat soils are extremely wet soils. In their natural state they have no use other than as native grazing areas. To be used as arable soils they would have to be drained. Their location in a river valley makes this difficult or impractical and thus they are best utilized as grazing areas.

SYLVITE (Sv) SOILS

Sylvite soils are dominantly Black soils that occur in central portions of the Rocanville and northwestern portion of the Moosomin municipality. These neutral to slightly alkaline soils have formed in shallow, sandy to loamy, shaly fluvial and lacustrine materials, underlain by shale or shaly glacial till. Surface textures range from sandy loam to loam. Varying degrees of stoniness are associated with these soils. A dense stone lag was left on the severely eroded surface of the underlying glacial till. Consequently, in areas where the overlying fluvial and lacustrine materials are thin, stones, often large in size, are a hindrance to cultivation. These soils are associated with undulating and hummocky landscapes having very gentle to moderate slopes.

Kinds of Sylvite Soils

Orthic, calcareous, carbonated and saline Sylvite, as well as poorly drained, are the principal kinds of Sylvite soils occurring in these municipalities. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage.

Orthic Sylvite The orthic Sylvite soil occurs on mid- and upper slopes. It is a well- to moderately well-drained soil with a black A horizon, 12 to 20 cm (5 to 8 in.) thick, underlain by a brownish or grayish-brown B horizon and a calcareous, brownish-colored C horizon. In some areas, the lower horizons are dotted with reddish spots and streaks indicative of impeded drainage caused by the less permeable underlying glacial till or shale.

Calcareous Sylvite The calcareous Sylvite soil occurs on mid- and upper slopes in landscapes where no orthic Sylvite soils occur. It is a moderately well-drained soil with a black A horizon, 10 to 20 cm (4 to 8 in.) thick, underlain by a calcareous, grayish-brown B horizon and a calcareous, brownish-colored C horizon. It occurs in landscapes where internal soil drainage is such that carbonates are not leached from the soil. Lower horizons are occasionally dotted with reddish spots and streaks indicative of impeded soil drainage.

Carbonated Sylvite The carbonated Sylvite soil occurs in lower and some depressional slope positions. It is a moderately well- to imperfectly drained soil. It has a highly calcareous A horizon that is 15 to 25 cm (6 to 10 in.) thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have reddish spots and stains, indicative of impeded soil drainage.

Saline Sylvite The saline Sylvite soil occurs on lower slopes, often surrounding sloughs or poorly drained depressional areas. It is characterized by the presence of soluble salts, usually within 50 cm (20 in.) of the surface. The salts occur as a white surface crust or as small, white specks within the soil although salts may not always be visible. It often occurs intermixed with carbonated Sylvite soils on lower slopes surrounding sloughs and has similar features, indicative of poor soil drainage.

Poorly Drained Soils Poorly drained soils occur mainly in sloughs and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during prolonged dry periods. They usually have relatively thick, dark-colored surface horizons, indicative of a high organic matter content, however, some that are arable have light-colored surface horizons indicative of a low organic matter content caused by leaching.

Map Units of Sylvite Soils

Sv1 This map unit consists almost entirely of orthic Sylvite soils. It is associated with a hummocky landscape having moderate slopes. There are, however, some calcareous and eroded Sylvite soils on the upper slopes and knolls throughout the area. There are also a few poorly drained soils in some of the depressional areas.

Sv2 Mainly orthic Sylvite soils on mid- and upper slopes, with carbonated Sylvite soils on lower slopes and in depressions. This map unit is associated with undulating, sometimes dissected, landscapes having very gentle or gentle slopes. Poorly drained soils occur in a few undrained depressions scattered throughout the landscape and saline soils are associated with a few of the carbonated soils, particularly those surrounding poorly drained areas.

Sv3 Mainly calcareous Sylvite soils on mid- and upper slopes, with saline Sylvite soils on some lower slopes, and poorly drained soils in depressions. This map unit is associated with undulating landscapes having very gentle slopes. Orthic Sylvite soils occur on a few upper slopes.

Agricultural Properties of Sylvite Soils

Sylvite soils are fair to poor agricultural soils of capability classes 3 and 4. Their variable texture results in a wide variation in water-holding capacity over the landscape, ranging from approximately 8 to 14 cm (3 to 6 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Their low to moderate organic matter content and sandy nature result in soils of low fertility and weak structures which increase the susceptibility to wind erosion. Tillage practices that maintain a trash cover and management practices that will increase the organic matter content are recommended. Water erosion is generally not a problem because of their relatively high infiltration rates and the smooth, nearly level landscapes on which they occur. Salinity in some areas is a problem because sufficient salts occur at or near the surface to depress crop yields in most years. Stones are also a hindrance to cultivation both in terms of numbers and size of stones. Some areas are sufficiently stony that cultivation is very difficult or impossible. Poorly drained soils are usually wet for a sufficient portion of the growing season to restrict their agricultural use. Some of those that are periodically arable are very low in organic matter, which results in difficulty in preparing a good seedbed and in seedling emergence.

TANTALLON (Ta) SOILS

Tantallon soils are a mixture of Dark Gray and Dark Gray Solonetzic soils that occur inextensively in the Qu'Appelle Valley in the southern portion of the Spy Hill municipality and southeast of Tantallon in the Rocanville municipality. These neutral to slightly acidic soils have formed in clayey materials derived from the weathering of bedrock shales left exposed in the valley. They occur on gently sloping aprons that extend from the base of the steep valley side to the floodplain of the river. All areas are externally drained, thus poorly drained depressions do not occur. Surface textures range from clay loam to clay. These soils are normally stone free, however, a few may occur in areas adjacent to the steep valley sideslopes.

Kinds of Tantallon Soils

Orthic, weakly developed and strong solonetzic Tantallon are the principal kinds of Tantallon soils that occur in these municipalities. They are mainly a result of the effect of drainage on soil development.

Orthic Tantallon The orthic Tantallon soil occurs scattered throughout the landscape, but often occurs on slightly higher landscape positions. It is a moderately well-drained soil with a dark-gray surface horizon underlain by a similarly colored B horizon that can be identified by its distinct angular-nutty structure, particularly when it is dry. This horizon is, in turn, underlain by a dark-colored C horizon composed of partially weathered shale.

Weakly Developed Tantallon The weakly developed Tantallon soil occurs mainly in parts of the landscape that are actively eroding as well as in areas receiving eroded materials. It is characterized by a lack of soil development and consists primarily of a dark-gray surface horizon (in most areas this is simply the plow-layer) underlain by dark-colored, partially weathered shale.

Strong Solonetzic Tantallon The strong solonetzic Tantallon soil also occurs scattered throughout the landscape but its development is strongest in slightly lower landscape positions. It is a moderately well-drained soil with a dark-gray surface horizon underlain by a B horizon that is characterized by a very tough, impervious, column-like structure with a distinct, rounded top. This structure is most evident in uncultivated areas as tillage has destroyed the rounded top of the columns, in most areas, but the very tough, impervious structure of the B horizon is still evident, particularly when the soil is dry. The B horizon is then underlain by a dark-colored C horizon composed of partially weathered shale.

Map Units of Tantallon Soils

Ta1 Mainly strong solonetzic Tantallon soils occurring over most of the landscape. This map unit is associated with gently sloping aprons in the Qu'Appelle Valley. Some of the best examples of the undesirable structure of these soils occur in these areas.

Ta2 Mainly strong solonetzic Tantallon soils, with a mixture of orthic Tantallon soils on some upper slopes and weakly developed Tantallon soils in areas of erosion and deposition. This map unit is associated with gently sloping aprons in the Qu'Appelle Valley. The strong solonetzic Tantallon soils occur throughout the landscape but occur less frequently on the upper and lower portions of the aprons.

Agricultural Properties of Tantallon Soils

Tantallon soils are only fair agricultural soils of capability class 3. Clay and heavy clay textures result in a high water-holding capacity of 21 to 23 cm (8 to 9 in.) of water in the top 1 m (3 to 4 ft.) of soil, however, there are many problems associated with these soils that contribute to low yields. Poor soil structure makes seedbed preparation difficult and also interferes with root penetration. Soil salinity associated with the strong solonetzic Tantallon soils reduces crop yields significantly in some areas. Wind erosion is not usually a problem, however, water erosion can be a problem because of the long uniform slopes and slow infiltration rates. They are also relatively low in organic matter. Cultural practices that will increase organic matter contents, such as the frequent inclusion of forages in crop rotations, will help to reduce structural problems and improve fertility.

TANTALLON-ELLISBORO (TaEb) SOILS

Tantallon-Ellisboro soils are a mixture of Dark Gray and Dark Gray Solonetzic soils (Tantallon) and Black soils (Ellisboro) that occur inextensively in the area where Scissors Creek enters the Qu'Appelle Valley in the Rocanville municipality. These neutral to slightly acidic soils have formed in a mixture of clayey materials derived from the weathering of bedrock shales (Tantallon) and variable-textured alluvial materials that have been washed into the valley (Ellisboro). This complex mixture of materials have formed aprons and fans along the base of the valley sides by the deposition and mixing of materials washed into the valley by creeks and other tributaries, with bedrock shales exposed in the valley. Surface textures vary from loam on the Ellisboro soils to clay loam or clay on the Tantallon soils. These soils are usually stone free, however, a few stones may occur throughout and often occur near the base of the steep valley sides. Landscapes are characterized by long, uniform, very gentle to gentle slopes, extending from the base of the valley side to the floodplain of the river, as shown in Fig. 11. These slopes may be cut by an erosion channel that extends from the apex of the fan or apron to the Qu'Appelle River.

Kinds of Tantallon-Ellisboro Soils

Orthic and solonetzic Tantallon and orthic Ellisboro are the principal kinds of Tantallon-Ellisboro soils that occur in this municipality. They are mainly a result of the effect of drainage and parent material on soil development. The orthic and solonetzic Tantallon soils are briefly described below while the orthic Ellisboro has been briefly described under Ellisboro Soils.

Orthic Tantallon The orthic Tantallon soil occurs scattered throughout the landscape, but often occurs on slightly higher landscape positions. It is a moderately well-drained soil with a dark-gray surface horizon, 8 to 12 cm (3 to 5 in.) thick, underlain by a similarly colored B horizon that can be identified by its distinct angular-nutty structure, particularly when it is dry. This horizon is, in turn, underlain by a dark-colored C horizon composed of partially weathered shale.

Solonetzic Tantallon The solonetzic Tantallon soil also occurs scattered throughout the landscape but most often occurs in slightly lower landscape positions. It is a moderately well-drained soil with a dark-gray surface horizon, 5 to 10 cm (2 to 4 in.) thick, underlain by a B horizon with a tough impervious angular-nutty structure. The B horizon is then underlain by a dark-colored C horizon composed of partially weathered shale. Under moist soil conditions, it is often difficult to distinguish this soil from the orthic Tantallon soil in the field, however, under dry soil conditions the structure in the B horizon is much more distinct and the peds are much harder in the solonetzic Tantallon.

Map Units of Tanallon-Ellisboro Soils

TaEb1 Mainly orthic Tantallon soils, with solonetzic Tantallon soils on some lower slopes, and orthic Ellisboro soils on upper slopes and knolls. This map unit is associated with very gently to gently sloping aprons in the Qu'Appelle Valley. The orthic Tantallon soils occur throughout the landscape but less frequently on the upper portions of the aprons. The solonetzic Tantallon soils occur most often in slight depressions in the landscape or nearer the bottom of the aprons. The orthic Ellisboro soils occur most frequently near the upper portions of the fans where deposition of eroded materials is greatest.

Agricultural Properties of Tantallon-Ellisboro Soils

Tantallon soils are only fair agricultural soils of capability class 3, while Ellisboro soils are good agricultural soils of capability class 2. The agricultural properties of each of these soils have been discussed previously under Tantallon Soils and Ellisboro Soils, respectively. The reader is, therefore, directed to the section on agricultural properties of the above-mentioned soils.

WELBY (Wb) SOILS

Welby soils are dominantly Black soils that occur in the northeastern portion of the Rocanville municipality. These neutral to slightly alkaline soils have formed in gravelly fluvial materials that have been modified by inclusions of shale. Surface textures range from sandy loam to loamy sand. Stoniness is extremely variable, ranging from almost nonstony in some areas to excessively stony in others. Welby soils occur adjacent to the Qu'Appelle Valley in portions of the Welby Sand Plain that were subject to various degrees of erosion as the valley was being cut. Consequently, they occur on a variety of landforms. Slopes are mainly gentle, but range from very gentle to moderate.

Kinds of Welby Soils

Orthic and calcareous Welby are the principal kinds of Welby soils that occurs in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage.

Orthic Welby The orthic Welby soil occurs on mid- and lower slope positions. It is a rapidly drained soil with a black A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brown B horizon and a lighter-colored, weakly calcareous C horizon. The C horizon is often much more gravelly than either the A or B horizon.

Calcareous Welby The calcareous Welby soil occurs on upper slopes and knolls. It is also rapidly drained and is similar to the orthic Welby except that the A and B horizons are thinner and carbonates are present in the B horizon and often in the A horizon. A lower organic matter content and the presence of carbonates in the A horizon often result in these soils having a much lighter surface color in cultivated fields than the surrounding orthic Whitesand soils.

Map Units of Welby Soils

Wb1 Mainly orthic Welby soils occurring throughout the landscape. This map unit occurs on a variety of landforms with slopes ranging from gentle to very gentle.

Wb2 Mainly orthic Welby soils on mid- and lower slopes, with calcareous Welby soils on upper slopes and knolls. This map unit is associated with hummocky landscapes in which shallow external drainage channels have developed. Slopes range from gentle to moderate. In some areas Oxbow soils developed in glacial till occur on a few knolls.

Agricultural Properties of Welby Soils

Welby soils are poor agricultural soils, predominantly of capability class 4. This is due to their gravelly nature. Their sandy loam to loamy sand surface textures, coupled with gravelly subsurface textures, result in a very low water-holding capacity of less than 5 cm (2 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Thus, they are very droughty. Their low organic matter content and low inherent fertility also contribute to the low potential that these soils have for the production of annual crops. They are also highly susceptible to wind erosion due to their very sandy texture and weak structure, which makes it difficult to keep a cloddy surface that is resistant to wind erosion. Tillage practices that maintain a trash cover and management practices that will maintain or increase organic matter, such as the frequent inclusion of forages in crop rotations, are recommended where these soils are cultivated. Water erosion is not a problem on these soils because of their high infiltration rate. Stones vary considerably from one area to another and even within the same area of Welby soils. Some areas are nearly stone free while others have sufficient stones to require periodic removal if the soils are to be cultivated, and others are too stony to permit cultivation. At best, these soils are marginal for arable crops, with many areas best utilized for forage production or native grazing.

WELBY-MEOTA (WbMe) SOILS

Welby-Meota soils are dominantly Black soils that occur inextensively along the side of the Qu'Appelle Valley south of Tantallon. They are neutral to slightly alkaline soils that have formed in a mixture of gravelly fluvial materials that have been modified by inclusions of shale (Welby) and sandy fluvial (Meota) materials. In these areas the sandy and gravelly sediments occur intermixed, but in general the sands occur in lower landscape positions. In the Rocanville municipality, these soils occur on a high terrace of the Qu'Appelle Valley. Slopes range from very gentle to gentle. Surface textures vary from sandy loam to loamy sand. Stoniness varies from nearly nonstony on the Meota soils to moderately stony on the Welby soils.

Kinds of Welby-Meota Soils

Orthic Welby and orthic Meota are the principal kinds of Welby-Meota soils that occur in this municipality. They are mainly a result of the effect of parent material on soil development. The orthic Welby soil has been briefly described under Welby Soils, while the orthic Meota soil has been briefly described under Meota Soils.

Map Units of Welby-Meota Soils

WbMe1 Mainly orthic Welby soils, with orthic Meota soils occurring randomly in the landscape. This map unit is associated with a very gently to gently sloping terrace along the side of the Qu'Appelle Valley.

Agricultural Properties of Welby-Meota Soils

Welby-Meota soils are poor agricultural soils of capability class 4 because of their gravelly-sandy nature. The agricultural properties of each of these soils have been discussed previously under Welby Soils and Meota Soils, respectively. The reader is, therefore, directed to the section on agricultural properties of the above-mentioned soils.

WELBY-OXBOW (WbOx) SOILS

Welby-Oxbow soils are dominantly Black soils that occur inextensively in the northeastern portion of the Rocanville municipality. These neutral to slightly alkaline soils have formed in a mixture of gravelly glaciofluvial materials that have been modified by inclusions of shale (Welby) and loamy glacial till (Oxbow). In these areas, the gravelly materials have been deposited mainly in the lower portions of very gently sloping, undulating landscapes. These materials are usually shallow and are always underlain by glacial till. Surface textures vary from sandy loam on the Whitesand soils to loam on the Oxbow soils. The soils are slightly to moderately stony with stones largely confined to the Oxbow soils and occurring mainly on the higher portions of the landscape.

Kinds of Welby-Oxbow Soils

Orthic and calcareous Welby, and orthic Oxbow are the principal kinds of Welby-Oxbow soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and the effect parent material has on soil development. The orthic and calcareous Welby soils have been briefly described under Welby Soils, while the orthic Oxbow soil has been briefly described under Oxbow Soils.

Map Units of Welby-Oxbow Soils

WbOx4 Mainly orthic Welby soils on mid- to upper slopes, with calcareous Welby soils on some upper slopes and knolls, and orthic Oxbow soils on mid- and lower slopes. This map unit is typically associated with undulating landscapes having very gentle slopes. Calcareous Oxbow soils occur on a few upper slopes.

Agricultural Properties of Welby-Oxbow Soils

Welby soils are poor agricultural soils of capability class 4, while Oxbow soils are good agricultural soils of capability class 2. The gravelly nature of these soils with their low nutrient status and low water-holding capacity are the main factors which limit their agricultural potential. The agricultural properties of each of these soils is discussed more fully under Welby Soils and Oxbow Soils, respectively. The reader is, therefore, directed to the section on agricultural properties of the above-mentioned soils.

WELBY-SYLVITE (WbSv) SOILS

Welby-Sylvite soils are dominantly Black soils that occur inextensively in the north-central portion of the Rocanville municipality. These neutral to slightly alkaline soils have formed in a mixture of shaly gravelly fluvial materials (Welby) and shallow, sandy to loamy, shaly fluvial and lacustrine materials, underlain by shale or shaly-glacial till (Sylvite). In these areas the gravelly materials occur mainly in higher portions of the landscape. Surface textures are mainly sandy loam. The soils are moderately stony and are associated with undulating landscapes having very gentle slopes.

Kinds of Welby-Sylvite Soils

Orthic and calcareous Welby, and orthic Sylvite are the principal kinds of Welby-Sylvite soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and the effect parent material has on soil development. The orthic and calcareous Welby soils have been briefly described under Welby Soils, while the orthic Sylvite soil has been briefly described under Sylvite Soils.

Map Units of Welby-Sylvite Soils

WbSv4 Mainly orthic Welby soils on mid- to upper slopes, with calcareous Welby soils on some upper slopes and knolls, and orthic Sylvite soils on mid- and lower slopes. This map unit is typically associated with undulating landscapes having very gentle slopes. Calcareous or carbonated Sylvite soils occur occasionally in the landscape.

Agricultural Properties of Welby-Sylvite Soils

Welby-Sylvite soils are poor agricultural soils of capability class 4, mainly because of their gravelly-sandy nature. The agricultural properties of each of these soils are discussed under Welby Soils and Sylvite Soils, respectively. The reader is, therefore, directed to the section on agricultural properties of the above-mentioned soils.

WHITEWOOD (Wh) SOILS

Whitewood soils are Dark Gray soils that occur in the Rocanville and Spy Hill municipalities. These neutral soils have formed in loamy glacial till, under wooded vegetation, resulting in soils with less organic matter and a lighter surface color than most soils in these municipalities. Surface textures are mainly loam with sandy loam occurring less extensively. Whitewood soils are moderately stony. Hummocky landscapes with gentle to moderate slopes are most common. Undulating landscapes with very gentle to gentle slopes occur less extensively.

Kinds of Whitewood Soils

Orthic, calcareous and eroded Whitewood, and poorly drained are the principal kinds of Whitewood soils occurring in these municipalities. They are mainly the result of the effect topography has in redistributing precipitation and in determining soil drainage.

Orthic Whitewood The orthic Whitewood soil occupies lower slopes in most landscapes, but may extend to midslopes and knolls in some areas. It is a well-drained soil with a dark-gray A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brownish or reddish-brown B horizon which usually has a strong, angular blocky structure. The B horizon, in turn, is underlain by a grayish-colored C horizon.

Calcareous Whitewood The calcareous Whitewood soil occurs on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This results in a thinner soil with less organic matter than the orthic Whitewood soil. It has a thin, usually calcareous A horizon and may have a thin, calcareous B horizon. It has usually been affected by erosion and its surface color is lighter than the surrounding orthic Whitewood soils.

Eroded Whitewood The eroded Whitewood, as the name implies, is a Whitewood soil whose topsoil has been partially or totally removed by erosion. It occurs on knolls and upper slopes and can be easily recognized by its light-brown to grayish surface color. It occurs most often in hummocky landscapes with moderate slopes.

Poorly Drained Soils These soils occur in sloughs and other low-lying depressional areas. They have a dark-colored A horizon and drab B and C horizons which are often dotted with red spots and streaks. Some of these soils may have a very light-gray horizon beneath the dark A horizon which imparts a light-gray color to the surface when cultivated (Fig. 45). They are usually wet for all or a significant portion of the growing season and are often flooded.

Fig. 45 Poorly drained soils with a light-gray horizon beneath the dark A horizon are common in areas of Whitewood soils.

Map Units of Whitewood Soils

Wh1 Mainly orthic Whitewood soils occurring over most of the landscape. This map unit is associated with undulating landscapes having very gentle to gentle slopes. Orthic Oxbow soils occur on a few upper slopes in some areas and a few poorly drained depressions occur scattered throughout some landscapes.

Wh6 Mainly orthic Whitewood soils on mid- and lower slopes, with calcareous Whitewood soils on upper slopes and knolls. This map unit is associated with undulating landscapes having very gentle slopes, hummocky landscapes having gentle or gentle to moderate slopes as shown in Fig. 46, and hummocky-inclined landscapes having moderate slopes. Slightly eroded Whitewood soils occur sporadically on knolls in some areas while orthic Oxbow soils may be present on upper slopes in others. A few poorly drained depressions also occur in some landscapes.

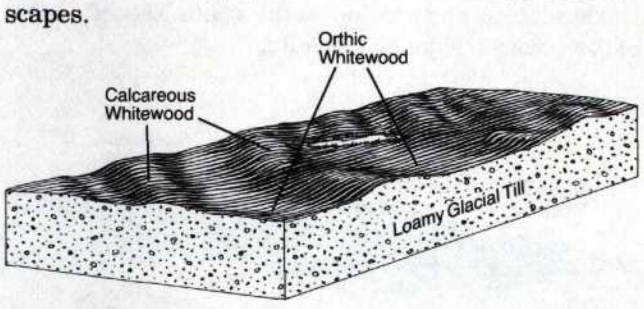


Fig. 46 Sketch of the Wh6 map unit showing calcareous Whitewood soils on upper slopes and knolls and orthic Whitewood soils on mid- and lower slopes. These soils are associated with loamy glacial till and hummocky surface forms.

Wh8 Mainly orthic Whitewood soils on mid- and lower slopes, with calcareous and slightly eroded Whitewood soils on upper slopes and knolls, and poorly drained soils in depressions. This map unit is associated with hummocky landscapes having gentle to moderate slopes. It is similar to the Wh6 map unit illustrated in Fig. 46, except that eroded Whitewood soils occur on more knolls and poorly drained depressions are common. In some areas, light-gray Waitville soils occur on lower slopes surrounding poorly drained areas.

Agricultural Properties of Whitewood Soils

Whitewood soils are usually good agricultural soils of capability class 2, but often these soils are reduced to class 3 because of topographic limitations. The loam texture results in a moderate water-holding capacity of about 14 cm (5.5 in.) of water in the upper 1 m (3 to 4 ft.) of soil. These soils are similar to the associated Oxbow soils, however, the Whitewood soils have less organic matter than the Oxbow soils and will probably require more nitrogen fertilizer for comparable yields. Most fields require periodic clearing of stones but these are generally not a problem. Wind erosion has not been a serious problem but can be expected to worsen when all land is cleared and cultivated. Water erosion is also not generally a problem, except on moderately or strongly sloping lands, particularly areas with long slopes. Poorly drained soils are usually wet for a sufficient portion of the growing season to restrict their agricultural use to forage production. Only those in shallow depressions have any capability for cultivated crops. However, many that are arable are very low in organic matter, resulting in poor structure, making seedbed preparation difficult and promoting crusting after heavy rains, resulting in poor seedling emergence.

WHITEWOOD-NISBET (WhNt) SOILS

Whitewood-Nisbet soils are dominantly Dark Gray soils that occur inextensively in the northwestern corner of the Rocanville municipality. These neutral to slightly alkaline soils have formed in a mixture of loamy glacial till (Whitewood) and sandy glaciofluvial materials (Nisbet). The glaciofluvial materials are shallow and underlain by glacial till. Surface textures range from loam on the Whitewood soils to sandy loam on the Nisbet soils. Stones are variable. Nisbet soils are normally stone free, however, in this municipality they have a few stones due to the close proximity of the underlying glacial till. The Whitewood soils range from moderately to very stony. These soils are typically associated with hummocky landscapes having gentle slopes. Some areas are externally drained by shallow channels.

Kinds of Whitewood-Nisbet Soils

Orthic Whitewood and orthic Nisbet are the principal kinds of Whitewood-Nisbet soils that occur in this municipality. They are mainly a result of the effect parent material has on soil development. The orthic Whitewood soil has been briefly described under Whitewood Soils, while the orthic Nisbet soil has been briefly described under Nisbet Soils.

Map Units of Whitewood-Nisbet Soils

WhNt1 Mainly orthic Whitewood soils on mid- to upper slopes and knolls, with orthic Nisbet soils on mid- and lower slopes and in local flat areas. This map unit is associated with hummocky landscapes having gentle slopes. Some areas have shallow channels which provide external drainage, carrying excess water out of the area. A few gravelly soils occur randomly in the landscape in some areas and poorly drained soils occur in a few depressions scattered throughout some landscapes.

Agricultural Properties of Whitewood-Nisbet Soils

Whitewood soils are good agricultural soils of capability class 2, while Nisbet soils are fair agricultural soils of capability class 3 due to their sandy nature. The agricultural properties of each of these soils are discussed under Whitewood Soils and Nisbet Soils, respectively. The reader is, therefore, directed to the sections on agricultural properties of the above-mentioned soils.

WHITEWOOD-OXBOW (WhOx) SOILS

The Whitewood-Oxbow soils are dominantly a mixture of Dark Gray (Whitewood) and Black (Oxbow) soils that occur inextensively in the Rocanville and Spy Hill municipalities. These neutral soils have formed in loamy glacial till where wooded vegetation has had an influence on soil development. The trees normally grow in lower, more moist positions in the landscape and on north- and east-facing slopes. In these positions, the Whitewood soils have developed and can be recognized in the field by their dark-gray surface color. The dark-colored Oxbow soils occupy higher positions in the landscape and often occur on south- and west-facing slopes. Whitewood and Oxbow soils are moderately stony soils with mainly loam surface textures. They occur on hummocky landscapes with gentle to moderate slopes and undulating landscapes with gentle to very gentle slopes.

Kinds of Whitewood-Oxbow Soils

Orthic Whitewood, orthic and calcareous Oxbow, and poorly drained are the principal kinds of Whitewood-Oxbow soils that occur in these municipalities. They are mainly a result of the effect topography has on redistributing precipitation and in determining soil drainage, and the effect vegetation has on soil development. A better understanding of the relationship of these soils to one another in the landscape may be obtained by referring to Fig. 18 in the Introduction to Soils section of this report. The properties of each of these soils are briefly described under Oxbow Soils and Whitewood Soils.

Map Units of Whitewood-Oxbow Soils

WhOx1 Mainly orthic Whitewood soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes. This map unit is associated with hummocky landscapes having gentle to moderate slopes. Gray Waitville soils occur in some areas, usually on lower slopes or in depressions.

WhOx2 Mainly orthic Whitewood soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes, calcareous Oxbow soils on upper slopes and knolls, and poorly drained soils in depressions. It is typically associated with hummocky landscapes that have gentle to moderate slopes. The Oxbow soils occur most often on south- and west-facing slopes as well as on the knolls. Light-gray soils on lower slopes, light-colored, limy knolls and numerous undrained depressions are characteristic landscape features (Fig. 47).

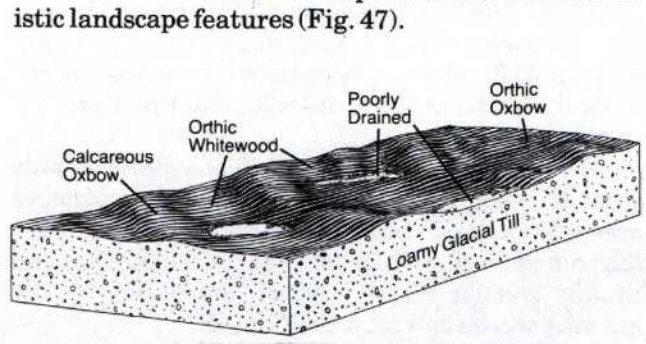


Fig. 47 Sketch of the WhOx2 map unit showing the complex of Black Oxbow and Dark Gray Whitewood and poorly drained soils on loamy glacial till.

WhOx4 Mainly orthic Whitewood soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes, and calcareous Oxbow soils on upper slopes and knolls. This map unit is associated with hummocky-inclined landscapes having moderate slopes in the Spy Hill municipality and undulating landscapes having very gentle to gentle slopes or with hummocky landscapes having gentle or moderate slopes in the Rocanville municipality. Landscapes are characterized by light-gray soils on lower slopes and light-colored, calcareous soils on upper slopes. They are similar to those of the WhOx2 map unit, illustrated in Fig. 47, except that only a few undrained depressions occur. In some areas, gray Waitville soils are associated with lower slopes, particularly those surrounding sloughs.

Agricultural Properties of Whitewood-Oxbow Soils

Whitewood-Oxbow soils are, for the most part, good agricultural soils of capability class 2. The agricultural properties of these soils have been described under Oxbow Soils and Whitewood Soils, respectively. The reader is, therefore, directed to those sections of this report.

WHITEWOOD-ROCANVILLE (WhRv) SOILS

Whitewood-Rocanville soils are dominantly Dark Gray soils that occur inextensively in the south-central portion of the Spy Hill municipality. These neutral soils have formed in a mixture of loamy glacial till (Whitewood) and loamy glacial till that has been modified by the inclusion of large amounts of shale (Rocanville). These soils have formed in areas where the native vegetation was dominantly trees. Hence, the surface color of the soils is dark-gray as opposed to the black surface color of the majority of soils in this municipality, reflecting the influence of trees on soil development. The soils are moderately stony and have mainly loam surface textures. They occur mainly on hummocky landscapes that are strongly sloping.

Kinds of Whitewood-Rocanville Soils

Orthic Whitewood and orthic Rocanville are the principal kinds of Whitewood-Rocanville soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage, and the effect vegetation and parent material have on soil development. The orthic Whitewood soil has been briefly described under Whitewood Soils, while the orthic Rocanville soil is similar to the dark-gray orthic Rocanville soil, described briefly under Rocanville Soils.

Map Units of Whitewood-Rocanville Soils

WhRv1 Mainly orthic Whitewood soils, with orthic Rocanville soils occurring randomly in the landscape. This map unit is associated with hummocky landscapes with strong slopes. In some of the depressions and lower slope positions, strongly leached soils occur, and can be recognized by their very light surface color. Many of these are also poorly drained.

Agricultural Properties of Whitewood-Rocanville Soils

Whitewood-Rocanville soils are good agricultural soils of capability class 2, however, in this municipality, they have been rated as class 4 because of the rough topography on which they occur. Their agricultural properties are similar to those described previously for Whitewood Soils and Rocanville Soils. They have loam textures which give rise to a moderate water-holding capacity, however, they are low in organic matter which results in low fertility and soils that are harder to keep in good tilth than the dominantly Black soils of the area. Favorable responses to the addition of nitrogen and phosphorus fertilizers will be obtained in most years. The light-colored soils that occur in some depressional areas are very low in organic matter and are areas that will present problems with seedbed preparation and seedling emergence. Attempts should be made to increase organic matter contents in these areas.

WHITEWOOD-WAITVILLE (WhWv) SOILS

Whitewood-Waitville soils are dominantly a mixture of Dark Gray (Whitewood) and Gray (Waitville) soils that occur through the western portion of the Rocanville municipality. These neutral to slightly acidic soils have formed in loamy glacial till in areas where the native vegetation was predominantly trees. Soils formed under the influence of forest vegetation are usually leached and low in organic matter, and hence have grayish-colored surface horizons. The Waitville soils occur in the more moist and strongly leached, lower portions of the landscape, with the Whitewood soils on the upper slopes and knolls. Whitewood and Waitville soils are moderately stony with mainly loam and sandy loam surface textures. They occur mainly on hummocky landscapes, some of which are externally drained, and have gentle to moderate slopes. A few areas occur on undulating landscapes that are externally drained and have very gentle to gentle slopes.

Kinds of Whitewood-Waitville Soils

Orthic and calcareous Whitewood, and dark gray wooded Waitville are the principal kinds of Whitewood-Waitville soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage, and the effect vegetation has on soil formation. The orthic and calcareous Whitewood and poorly drained soils have been briefly described under Whitewood Soils, while the dark gray wooded Waitville soil is briefly described below.

Dark Gray Wooded Waitville The dark gray wooded Waitville soil occupies lower slopes in all landscapes. It is a moderately well-drained soil with a light-gray A horizon, 10 to 18 cm (4 to 7 in.) thick, underlain by a relatively thick, brownish or reddish-brown colored B horizon, that has a distinct angular, nutty structure. The B horizon, in turn, is underlain by a grayish-colored, calcareous C horizon. Most of these soils, and in particular those that still occur under a forest-type vegetation, have a light-gray horizon, with platy structure, separating the surface horizon from the B horizon. In cultivated areas, where this horizon was thin and near the surface, it usually has been partially or totally destroyed by cultivation.

Map Units of Whitewood-Waitville Soils

WhWv1 Mainly orthic Whitewood soils on mid- and upper slopes, with dark gray wooded Waitville soils on lower slopes. This map unit is associated with undulating dissected landscapes having very gentle to gentle slopes and with hummocky, hummocky dissected, and hummocky-ridged landscapes with gentle to moderate slopes. The WhWv1 soils are similar to WhWv5 soils, shown in Fig. 48, except that poorly drained soils occur in only a few depressions and calcareous Whitewood soils occur on a few knolls.

WhWv4 Mainly orthic Whitewood soils on mid- and upper slopes, with calcareous Whitewood soils on knolls, and dark gray wooded Waitville soils in lower slopes. This map unit is associated with hummocky landscapes having gentle slopes. Shallow drainage channels have developed in most landscapes, which carry excess water from these areas, thus, sloughs occur infrequently. However, poorly drained soils occasionally occur in the bottoms of these channels.

WhWv5 Mainly orthic Whitewood soils on mid- and upper slopes, with dark gray wooded Waitville soils on lower slopes, and poorly drained soils in depressions. As illustrated in Fig. 48, this map unit is associated with hummocky landscapes having moderate slopes. Calcareous Whitewood soils occur on a few upper slopes and knolls.

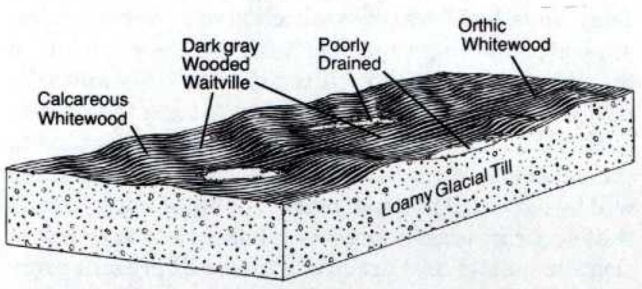


Fig. 48 Sketch of the WhWv5 map unit showing orthic Whitewood soils on mid- and upper slopes, dark gray wooded Waitville soils on lower slopes and poorly drained soils in depressions. These soils are associated with hummocky landscapes and moderate slopes.

Agricultural Properties of Whitewood-Waitville Soils

Whitewood-Waitville soils are fair to good agricultural soils of capability classes 2 and 3. These soils are similar to Whitewood soils described previously except that the Waitville soils are lower in organic matter. The loam to sandy loam textures result in a low to moderate water-holding capacity of about 8 to 14 cm (3 to 5.5 in.) of water in the upper 1 m (3 to 4 ft.) of soil. The low organic matter content results in soils of lower fertility than the dominantly Black soils of this municipality, necessitating higher applications of fertilizer, particularly nitrogen, for comparable yields. The low organic matter content, particularly in the Waitville soils on the lower slopes, results in a structure that makes seedbed preparation difficult. The low organic matter content also makes these soils susceptible to crusting after heavy rains, resulting in poor seedling emergence. Cultural practices such as the use of forages in the rotation should be used to increase the organic matter content of these soils. Most fields require periodic clearing of stones but these are generally not a problem. Wind erosion has not been a problem but can be expected to worsen as more land is cleared and cultivated. Water erosion also is not generally a problem except on long slopes in the spring and during periods of heavy rainfall. Poorly drained soils are usually wet for a sufficient portion of the growing season to restrict their agricultural use to forage production. Only those in shallow depressions have any capability for cultivation. However, many that are arable are also very low in organic matter and have structural problems similar to the Waitville soils.

WINDTHORST (Wn) SOILS

Windthorst soils are dominantly Black soils that occur scattered throughout the Moosomin, Martin and Rocanville municipalities. These neutral to slightly alkaline soils have formed in sandy to loamy, water-modified glacial till. They are similar to the Oxbow soils except that the parent material has been altered by enrichment of the glacial till with sandy materials. Thus, the parent material includes a range of materials including loamy glacial till, sandy glacial till and shallow, sandy glaciofluvial materials. Surface textures are mostly sandy loam and loam. Windthorst soils range from slightly to very stony and occur on hummocky landscapes with very gentle to strong slopes and on undulating or undulating dissected landscapes with very gentle to gentle slopes.

Kinds of Windthorst Soils

Orthic, calcareous and eroded Windthorst, as well as poorly drained, are the principal kinds of Windthorst soils that occur in these municipalities. They are mainly a result of the effect of topography on precipitation redistribution and soil drainage. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 20 in the Introduction to Soils section of this report.

Orthic Windthorst The orthic Windthorst soil occupies midslopes in most Windthorst landscapes but extends to upper or lower slopes in some areas. It is a well-drained soil with a black A horizon, 10 to 15 cm (4 to 6 in.) thick, underlain by a brown B horizon and a grayish-brown C horizon.

Calcareous Windthorst The calcareous Windthorst soil occurs on upper slopes above the orthic Windthorst. It is similar to the orthic, except that the A horizon is thinner and the B horizon is calcareous, which imparts a grayish-brown rather than brownish color to it. It has usually been affected by erosion but the extent of erosion is less than that which occurs on the eroded Windthorst soil.

Eroded Windthorst The eroded Windthorst soil occurs on the knolls. It is a Windthorst soil from which the topsoil has been partially removed by erosion. Consequently, it is shallow and usually weakly developed. It can be recognized in summerfallow fields by lighter-colored surfaces than the surrounding orthic Windthorst soil.

Poorly Drained Soils Poorly drained soils occur in sloughs and other low-lying depressional areas. They have a black A horizon and drab subsurface colors with reddish spots and streaks. They are usually wet for all or a significant portion of the growing season and are often flooded.

Map Units of Windthorst Soils

Wn1 Mainly orthic Windthorst soils on mid- and lower slopes, with calcareous Windthorst soils on upper slopes and knolls, and poorly drained, leached soils in depressions. These soils occur on moderately sloping, hummocky landscapes in the west-central portion of the Martin municipality. Numerous undrained depressions occur throughout the landscape and some knolls have been slightly eroded.

Wn2 Mainly orthic Windthorst soils on mid- and lower slopes, with a mixture of calcareous and slightly eroded Windthorst soils on upper slopes and knolls, and poorly drained soils in depressions. It may occur on hummocky landscapes having gentle to moderate slopes and occasionally strong slopes, as depicted in Fig. 49 or on undulating, dissected landscapes with gentle or very gentle slopes. Numerous undrained depressions occur thoughout the landscape and erosion on the knolls has left many of them very stony and gravelly.

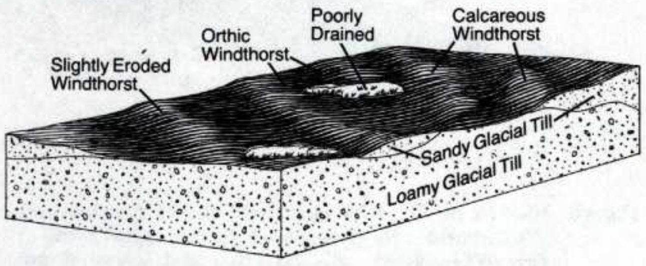


Fig. 49 Sketch of the Wn2 map unit showing the distribution of the main kinds of Windthorst soils on the complex of sandy and loamy glacial till.

Wn3 Mainly orthic Windthorst soils, with a mixture of calcareous and slightly eroded Windthorst soils on upper slopes and knolls. It is typically associated with hummocky landscapes having gentle to strong slopes. These soils are similar to the Wn2 soils illustrated in Fig. 49 except that poorly drained soils occur in only a few depressions. Stony or gravelly knolls are common in these areas.

Agricultural Properties of Windthorst Soils

Windthorst soils are fair agricultural soils of capability class 3. Their loam to sandy loam textures result in a water-holding capacity of approximately 10 to 13 cm (4 to 5 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Their low to moderate organic matter content and sandy nature result in soils of moderate fertility that are not easily kept in good tilth. Most fields require periodic clearing of stones and in some areas are a serious problem. The potential for wind erosion is fairly high on these soils because their sandy texture and weak structure make it difficult to keep a cloddy surface that is resistant to wind erosion. Tillage practices that maintain a trash cover and management practices that will maintain or increase the organic matter content of these soils are recommended. Water erosion is generally not a problem, except where these soils occur on dissected landscapes, in which case, erosion along shallow channels can be serious during periods of heavy runoff.

The orthic Windthorst soils have the fewest agricultural limitations; strong slopes and moisture limitations being the major ones. Other Windthorst soils are less productive or more difficult to farm. The calcareous Windthorst soils on knolls are locally dry because of rapid runoff and because the knoll positions often have the coarsest textures. Nutrient reserves, particularly phosphorus, are lowest in these soils. Wind and water erosion can be a serious problem if the soils are not protected by trash covers. On some of the more susceptible knolls and ridges, erosion has taken place giving rise to eroded Windthorst soils. They are also locally dry because of the rapid runoff and coarser textures associated with these slopes, and have very low nutrient reserves, particularly phosphorus. Poorly drained soils are usually wet for all or a sufficient portion of the growing season to restrict their agricultural use. Many have little or no value for agriculture while others have only a limited potential as areas for forage production. Only those in shallow depressions have any significant capability for production of cultivated crops.

Fig. 50 **The sandy and gravelly texture of Whitesand soils is largely responsible for their high erodibility and low water-holding capacity.**

WHITESAND (Ws) SOILS

Whitesand soils are dominantly Black soils that occur in the Martin and Spy Hill municipalities. They are neutral to slightly alkaline soils that have formed in gravelly fluvial and glaciofluvial materials. Surface textures range from loamy sand to sandy loam and gravelly sandy loam. Stoniness is variable, ranging from nonstony in some areas to moderately stony in others. These soils are associated with undulating landscapes having very gentle to gentle slopes, and with hummocky landscapes having slopes ranging from gentle to strong (Fig. 50).

Kinds of Whitesand Soils

Orthic, calcareous, eroded, carbonated and saline Whitesand, as well as poorly drained, are the principal kinds of Whitesand soils that occur in these municipalities. They are mainly a result of the effect internal soil drainage has on soil development. A better understanding of the relationship of these soils to one another in the landscape may be obtained by referring to Fig. 17 in the Introduction to Soils section of this report.

Orthic Whitesand The orthic Whitesand soil occurs on mid- and lower slope positions but in gently or very gently sloping landscapes may occur in all slope positions. It is a rapidly drained soil with a black A horizon, 8 to 12 cm (3 to 5 in.) thick, underlain by a brownish B horizon and a lighter-colored, weakly calcareous C horizon. The C horizon is often much more gravelly than either the A or B horizon.

Calcareous Whitesand The calcareous Whitesand soil occurs mainly on upper slopes and knolls but in some landscapes may occur in all slope positions. It is also rapidly drained and is similar to the orthic Whitesand except that the A and B horizons are thinner and carbonates are present in the B horizon and often in the A horizon. A lower organic matter content and the presence of carbonates in the A horizon often result in these soils having a much lighter surface color in cultivated fields than the surrounding orthic Whitesand soils.

Eroded Whitesand The eroded Whitesand soil occurs on upper slopes and knolls. It is also a rapidly drained soil but most of the topsoil has been removed by erosion. This results in a grayish-colored surface often lighter in color than the calcareous Whitesand soils.

Carbonated Whitesand The carbonated Whitesand soil occurs in low landscape positions and frequently occurs around sloughs or poorly drained depressions, in association with saline soils. It has a highly calcareous A horizon that is 15 to 25 cm (6 to 10 in.) thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have drab colors and reddish spots and stains, indicative of poor soil drainage. Also, the subsoil is often affected to some degree by salinity.

Saline Whitesand The saline Whitesand soil also occurs in low landscape positions, often surrounding sloughs or poorly drained depressions. It is characterized by the presence of soluble salts, usually within 50 cm (20 in.) of the surface. The salts occur as a white surface crust or as small, white specks within the soil although salts may not always be visible. It often occurs intermixed with carbonated Whitesand soils on lower slopes, surrounding sloughs, and has similar features, indicative of poor soil drainage.

Poorly Drained Soils Poorly drained soils occur mainly in sloughs and other low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt and usually remain wet for much of the growing season. They have thick, dark-colored A horizons and drab subsurface colors that often include red spots and streaks. In some areas these soils may be saline as well.

Map Units of Whitesand Soils

Ws1 Mainly orthic Whitesand soils occurring throughout the landscape. These soils occur on hummocky landscapes (Fig. 51). Slopes are gentle to very gentle in the Martin but may be moderate or strong in the Spy Hill municipality. Poorly drained soils occur in a few undrained depressions, in some areas.

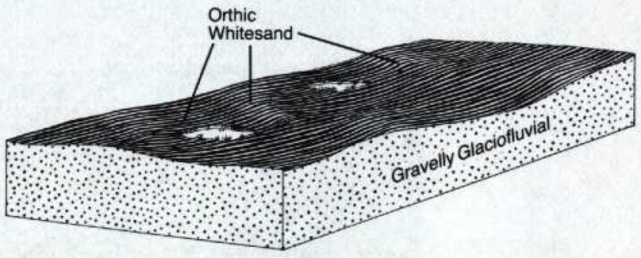


Fig. 51 **Sketch of the Ws1 map unit showing the predominance of orthic Whitesand soils throughout most slope positions of these gently sloping hummocky and undulating landscapes. These soils are associated with gravelly fluvial and glaciofluvial deposits.**

Ws5 Mainly orthic Whitesand soils, with poorly drained soils in depressions. This map unit is associated with the broad, shallow drainage channel of Deerhorn Creek in the Spy Hill municipality. The shallow nature of this channel has left many depressional areas that retain runoff water, resulting in poorly drained soils in these areas. Shallow, calcareous Whitesand soils occur on a few of the higher knolls in the landscape.

Ws6 Mainly saline and carbonated Whitesand soils, with poorly drained and saline poorly drained soils in depressions. This map unit occurs in a low topographic position, along the northern edge of the Welby Sand Plain in the Spy Hill municipality. The landscape is undulating, with gentle to very gentle slopes. Poor drainage conditions have resulted in the accumulation of salts and some of the soils in depressions and lower slope positions have been affected to some degree.

Ws7 Mainly orthic Whitesand soils on mid- and lower slopes, with calcareous Whitesand soils on upper slopes, and eroded Whitesand soils on knolls (Fig. 52). These soils occur on undulating landscapes having slopes that range from very gentle to gentle and hummocky landscapes having slopes that range from gentle to strong. Some areas of these soils contain numerous stones which occur mainly on the upper slope and knoll positions.

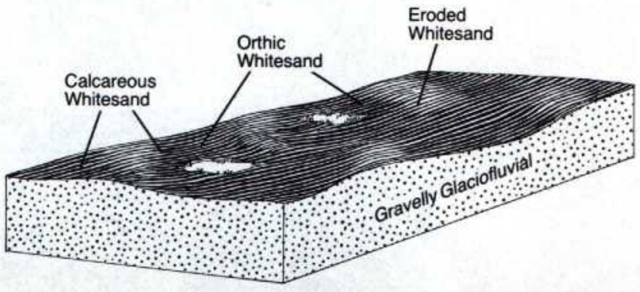


Fig. 52 **Sketch of the Ws7 map unit showing calcareous and eroded Whitesand soils on upper slopes and knolls and orthic Whitesand soils on mid- and lower slopes. These soils are associated with gravelly fluvial and glaciofluvial deposits and hummocky landscapes.**

Ws8 Mainly calcareous Whitesand soils occurring over most of the landscape. This map unit occurs on undulating landscapes with very gentle slopes and hummocky landscapes with steep slopes. In most landscapes a few orthic Whitesand soils occur on mid- or lower slopes. In undulating landscapes, poorly drained soils occur in a few depressions.

Ws9 Mainly calcareous Whitesand soils on mid- to upper slopes and knolls, with orthic Whitesand soils on lower slopes, and poorly drained soils in depressions. This map unit is associated with undulating landscapes with gentle to very gentle slopes, in which many broad, flat depressional areas occur. Weak salinity is associated with some of these areas. Glacial till also underlies portions of the area, and Oxbow soils occur on a few knolls.

Agricultural Properties of Whitesand Soils

Whitesand soils are poor agricultural soils, predominantly of capability class 4. This is due to their gravelly nature. Their loamy sand to sandy loam surface textures, coupled with gravelly subsurface textures, result in a very low water-holding capacity of less than 5 cm (2 in.) of water in the upper 1 m (3 to 4 ft.) of soil. Thus, they are very droughty. Their low organic matter content and low inherent fertility also contribute to the low potential that these soils have for the production of annual crops. Another factor is their high susceptibility to wind erosion due to their very sandy texture and weak structure, which make it difficult to keep a rough surface that is resistant to wind erosion. Tillage practices that maintain a trash cover and management practices that will maintain or increase the organic matter content, such as the frequent inclusion of forages in crop rotations, are recommended where these soils are cultivated. Water erosion is not a problem on these soils because of their high infiltration rate. Stoniness varies considerably from one area to another and even within the same area of Whitesand soils. Some areas are stone free while others have sufficient stones to require periodic removal if the soils are to be cultivated. At best, these soils are marginal for arable crops, with many areas best utilized for forage production or native grazing.

WHITESAND-MEOTA (WsMe) SOILS

Whitesand-Meota soils are dominantly Black soils that occur inextensively east of Spy Hill. They are neutral to slightly alkaline soils that have formed in a mixture of gravelly (Whitesand) and sandy (Meota) fluvial materials. In these areas the sandy and gravelly sediments occur intermixed but in general the sands occur in lower and the gravels in higher landscape positions. They are associated with undulating landscapes that have very gentle to gentle slopes. Surface textures vary from loamy sand to sandy loam. Stones are not a problem, occurring mainly on the higher portions of the landscape and are largely confined to the Whitesand soils.

Kinds of Whitesand-Meota Soils

Orthic Whitesand and orthic Meota are the principal kinds of Whitesand-Meota soils occurring in this municipality. They are mainly a result of the effect parent material has on soil formation. The properties of each of these soils have been briefly described under Whitesand Soils and Meota Soils, respectively. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Whitesand-Meota Soils

WsMe1 Mainly orthic Whitesand soils occurring over most of the landscape, with orthic Meota soils occurring randomly throughout the landscape. This map unit is associated with undulating landscapes having very gentle to gentle slopes, as shown in Fig. 53. In these landscapes the sandy Meota soils normally occur in the lower landscape positions but may extend over some of the lower knolls occasionally as calcareous Meota soils. As well, the gravelly Whitesand soils occasionally extend to lower slopes.

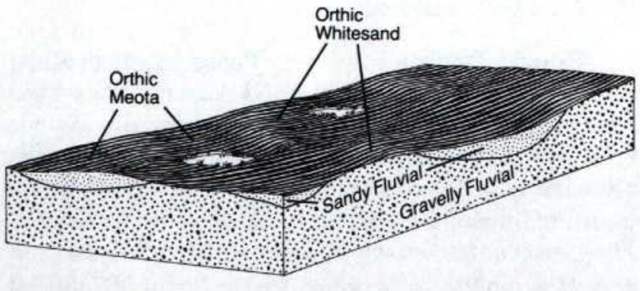


Fig. 53 **Sketch of the WsMe1 map unit showing the random distribution of orthic Whitesand and orthic Meota soils in the gently sloping landscape. Whitesand soils are associated with gravelly fluvial deposits and Meota soils with sandy fluvial deposits.**

Agricultural Properties of Whitesand-Meota Soils

Whitesand-Meota soils are poor agricultural soils of capability class 4. Their agricultural properties have been described previously under Whitesand Soils and Meota Soils, respectively, and the reader is, therefore, directed to those sections of this report.

WHITESAND-OXBOW (WsOx) SOILS

Whitesand-Oxbow soils are dominantly Black soils that occur inextensively in the Moosomin and Martin municipalities. They are neutral to slightly alkaline soils that have formed in a mixture of gravelly fluvial and glaciofluvial materials (Whitesand) and loamy glacial till (Oxbow). In these areas, the gravelly fluvial and glaciofluvial materials have been deposited in the lower portion of gently to steeply sloping, hummocky and ridged landscapes or gently sloping terraced landscapes. They are usually shallow and are always underlain by glacial till. Surface textures vary from loamy sand and gravelly sandy loam on the Whitesand soils to sandy loam and loam on the Oxbow soils. These areas are slightly to moderately stony with stones being confined largely to the Oxbow soils and occurring mainly on the higher portions of the landscape.

Kinds of Whitesand-Oxbow Soils

Orthic and calcareous Whitesand and orthic and calcareous Oxbow are the principal kinds of Whitesand-Oxbow soils that occur in these municipalities. Their properties have been described under Whitesand Soils and Oxbow Soils, respectively. A better understanding of the relationship of these soils and materials to one another in the landscape may be obtained by referring to Fig. 19 in the Introduction to Soils section of this report.

Map Units of Whitesand-Oxbow Soils

WsOx4 Mainly orthic Whitesand soils on mid- and lower slopes, with orthic Oxbow soils on mid- and upper slopes, and calcareous Oxbow soils on knolls. Where it occurs in the Moosomin municipality, it is associated with gently to moderately sloping, hummocky and terraced landscapes. Poorly drained soils occur in a few depressions.

WsOx10 Mainly calcareous Whitesand soils occurring over most of the landscape, with orthic Whitesand and orthic Oxbow soils on some mid- and upper slopes. These soils are associated with a gently sloping, undulating landscape in the southwestern portion of the Martin municipality.

Agricultural Properties of Whitesand-Oxbow Soils

Whitesand-Oxbow soils, in these municipalities, are poor to fair agricultural soils of capability classes 4 and 3. Their agricultural properties have been described previously under Whitesand Soils and Oxbow Soils, respectively.

WETLAND (Wz) SOILS

Wetland soils occur extensively throughout these municipalities. They are poorly drained soils developed in a mixture of materials associated with depressional areas. Most occur as sloughs, too small to show separately on the map and are included in the map units of the surrounding upland soils. Only the larger areas have been delineated on the map. The Wetland soils are made up of a variety of soils which are referred to collectively as poorly drained soils. All are wet for at least a portion of the growing season and many remain flooded for much or all of the growing season.

Kinds of Wetland Soils

Poorly Drained Soils These poorly drained soils occur mainly in sloughs and occasionally on the bottom of drainage channels. They remain wet for most of the growing season and are usually nonarable with at least central portions of most areas remaining flooded for part or all of the growing season. They are characterized by a dark-colored A horizon and drab subsurface colors which are often dotted with reddish spots and streaks. Some may have a very light-gray lower A horizon, between the dark-colored surface and subsurface layers.

Map Units of Wetland Soils

Wz1 The Wz1 map unit consists almost entirely of poorly drained soils. Some areas may have shallow open water occurring in central regions, as depicted in Fig. 54. They are referred to as Wet Meadows. Flooding normally occurs in the spring but can last until midsummer.

Wz2 The Wz2 map unit consists of a mixture of poorly drained soils in the outer regions of the area and shallow open water in central regions, as depicted in Fig. 55. They are referred to as Marshes. Flooding usually extends from spring to late summer or fall and may persist throughout the winter.

Wz3 The Wz3 map unit consists almost entirely of shallow open water, as depicted in Fig. 56, with some poorly drained soils occurring on the margins. They are referred to as Open Water Wetlands and are usually small lakes or large sloughs. The poorly drained soils are confined to a narrow marginal strip with the rest of the area occupied by shallow open water. These areas usually remain flooded but some may become dry during periods of prolonged, extreme drought.

Agricultural Properties of Wetland Soils

All areas of Wetland soils have little or no potential for arable agriculture. All have been rated as class 5 or lower for agricultural capability. They have a potential as areas for tame or native forage production or for native grazing land. Those areas indicated on the soil map with the Wz1 map unit have the highest potential. These are areas that usually become dry at some point in the growing season and have a potential for forage production. Some of the shallower ones may be arable during extended dry periods and will have some potential for the production of tame hay.

YORKTON (Yk) SOILS

Yorkton soils are dominantly Thick Black soils that occur inextensively in the northern portion of the Spy Hill municipality. They have formed in more moist areas of the black soil zone where soils with thicker-than-normal surface horizons have formed. These neutral to moderately alkaline soils have formed in loamy glacial till and are associated with hummocky and undulating landscapes having mainly gentle or very gentle slopes. Sloughs commonly occur throughout these landscapes. The soils are moderately stony and have mainly loam to sandy loam surface textures.

Fig. 54 The Wz1 map unit comprises poorly drained soils that are subject to temporary flooding.

Fig. 55 The Wz2 map unit comprises poorly drained soils in areas where flooding usually persists from spring to late summer.

Fig. 56 The Wz3 map unit represents areas that are permanently flooded.

Kinds of Yorkton Soils

Orthic, calcareous, weakly developed and carbonated Yorkton, as well as poorly drained, are the principal kinds of Yorkton soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage. A better understanding of the relationship of these soils to one another in the landscape may be obtained by referring to Fig. 17 in the Introduction to Soils section of this report.

Orthic Yorkton The orthic Yorkton soil occurs mainly on lower slopes but may extend onto midslopes in some landsapes. It is a well- to moderately well-drained soil with a thick, black A horizon that extends to a depth of 20 to 30 cm (8 to 12 in.). It is underlain, in turn, by a brownish B horizon and a grayish-colored C horizon.

Calcareous Yorkton The calcareous Yorkton soil occurs mainly on upper slopes and knolls but can occur in association with orthic Yorkton soils on mid- and lower slopes. It is a well-drained soil with a thick, black, usually calcareous A horizon that extends to a depth of 20 to 30 cm (8 to 12 in.). It is underlain, in turn, by a brownish-colored, calcareous B horizon and a grayish-colored C horizon.

Weakly Developed Yorkton The weakly developed Yorkton soil occurs on upper slopes and knolls. It is a well-drained soil, characterized by a black, usually calcareous A horizon, 15 to 25 cm (6 to 10 in.) thick, underlain by a grayish-colored, highly calcareous C horizon. In some instances, erosion may have reduced the A horizon to only a few inches in thickness, in which case it has a much lighter surface color than the surrounding Yorkton soils.

Carbonated Yorkton The carbonated Yorkton soil occurs mainly on lower slopes, frequently surrounding sloughs or poorly drained depressions. It has a highly calcareous A horizon, 25 to 35 cm (10 to 14 in.) thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have drab colors and reddish spots or stains, indicative of poor soil drainage. In some areas these soils may be affected to some degree by salinity.

Poorly Drained Soils The poorly drained soils occur in sloughs and occasionally in the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They have thick, dark-colored A horizons and drab subsurface colors that are often dotted with red spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought.

Map Units of Yorkton Soils

Yk3 Mainly calcareous Yorkton soils on mid- and upper slopes, with orthic Yorkton soils on lower slopes, and poorly drained soils in depressions. This map unit occurs on hummocky landscapes with gentle to moderate slopes. Thin black soils of the Oxbow Association occur on some of the knolls and weak salinity occurs in some of the Yorkton soils on lower slopes surrounding poorly drained depressions.

Yk4 Mainly a mixture of calcareous, weakly developed and carbonated Yorkton soils, with poorly drained soils in depressions. This map unit occurs on hummocky landscapes with gentle slopes in one area in this municipality. This area has a high proportion of poorly drained depressions and many of the carbonated Yorkton soils are poorly drained to some extent. Also, many of the Yorkton soils on the lower slope positions, surrounding poorly drained areas are affected by salinity to some degree.

Yk7 Mainly orthic Yorkton soils on mid- and lower slopes, with calcareous Yorkton soils on upper slopes and knolls, and poorly drained soils in depressions. This map unit occurs on hummocky landscapes with gentle slopes, as shown in Fig. 57. Thin black soils of the Oxbow Association occur on some of the knolls and weak salinity occurs in some of the Yorkton soils on lower slopes surrounding poorly drained depressions.

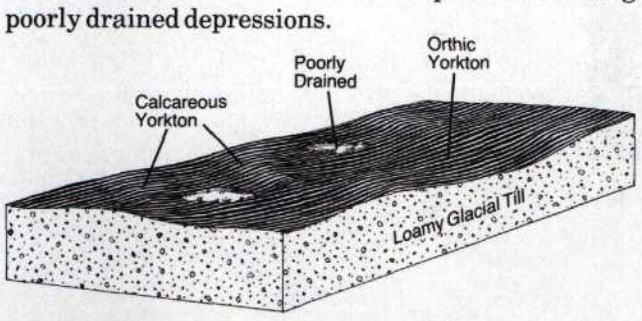


Fig. 57 **Sketch of the Yk7 map unit showing calcareous Yorkton soils on knolls and upper slopes, orthic Yorkton soils on mid- and lower slopes, and poorly drained soils in depressions. It is associated with loamy glacial till and gently sloping topography.**

Yk11 Mainly calcareous Yorkton soils on mid- to upper slopes, with orthic Yorkton soils on lower slopes, and weakly developed Yorkton soils on knolls. This map unit occurs on hummocky landscapes with gentle slopes. A few light-colored, slightly eroded soils of the Oxbow Association occur scattered throughout the area on some of the higher knolls. Poorly drained soils occur in a few of the deeper depressions scattered throughout the landscape.

Yk12 Mainly a mixture of calcareous and weakly developed Yorkton soils on upper slopes and knolls, with orthic Yorkton soils on lower slopes, and poorly drained soils in depressions. This map unit occurs on hummocky landscapes with gentle slopes, and is similar to the Yk11 map unit, except that poorly drained depressions are much more prevalent in the landscape. Weak salinity affects some of the soils on lower slopes surrounding a few of the poorly drained depressions.

Agricultural Properties of Yorkton Soils

Yorkton soils are very good agricultural soils of capability class 1 or 2. The loam texture results in a water-holding capacity of about 14 cm (5.5 in.) of water in the top 1 m (3 to 4 ft.) of soil. The thick surface horizons with high organic matter content give rise to fertile soils of good tilth. Most fields require periodic clearing of stones but these are generally not a serious problem. Wind and water erosion have not been serious but have occurred to some extent on some knolls. Attempts should be made to protect these and to increase their organic matter content. Saline soils occur infrequently, however, where they do occur they are usually associated with depressional areas. Consequently, crop yields in small areas adjacent to poorly drained depressional areas may be depressed in some years. Poorly drained soils are usually wet for a sufficient portion of the growing season to restrict their agricultural use to forage production. Only those in shallow depressions have a significant capability for cultivated crops.

YORKTON-OXBOW (YkOx) SOILS

Yorkton-Oxbow soils are a mixture of Thick Black (Yorkton) soils and Black (Oxbow) soils that occur throughout the northern portion of the Spy Hill municipality. They have formed in more moist areas of the Black soil zone where soils with thicker-than-normal surface horizons have formed over much of the landscape. These neutral to moderately alkaline soils have formed in loamy glacial till and are associated with hummocky and undulating landscapes having mainly gentle or very gentle slopes. Sloughs commonly occur throughout these landscapes. The soils are moderately stony and have mainly loam surface textures.

Kinds of Yorkton-Oxbow Soils

Orthic, calcareous and carbonated Yorkton, orthic, calcareous and slightly eroded Oxbow and poorly drained, are the principal kinds of Yorkton-Oxbow soils that occur in this municipality. They are mainly a result of the effect topography has in redistributing precipitation and in determining soil drainage. The Yorkton soils are briefly described under Yorkton Soils while the Oxbow soils are briefly described under Oxbow Soils.

Map Units of Yorkton-Oxbow Soils

YkOx1 Mainly a mixture of orthic and calcareous Yorkton soils on mid- and lower slopes, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls. This map unit occurs on hummocky landscapes with gentle to moderate slopes. Light-colored knolls and few undrained depressions are characteristic landscape features. A few orthic Oxbow soils occur on some upper slopes and salinity occurs occasionally on some of the lower slopes, particularly those surrounding infrequent poorly drained areas.

YkOx4 Mainly a mixture of orthic and calcareous Yorkton soils on mid- and lower slopes, with a mixture of orthic and calcareous Oxbow soils on upper slopes and knolls. This map unit occurs on undulating landscapes with gentle to very gentle slopes, as shown in Fig. 58. The orthic and calcareous Yorkton soils occur intermixed on the mid- and lower slopes, but generally the calcareous soils occur above the orthic soils. Slightly eroded Oxbow soils occur on a few of the higher knolls and poorly drained soils occur in a few depressions scattered throughout the landscape.

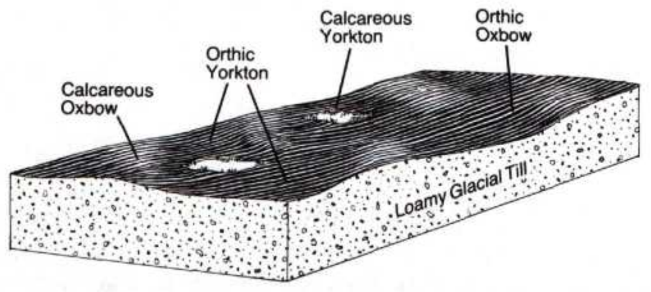


Fig. 58 **Sketch of the YkOx4 map unit showing a mixture of orthic and calcareous Yorkton soils on mid- and lower slopes, and a mixture of orthic and calcareous Oxbow soils on upper slopes and knolls. It is associated with loamy glacial till and gently sloping topography.**

YkOx7 Mainly a mixture of calcareous and carbonated Yorkton soils on mid- and lower slopes, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls. This map unit is associated with hummocky landscapes having gentle slopes. The carbonated Yorkton soils occur mainly on lower slopes, extending through most depressions where they are often affected by imperfect drainage. A few are affected to some degree by salinity, and poorly drained soils occur in a few of the deeper depressions.

YkOx8 Mainly a mixture of calcareous and carbonated Yorkton soils, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls, orthic Yorkton soils on some lower slopes, and poorly drained soils in depressions. This map unit is associated with hummocky landscapes having gentle to moderate slopes, as shown in Fig. 59. The calcareous Yorkton soils are associated with midslopes, while the carbonated Yorkton soils occur on lower slopes and in depressional areas surrounding poorly drained soils. Orthic Oxbow soils occur on a few upper slopes and low knolls.

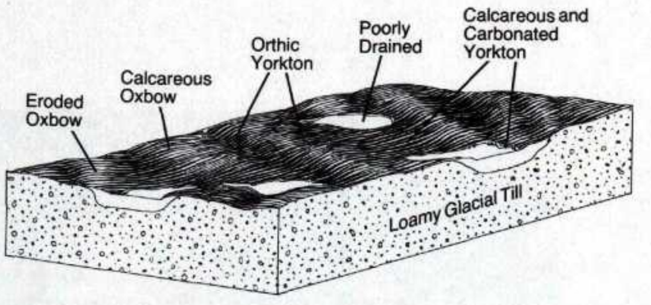


Fig. 59 **Sketch of the YkOx8 map unit showing a mixture of calcareous and carbonated Yorkton soils on mid- and lower slopes, orthic Yorkton soils on some lower slopes, a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls, and poorly drained soils in depressions. It is associated with loamy glacial till and gently sloping topography.**

YkOx10 Mainly a mixture of calcareous and carbonated Yorkton soils, with a mixture of calcareous and slightly eroded Oxbow soils on upper slopes and knolls, and orthic Yorkton soils on some lower slopes. This map unit is associated with hummocky landscapes having gentle slopes. It is similar to the YkOx8 map unit except that fewer undrained depressions occur in the landscape. Instead, carbonated Yorkton soils occur throughout many of the depressions.

YkOx11 Mainly a mixture of calcareous and carbonated Yorkton soilson mid- and lower slopes, with a mixture of orthic and calcareous Oxbow soils on upper slopes and knolls, orthic Yorkton soils on some lower slopes, and poorly drained soils in depressions. This is the most common Yorkton-Oxbow map unit in this municipality and occurs on hummocky landscapes with gentle to moderate slopes. It is very similar to the YkOx8 map unit, as shown in Fig. 59, except that the knolls are not as eroded and salinity has affected, to some degree, the carbonated Yorkton soils in a few areas.

Agricultural Properties of Yorkton-Oxbow Soils

Yorkton-Oxbow soils are very good agricultural soils of capability class 1 or 2. Their agricultural properties are similar to those of Yorkton Soils, which have been discussed previously, and the reader is directed to that section of this report.

by **W.D. Eilers, L.M. Kozak, H.P.W. Rostad and H.B. Stonehouse**

SOIL CAPABILITY FOR AGRICULTURE

INTRODUCTION

The soil capability classification for agricultural use is an interpretive classification of soils based on limitations affecting their use for production of annual crops. These limitations are categorized according to **degree** or severity and **kind** of limitation. Degree of limitation is represented by the Capability Class and kind is represented by the Capability Subclass. Capability classes and subclasses are briefly outlined below. A complete explanation of the system of soil capability classification for agriculture is contained in the publication, **A Guide to Soil Capability and Land Inventory Maps in Saskatchewan.**

CAPABILITY CLASS (DEGREE OF LIMITATION)

The mineral soils of Saskatchewan are grouped into seven capability classes. Soils rated Class 1 to 3 are considered suitable for sustained production of common cultivated field crops, those rated Class 4 are considered marginal for sustained production of common cultivated field crops, those rated Class 5 are considered capable only of permanent pasture and hay production, those rated Class 6 are considered suitable only for use as native pasture, and those rated Class 7 are considered unsuitable for either the production of field crops or for use as native pasture.

As a general rule, in rating each of the soils, those considered feasible of improvement by practices that can be made economically by the individual farm operator are classified according to their limitations **after** the improvements are made. Land requiring improvement beyond the means of the individual farmer is classified according to its present condition.

The average wheat yields in Saskatchewan for a ten-year period and potential yields for Classes 1 to 4 are shown in Table 1. As a basis for comparison, yields of spring wheat and various other crops for each of the municipalities of the map area and the crop districts in which they occur are presented in Table 2. This data is included to show relative differences in productivity that can be expected between these classes under average management. It should be realized that, with superior management and increased inputs, yields from lower capability classes can approach those of higher classes, although it should be recognized that increasing production may not always be economically feasible.

Table 1. Estimated average and potential wheat yield (kg/ac.) of soil capability classes in Saskatchewan.

Capability Class	1966-75 Fallow	1966-75 Stubble	Potential Fallow	Potential Stubble
1	955	668	1174	939
2	809	571	996	797
3	668	469	821	619
4	478	336	587	413

Table 2. Ten-year average (1974-83) grain yields (kg/ac.).

Area	Spring Wheat	Durum Wheat	Oats	Barley	Fall Rye	Flax	Canola
R.M. 121	691	662	707	825	707	343	398*
R.M. 122	659	669	663	724	610	338	388
R.M. 151	692	696	740	855	660	351	381*
R.M. 152	700	658	764	817	544	346	445
Crop Dist. 1B**	670	654	696	813	663	343	350
Crop Dist. 5A**	732	701	744	890	643	383	411

* Average by less than 10 years.
** 1975-84 average.

CAPABILITY SUBCLASS (KIND OF LIMITATION)

The capability subclass represents a grouping of soils that have the same kind of limitations for crop production. If more than one limiting condition is recognized in a particular area, the subclasses are listed in order of their importance.

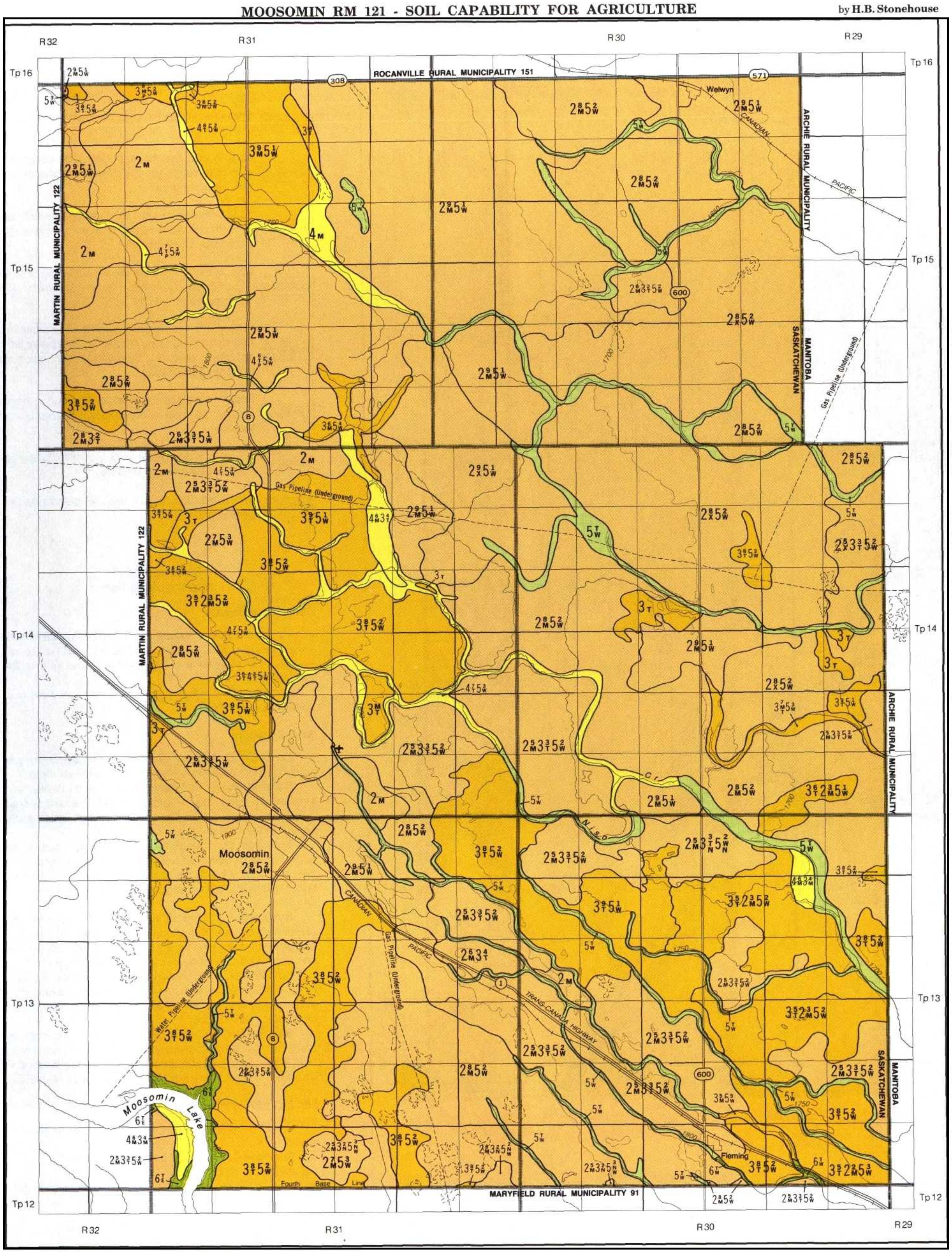
Fig. 60 Soils of agricultural capability class 2m5w have moderate limitations due to topography and severe limitations due to wetness.

Fig. 61 Soils of agricultural capability class 3t5w have moderately severe limitations due to topography and severe limitations due to wetness.

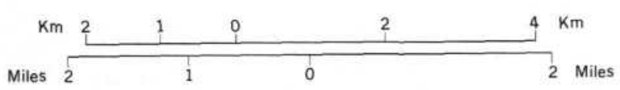
Fig. 62 Soils of agricultural capability class 4m have severe limitations due to insufficient water-holding capacity.

MOOSOMIN RM 121 - SOIL CAPABILITY FOR AGRICULTURE

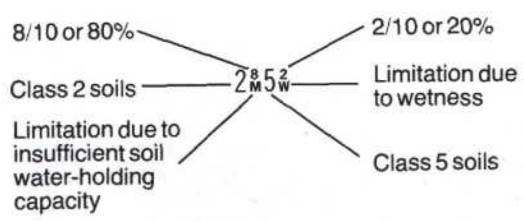
by H.B. Stonehouse



1:100,000



SEQUENCE OF MAP SYMBOLS



LEGEND

CAPABILITY CLASSES
Degree of Limitation

CLASS 1 Soils in this class have no significant limitations in use for crops.

CLASS 2 Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.

CLASS 3 Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.

CLASS 4 Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both.

CLASS 5 Soils in this class have very severe limitations that restrict their use to the production of native or tame species of perennial forage crops. Improvement practices are feasible.

CLASS 6 Soils in this class are capable of producing native forage crops only. Improvement practices are not feasible.

CLASS 7 Soils in this class have no capability for arable agriculture or permanent pasture.

CLASS 0 Soils in this class are organic and are not rated for agricultural capability.

SUBCLASSES
Kind of Limitation

Climatic Limitations

Limitations due to climate are caused by deficiencies in the amount and distribution of precipitation, length of growing season, frost-free period and amount of heat units available for plant growth.

Subclass C: Depicts a moisture deficiency due to insufficient precipitation.

Soil Limitations

Limitations due to soil deficiencies are caused by adverse physical, chemical and morphological properties of the soil.

Subclass M: Depicts an insufficient soil water-holding capacity, due to the combined effects of the textural characteristics of the top 1 m (3 to 4 ft.) and by the organic matter content of the surface horizon.

Subclass D: Depicts adverse soil structure in the upper layers (A and B horizons) that affects the condition of the seed bed, prevents or restricts root growth and penetration, or adversely affects moisture permeability and percolation.

Subclass F: Depicts adverse fertility characteristics of soils having naturally low inherent fertility due to lack of available nutrients, high acidity or alkalinity, high calcium carbonate content or inadequate cation exchange capacity.

Subclass N: Depicts excessive soil salinity and applies to soils with either high alkalinity or a sufficient content of soluble salts to adversely affect crop growth or the range of crops which can be grown.

Subclass S: Depicts a variety of adverse soil characteristics. It is used in a collective sense in place of subclasses M, D, F and N, where more than two of them are present, or where two of these occur in addition to some other limitation.

Landscape Limitations

Limitations due to adverse characteristics of the soil landscape.

Subclass T: Depicts a limitation in agricultural use of the soil as the result of unfavorable topography. It includes hazards to cultivation and cropping imposed by increasing degree of slope as well as by the irregularity of field pattern and lack of soil uniformity.

Subclass W: Depicts a limitation due to excess water caused by either poor soil drainage, a high groundwater table or to seepage and local runoff. It does not include limitations that are the result of flooding.

Subclass P: Depicts a limitation caused by excess stones and it applies to soils that are sufficiently stony that the difficulty of tillage, seeding and harvesting are significantly increased.

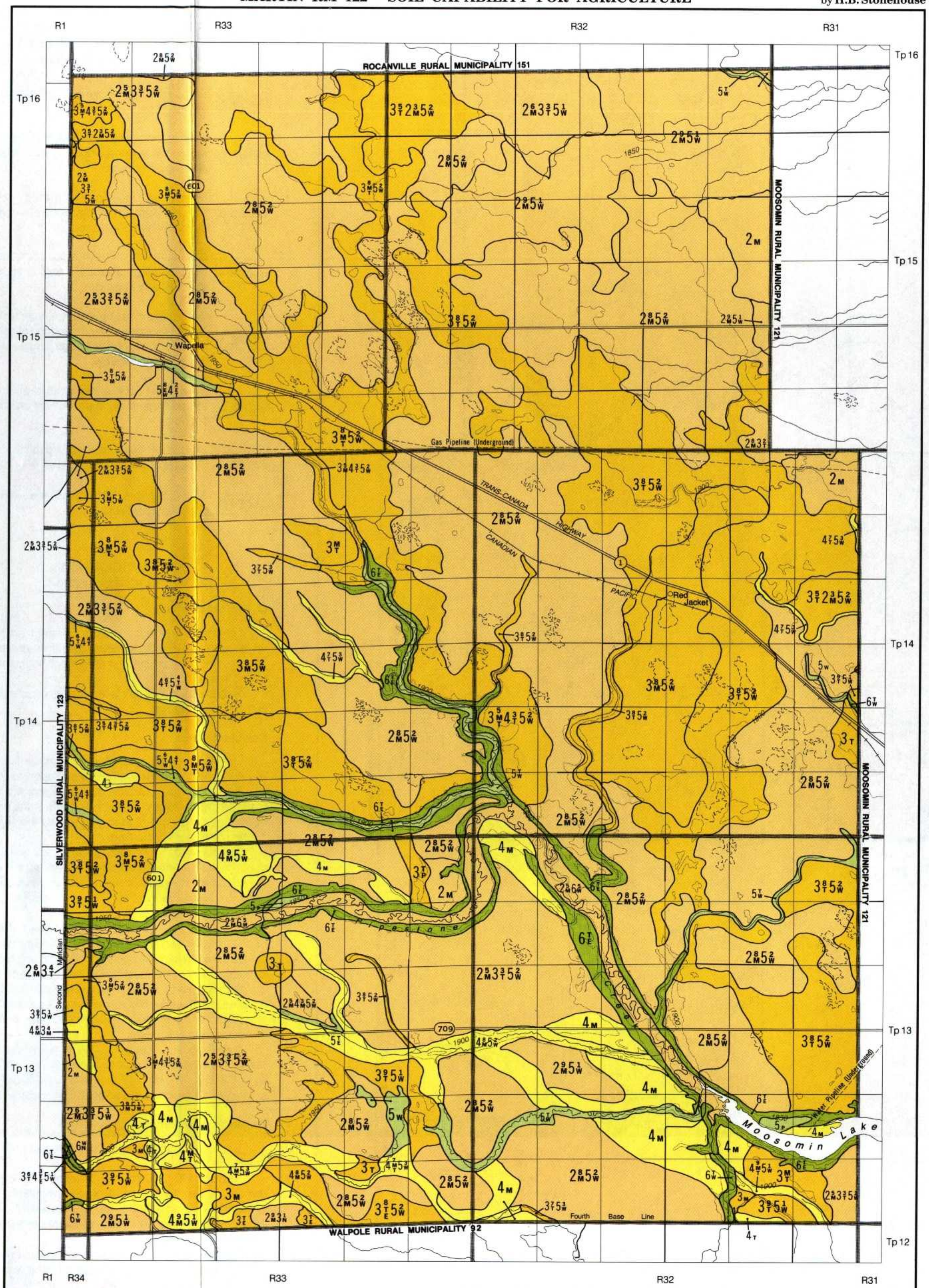
Subclass E: Depicts a limitation caused by actual damage from wind and/or water erosion.

Subclass I: Depicts a limitation due to inundation and applies to soils subjected to flooding by lakes or streams, but does not include local ponding in undrained depressions.

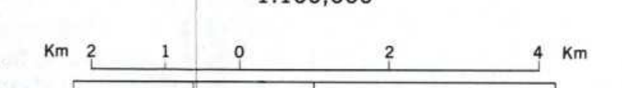
Subclass X: Soils having a moderate limitation due to the accumulative effect of two or more adverse characteristics of the soil and the landscape which singly are not serious enough to affect the class rating.

by H.B. Stonehouse

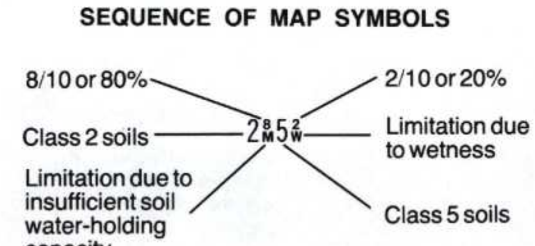
MARTIN RM 122 - SOIL CAPABILITY FOR AGRICULTURE by H.B. Stonehouse



1:100,000



SEQUENCE OF MAP SYMBOLS



LEGEND

CAPABILITY CLASSES
Degree of Limitation

- **CLASS 1** Soils in this class have no significant limitations in use for crops.
- **CLASS 2** Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.
- **CLASS 3** Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.
- **CLASS 4** Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both.
- **CLASS 5** Soils in this class have very severe limitations that restrict their use to the production of native or tame species of perennial forage crops. Improvement practices are feasible.
- **CLASS 6** Soils in this class are capable of producing native forage crops only. Improvement practices are not feasible.
- **CLASS 7** Soils in this class have no capability for arable agriculture or permanent pasture.
- **CLASS 0** Soils in this class are organic and are not rated for agricultural capability.

SUBCLASSES
Kind of Limitation

Climatic Limitations

Limitations due to climate are caused by deficiencies in the amount and distribution of precipitation, length of growing season, frost-free period and amount of heat units available for plant growth.

Subclass C: Depicts a moisture deficiency due to insufficient precipitation.

Soil Limitations

Limitations due to soil deficiencies are caused by adverse physical, chemical and morphological properties of the soil.

Subclass M: Depicts an insufficient soil water-holding capacity, due to the combined effects of the textural characteristics of the top 1 m (3 to 4 ft.) and by the organic matter content of the surface horizon.

Subclass D: Depicts adverse soil structure in the upper layers (A and B horizons) that affects the condition of the seed bed, prevents or restricts root growth and penetration, or adversely affects moisture permeability and percolation.

Subclass F: Depicts adverse fertility characteristics of soils having naturally low inherent fertility due to lack of available nutrients, high acidity or alkalinity, high calcium carbonate content or inadequate cation exchange capacity.

Subclass N: Depicts excessive soil salinity and applies to soils with either high alkalinity or a sufficient content of soluble salts to adversely affect crop growth or the range of crops which can be grown.

Subclass S: Depicts a variety of adverse soil characteristics. It is used in a collective sense in place of subclasses M, D, F and N, where more than two of them are present, or where two of these occur in addition to some other limitation.

Landscape Limitations

Limitations due to adverse characteristics of the soil landscape.

Subclass T: Depicts a limitation in agricultural use of the soil as the result of unfavorable topography. It includes hazards to cultivation and cropping imposed by increasing degree of slope as well as by the irregularity of field pattern and lack of soil uniformity.

Subclass W: Depicts a limitation due to excess water caused by either poor soil drainage, a high groundwater table or to seepage and local runoff. It does not include limitations that are the result of flooding.

Subclass P: Depicts a limitation caused by excess stones and it applies to soils that are sufficiently stony that the difficulty of tillage, seeding and harvesting are significantly increased.

Subclass E: Depicts a limitation caused by actual damage from wind and/or water erosion.

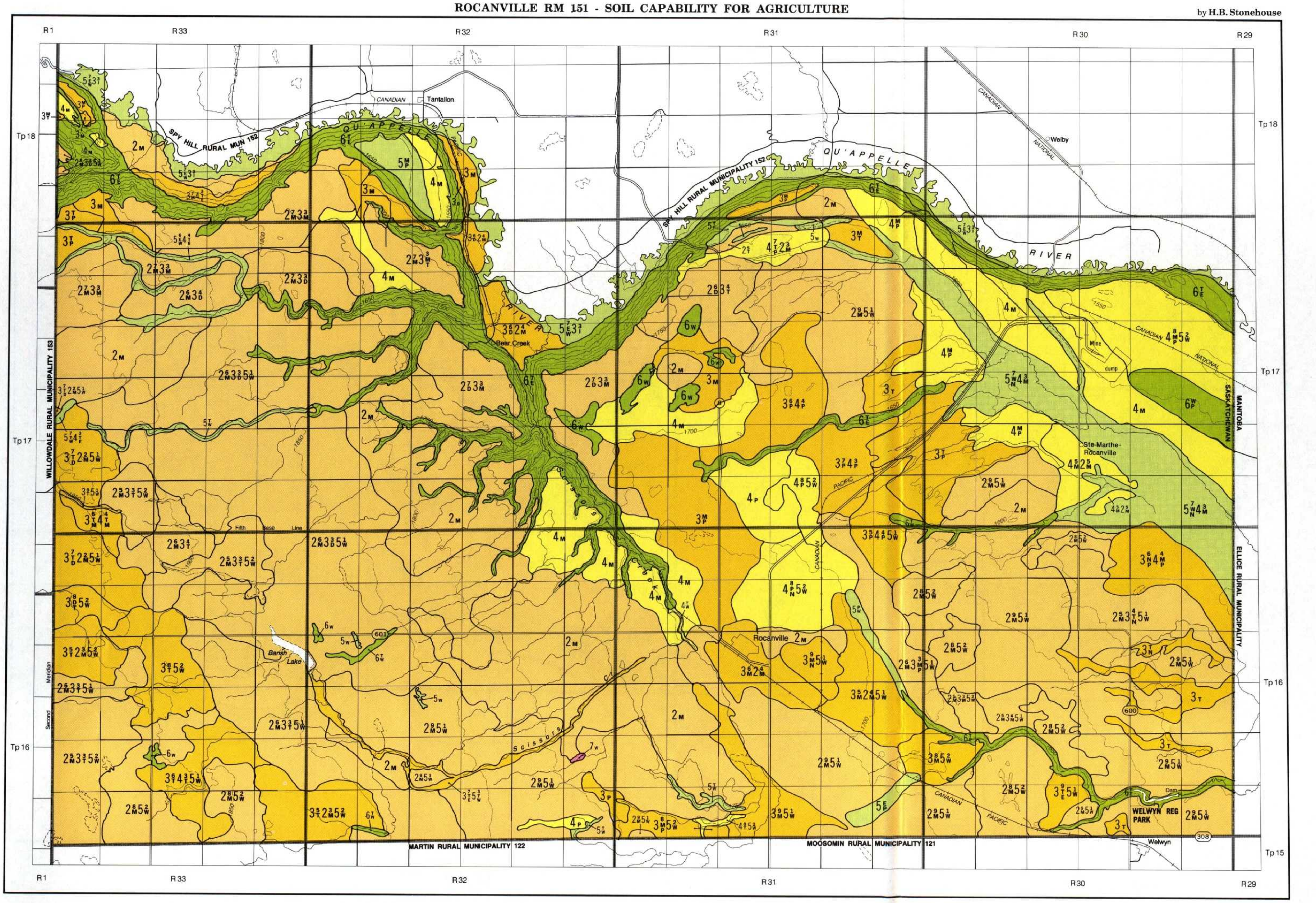
Subclass I: Depicts a limitation due to inundation and applies to soils subjected to flooding by lakes or streams, but does not include local ponding in undrained depressions.

Subclass X: Soils having a moderate limitation due to the accumulative effect of two or more adverse characteristics of the soil and the landscape which singly are not serious enough to affect the class rating.

by H.B. Stonehouse

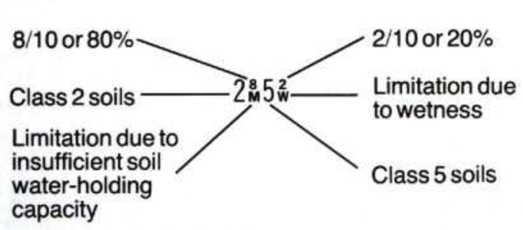
ROCANVILLE RM 151 - SOIL CAPABILITY FOR AGRICULTURE

by H.B. Stonehouse

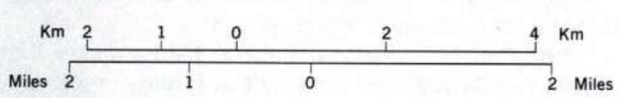


LEGEND

SEQUENCE OF MAP SYMBOLS



1:100,000



CAPABILITY CLASSES
Degree of Limitation

- **CLASS 1** Soils in this class have no significant limitations in use for crops.
- **CLASS 2** Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.
- **CLASS 3** Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.
- **CLASS 4** Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both.
- **CLASS 5** Soils in this class have very severe limitations that restrict their use to the production of native or tame species of perennial forage crops. Improvement practices are feasible.
- **CLASS 6** Soils in this class are capable of producing native forage crops only. Improvement practices are not feasible.
- **CLASS 7** Soils in this class have no capability for arable agriculture or permanent pasture.
- **CLASS 0** Soils in this class are organic and are not rated for agricultural capability.

SUBCLASSES
Kind of Limitation

Climatic Limitations

Limitations due to climate are caused by deficiencies in the amount and distribution of precipitation, length of growing season, frost-free period and amount of heat units available for plant growth.

Subclass C: Depicts a moisture deficiency due to insufficient precipitation.

Soil Limitations

Limitations due to soil deficiencies are caused by adverse physical, chemical and morphological properties of the soil.

Subclass M: Depicts an insufficient soil water-holding capacity, due to the combined effects of the textural characteristics of the top 1 m (3 to 4 ft.) and by the organic matter content of the surface horizon.

Subclass D: Depicts adverse soil structure in the upper layers (A and B horizons) that affects the condition of the seed bed, prevents or restricts root growth and penetration, or adversely affects moisture permeability and percolation.

Subclass F: Depicts adverse fertility characteristics of soils having naturally low inherent fertility due to lack of available nutrients, high acidity or alkalinity, high calcium carbonate content or inadequate cation exchange capacity.

Subclass N: Depicts excessive soil salinity and applies to soils with either high alkalinity or a sufficient content of soluble salts to adversely affect crop growth or the range of crops which can be grown.

Subclass S: Depicts a variety of adverse soil characteristics. It is used in a collective sense in place of subclasses M, D, F and N, where more than two of them are present, or where two of these occur in addition to some other limitation.

Landscape Limitations

Limitations due to adverse characteristics of the soil landscape.

Subclass T: Depicts a limitation in agricultural use of the soil as the result of unfavorable topography. It includes hazards to cultivation and cropping imposed by increasing degree of slope as well as by the irregularity of field pattern and lack of soil uniformity.

Subclass W: Depicts a limitation due to excess water caused by either poor soil drainage, a high groundwater table or to seepage and local runoff. It does not include limitations that are the result of flooding.

Subclass P: Depicts a limitation caused by excess stones and it applies to soils that are sufficiently stony that the difficulty of tillage, seeding and harvesting are significantly increased.

Subclass E: Depicts a limitation caused by actual damage from wind and/or water erosion.

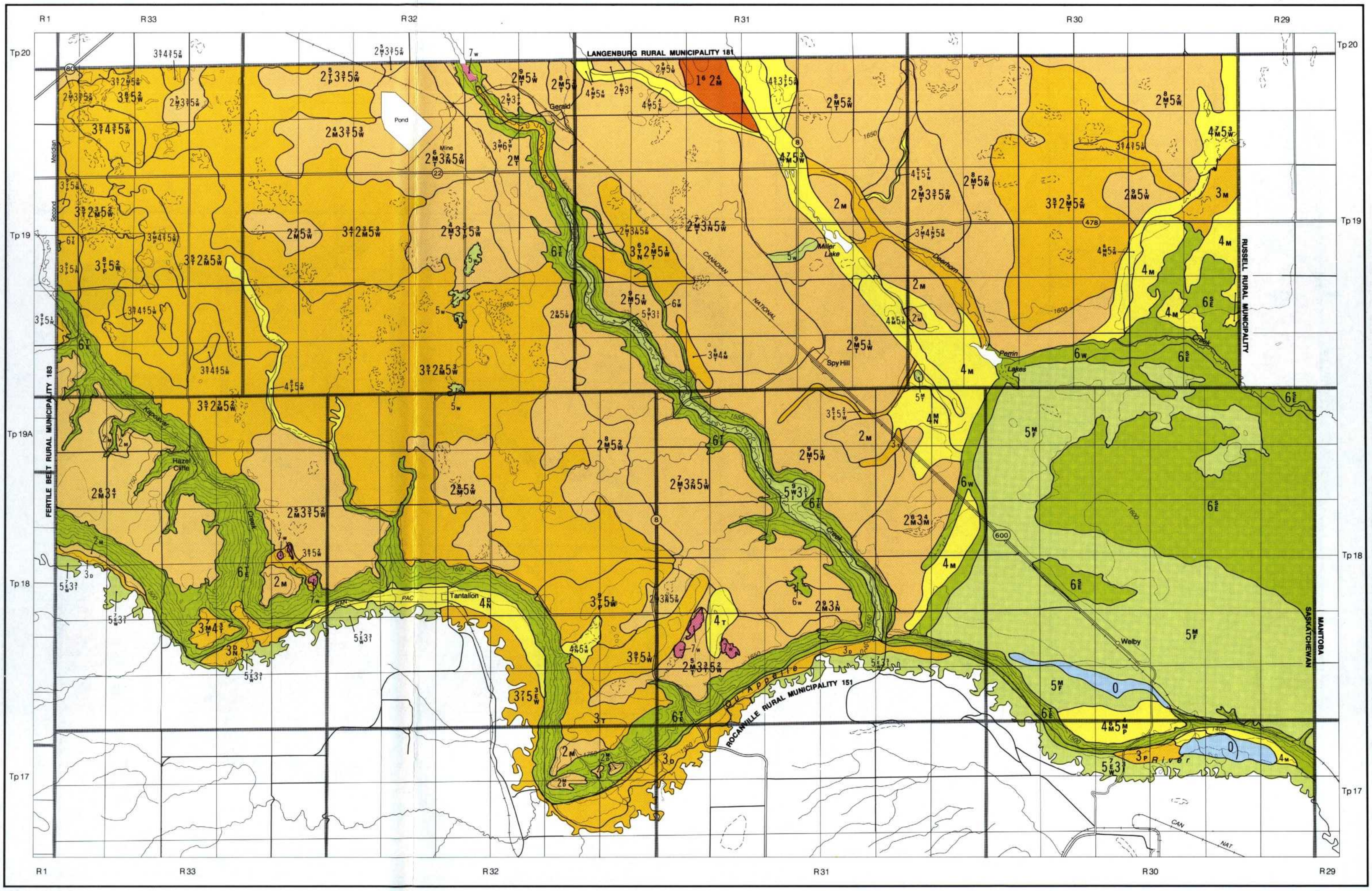
Subclass I: Depicts a limitation due to inundation and applies to soils subjected to flooding by lakes or streams, but does not include local ponding in undrained depressions.

Subclass X: Soils having a moderate limitation due to the accumulative effect of two or more adverse characteristics of the soil and the landscape which singly are not serious enough to affect the class rating.

by H.B. Stonehouse

SPY HILL RM 152 - SOIL CAPABILITY FOR AGRICULTURE

by H.B. Stonehouse



LEGEND

SEQUENCE OF MAP SYMBOLS

8/10 or 80%

2/10 or 20%

Class 2 soils

Limitation due to wetness

Limitation due to insufficient soil water-holding capacity

Class 5 soils

1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

CAPABILITY CLASSES
Degree of Limitation

CLASS 1 Soils in this class have no significant limitations in use for crops.

CLASS 2 Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.

CLASS 3 Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.

CLASS 4 Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both.

CLASS 5 Soils in this class have very severe limitations that restrict their use to the production of native or tame species of perennial forage crops. Improvement practices are feasible.

CLASS 6 Soils in this class are capable of producing native forage crops only. Improvement practices are not feasible.

CLASS 7 Soils in this class have no capability for arable agriculture or permanent pasture.

CLASS 0 Soils in this class are organic and are not rated for agricultural capability.

SUBCLASSES
Kind of Limitation

Climatic Limitations

Limitations due to climate are caused by deficiencies in the amount and distribution of precipitation, length of growing season, frost-free period and amount of heat units available for plant growth.

Subclass C: Depicts a moisture deficiency due to insufficient precipitation.

Soil Limitations

Limitations due to soil deficiencies are caused by adverse physical, chemical and morphological properties of the soil.

Subclass M: Depicts an insufficient soil water-holding capacity, due to the combined effects of the textural characteristics of the top 1 m (3 to 4 ft.) and by the organic matter content of the surface horizon.

Subclass D: Depicts adverse soil structure in the upper layers (A and B horizons) that affects the condition of the seed bed, prevents or restricts root growth and penetration, or adversely affects moisture permeability and percolation.

Subclass F: Depicts adverse fertility characteristics of soils having naturally low inherent fertility due to lack of available nutrients, high acidity or alkalinity, high calcium carbonate content or inadequate cation exchange capacity.

Subclass N: Depicts excessive soil salinity and applies to soils with either high alkalinity or a sufficient content of soluble salts to adversely affect crop growth or the range of crops which can be grown.

Subclass S: Depicts a variety of adverse soil characteristics. It is used in a collective sense in place of subclasses M, D, F and N, where more than two of them are present, or where two of these occur in addition to some other limitation.

Landscape Limitations

Limitations due to adverse characteristics of the soil landscape.

Subclass T: Depicts a limitation in agricultural use of the soil as the result of unfavorable topography. It includes hazards to cultivation and cropping imposed by increasing degree of slope as well as by the irregularity of field pattern and lack of soil uniformity.

Subclass W: Depicts a limitation due to excess water caused by either poor soil drainage, a high groundwater table or to seepage and local runoff. It does not include limitations that are the result of flooding.

Subclass P: Depicts a limitation caused by excess stones and it applies to soils that are sufficiently stony that the difficulty of tillage, seeding and harvesting are significantly increased.

Subclass E: Depicts a limitation caused by actual damage from wind and/or water erosion.

Subclass I: Depicts a limitation due to inundation and applies to soils subjected to flooding by lakes or streams, but does not include local ponding in undrained depressions.

Subclass X: Soils having a moderate limitation due to the accumulative effect of two or more adverse characteristics of the soil and the landscape which singly are not serious enough to affect the class rating.

by H.B. Stonehouse

SOIL PRODUCTIVITY

Soil productivity is a measure of the land's ability to sustain production under a specified level of management. In general, it is related to climate and to several soil factors of which soil texture and soil fertility are the most important.

SOIL TEXTURE

Mineral soil is a mixture of various-sized mineral particles, decaying organic matter, and air and water. The mineral particles, exclusive of stones and gravel, may be grouped into three particle-size fractions: sands (the largest or coarsest), silts, and clays (the smallest or finest). The relative proportions of these particle-size fractions in a soil determine its **texture.** Thus, sand, when dominant, yields a sandy- or coarse-textured soil, whereas a fine-textured soil is made up largely of silt and clay. The terms 'light' and 'heavy' are often used to refer to sandy- and clayey-textured soils respectively.

Textural class names such as sandy loam, clay loam, heavy clay and the like are given to soils based upon the relative proportions of sand, silt and clay. Three broad yet fundamental textural groups are recognized: sands, loam and clays.

SANDS The sand group includes soils in which the sand particles make up at least 70% of the material by weight. Two main classes are recognized: sand and loamy sand.

CLAYS The clay group contains at least 35% clay, and in most cases more than 40%. Class names are sandy clay, silty clay, clay, and heavy clay. Soils of this group are often called 'gumbo'.

LOAMS The loam group is intermediate in texture between the coarse-textured sands and the fine-textured clays, and usually contains a significant proportion of each particle-size fraction. Class names include sandy loam, silt loam, silty clay loam, sandy clay loam, clay loam, and loam.

SOIL TEXTURE CLASSES

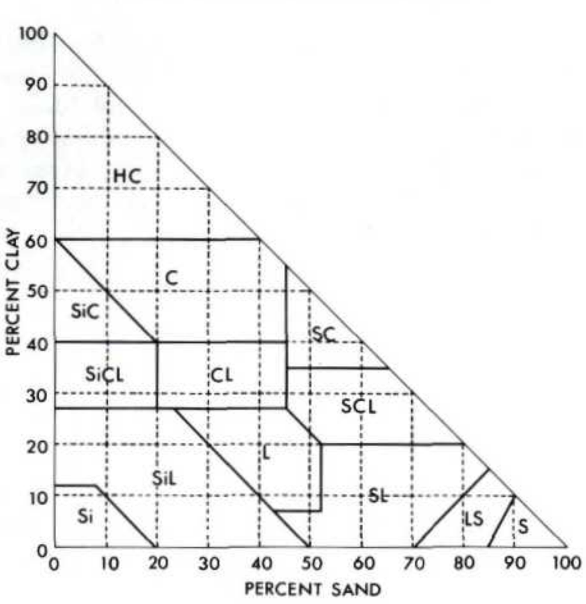


Fig. 63 Textural triangle showing percentages of sand, silt, and clay in each textural class.

SOIL MOISTURE

Sandy soils have mainly large, continuous pores which transmit water relatively quickly by gravitational flow. Clayey soils have mainly small pores which retain water by capillary forces, but transmit it slowly.

As water enters the soil, air is displaced and the soil pores fill with water. At this point the upper part of the soil is said to be **saturated**. If the supply of water is cut off, downward movement of water will essentially cease after a day or two. The water will have moved out of the large pores and its place taken by air. The small pores will still be filled with water, and it is from this source that plants will be able to absorb water for their use. At this point the soil is said to be at field capacity. If plant growth is eliminated or kept to a minimum, the soil will remain at or near **field capacity** for some time, except at the surface where some moisture will be lost through evaporation. If the soil is cultivated, it will likely dry out to the depth of cultivation.

As plants absorb water from the soil, it will gradually dry out, and eventually the plants will wilt. Although there is still moisture in the soil, it is so tightly held that plants are unable to absorb it fast enough for their needs. At this point, the soil is said to be at the **wilting point.**

Available water is the portion of soil water that can be absorbed fast enough by plant roots to sustain life, and is roughly equal to the difference between the amount of water held at **field capacity** (the maximum amount of water that a soil can hold against the pull of gravity) and that held at the **wilting point** (the amount of water so tightly held by the soil that it is unavailable to plants).

Calculation of Available Soil Moisture

Since the soil's moisture content at both field capacity and permanent wilting point are a function of its texture, the available water-holding capacity of the soil can be estimated if the texture of the soil is known.

Table 3. Available water-holding capacities of soil texture classes.

Texture class	Available water-holding capacity per unit depth of moist soil
Gravelly sand	0.02
Coarse sand	0.02
Sand	0.03
Gravelly loamy sand	0.04
Loamy sand	0.05
Loamy fine sand	0.06
Gravelly sandy loam	0.07
Sandy loam	0.08
Fine sandy loam	0.09
Very fine sandy loam	0.10
Gravelly loam	0.11
Sandy clay loam	0.12
Fine sandy clay loam	0.13
Very fine sandy clay loam	0.13
Loam	0.14
Silt loam	0.16
Clay loam	0.17
Silty clay loam	0.20
Clay	0.21
Silty clay	0.22
Heavy clay	0.23

To calculate the amount of available water in the soil, multiply the soil's available water-holding capacity by the depth of moist soil.

Example: If a loam-textured soil were moist to a depth of 500 mm, it would contain about (500 x 0.14) 70 mm of available water.

In most fields, the depth of moist soil will vary from place to place because of the effect of runoff. For this reason, soil moisture should be evaluated either in a relatively level area of the field or in the midslope position to obtain an average figure. The maximum depth from which plants can absorb water ranges from about 1 m (3 to 4 ft) for most cereals, grasses and root crops, to about 2 m (6 to 7 ft) for alfalfa.

Estimation of Potential Yield

An estimate of the amount of available soil moisture may be of value in decision-making regarding the seeding of stubble land and the level of fertilizer inputs required. In most cases such decisions rely, in part, on an estimate of expected yield. Since yield is largely a function of soil moisture conditions, an estimate of the amount of soil moisture available to the crop over the growing season can be used to assess the probability of obtaining a given yield.

As a general rule, approximately 75 mm (3 in) of available water is needed to produce wheat plants from seed to maturity. Each additional 25 mm (1 in) of available moisture in the soil yields an additional 200 to 350 kg/ha (3 to 5 bu/ac) of wheat depending upon climate, soil and landscape characteristics, soil fertility levels, as well as the timeliness, duration and intensity of rainfall events. The total soil moisture requirements in relation to the anticipated yields of various crops commonly grown in this area are presented in Table 4.

In a particular year the amount of soil moisture available to the crop equals the amount stored in the soil prior to seeding, plus that received as precipitation during the growing season. The amount of available moisture in the soil prior to seeding can be estimated using Table 3 as shown previously. The amount of precipitation, on the other hand, obviously cannot be estimated as precisely. At best, one can only assess the probability of receiving various amounts of precipitation based on long-term weather records for the area in question.

Precipitation probability data for these municipalities are presented in Table 5, which in essence, simply provides the odds or chances (expressed in percentage terms) of receiving **at least** a given amount of precipitation during the growing season.

Example: If the probability of receiving 175 mm (7 in) of precipitation were 70%, then at least 175 mm of precipitation could be expected in 7 out of every 10 years.

Table 5. Probability (%) of receiving at least the indicated amounts of growing-season precipitation in this area.[a]

Precipitation (mm)[b]										
50	75	100	125	150	175	200	225	250	275	300
>95	95	90	85	80	70	60	50	40	30	20

[a] Precipitation data from Moosomin weather station.

[b] To convert millimetres (mm) to inches, divide by 25.

To assess the probability of obtaining a particular yield: **first**, estimate the amount of available moisture stored in soil prior to seeding (Table 3); **second**, determine the total moisture requirements (Table 4); and **third**, assess the probability of receiving enough precipitation during the growing season to make up the difference (Table 5).

Example: If prior to seeding a loam-textured soil were moist to a depth of 500 mm, what would be the probability of obtaining at least a 1500 kg/ha (22 bu/ac) wheat yield?

1. Moisture stored in the soil prior to seeding equals (500 x 0.14) 70 mm.
2. Total moisture requirements for a yield of 1500 kg/ha wheat is 200 mm.
3. The amount of moisture required during the growing season to produce a yield of 1500 kg/ha is (200-70) 130 mm, and the probability of receiving at least 130 mm and thus obtaining a yield of 1500 kg/ha is about 83%.

Table 4. Estimated yields[a] (kg/ha) in relation to total moisture requirements.

	Moisture requirements (mm)[b]										To convert kg/ha to bu/ac
Crop	125	150	175	200	225	250	275	300	325	350	multiply by:
Wheat	600	900	1200	1500	1800	2100	2400	2700	3000	3300	.015
Oats	640	950	1270	1590	1910	2230	2540	2860	3180	3500	.026
Barley	740	1110	1480	1850	2210	2580	2950	3320	3690	4060	.019
Flax	330	500	660	830	990	1160	1320	1490	1650	1820	.016
Canola	360	540	720	900	1080	1270	1440	1620	1800	1980	.018

[a] Yield estimates are based on good management and reasonably normal seasonal climatic conditions, particularly with respect to the timeliness, intensity and duration of rainfall events. Thus, actual yields may exceed estimates under abnormally favorable conditions, or be below estimates due to weeds, disease, low fertility, or adverse climatic extremes.

[b] To convert millimetres (mm) to inches, divide by 25.

SOIL FERTILITY

Soil fertility is the ability of the soil to supply the essential plant nutrients to the crop. Plants, to grow, need at least 16 elements. From the air and water they utilize carbon, hydrogen and oxygen. All other nutrients, except some nitrogen that may be acquired from the air by legumes, are normally obtained from the soil. Those absorbed in large amounts, **macronutrients**, are nitrogen, phosphorus, potassium, sulfur, calcium, and magnesium; the remainder – iron, boron, copper, zinc, manganese, molybdenum, and chlorine – are absorbed in relatively small quantities and are termed **micronutrients.**

Soil Organic Matter

The principal storehouse in the soil for large amounts of nutrients is the soil organic matter, which is a complex collection of plant and animal remains in various stages of decay, of microorganisms, and of various substances synthesized by microorganisms. Humus is the dark brown to black, strongly decomposed organic material.

Although soil organic matter comprises less than 10% of the soil by weight, it accounts for about 95% of the soil nitrogen, 60% of the soil phosphorus and as much as 80% of the soil sulfur. In absolute terms this amounts to hundreds and sometimes thousands of kilograms per hectare for each nutrient. Only a small fraction, however, is in a form that is available to plants. As available nutrients, particularly nitrogen and sulfur, are removed by plant absorption, they are gradually replenished via the decomposition of soil organic matter by microorganisms. Most nutrient deficiencies occur because the rate at which available nutrients are replenished is not fast enough to meet crop requirements; to augment these insufficient supplies, fertilizers are added.

The amount of organic matter in the soil is largely a function of the amount of organic residues produced and added to the soil. In virgin or uncultivated soils, it is related to the vegetation that has prevailed in the area for the past 10,000 years or so since deglaciation. In general, the more luxuriant the vegetative growth, the more residues produced and the greater the amount of organic matter added to the soil. Also of importance is the type of vegetation. Soils developed under grassland vegetation have relatively high organic matter contents compared to those developed under forests. The reason is that most grasses, having adapted to an arid environment, have dense, fibrous root systems which upon decay add organic matter to the soil. With forest vegetation, on the other hand, most growth occurs aboveground, adding little, if any, organic matter to the soil.

The accumulation of organic matter occurs mainly in the upper 25 cm (10 in) of the soil, the exception being some heavy clay soils in which continual shrinking and swelling and resultant cracking tends to incorporate the organic materials to a greater depth, often to as much as a metre. The organic matter content of this surface layer of soil is reflected by its color – the darker the color, the more organic matter.

In a regional sense, the organic matter content of Saskatchewan soils is expressed by several major soil zones – Brown, Dark Brown, Black, Dark Gray, and Gray – which are named for the prevailing color of the soil's surface horizon. Regional changes in the soil's organic matter content are gradual, and tend to parallel the increasing moisture and decreasing energy gradients from the southwest to the northeast. Thus, organic matter levels in the province follow a predictable trend, increasing from the Brown through the Black zones, and then decreasing again from the Black to the Gray zones, the latter reflecting the increasing influence of forest vegetation.

Soil organic matter contents and nutrient levels also follow a predictable trend within most landscapes, in general paralleling the increasing moisture gradient from the upper to the lower slopes. Thus, soils on knolls and upper slopes often have significantly lower organic matter contents than those on the lower slopes. Soils on the midslopes generally have average organic matter contents characteristic of the soil zone in which they occur.

Soil organic matter levels are also affected, often dramatically, by cultivation, particularly where land is summerfallowed often. According to some, as much as half of the soil's original supply of organic matter has been exhausted after a mere 75 years or so of cultivation, evidence of the simple fact that under past management practices more organic matter and nutrients have been consumed annually than have been replenished from crop residues (Fig. 64). Of practical significance is the fact that as organic matter levels in the soil decline, steadily increasing amounts of fertilizers must be added to meet the nutrient requirements of the crop. In addition, soils may become more difficult to till, and the rate of infiltration of water into the soil may decrease leading to increased runoff.

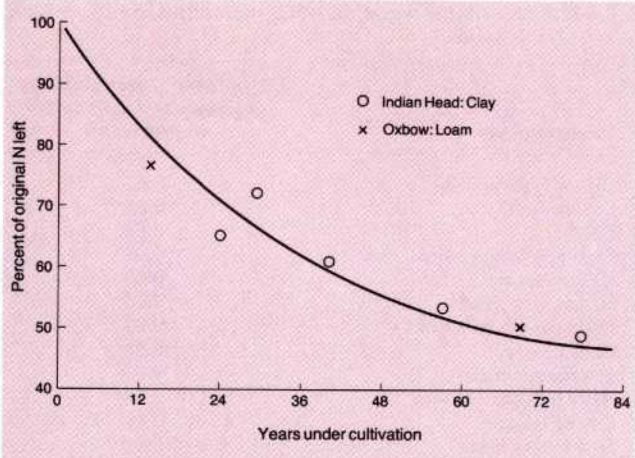


Fig. 64 Loss in nitrogen since cultivation on some common soils of the area.

Nitrogen

Poor yields are often the result of a deficiency of nitrogen. As with most nutrients, however, a nitrogen deficiency is usually not due to a lack of nitrogen in the soil, but rather to a lack of nitrogen in a form that can be utilized by plants. Soil microorganisms, breaking down soil organic matter (humus), release nitrogen that is available to plants. Seldom, however, is the amount of nitrogen released annually sufficient to meet crop requirements. Thus, in stubble fields, nitrogen is almost always in short supply (Table 6). During the summerfallow period, available forms of nitrogen released by microorganisms accumulate in the soil. Although this nitrogen, plus that released during the following growing season are often sufficient to meet the requirements of the crop, recent soil test data suggests that about half of the summerfallow fields in these municipalities and the surrounding area require additions of at least 20 kg/ha (18 lb/ac) of nitrogen fertilizers to meet the minimum requirements for most crops in years of favorable moisture conditions when yield potentials are high (Table 6). Since there is a limit to the amount of nitrogen the soil can continue to supply, it is reasonable to expect that if organic matter levels continue to decline, an increasing proportion of summerfallow fields or parts thereof will also require nitrogen fertilizers.

Table 6. Percentages of soils[a] having less than the indicated soil test levels of nitrogen.

	Nitrogen (NO_3-N) (kg/ha)									Minimum levels considered sufficient[b] (kg/ha)
	20	30	40	50	60	70	80	90	100	
Stubble	14	35	54	67	77	83	88	91	93	80-100
Fallow	1	3	10	22	38	53	66	76	83	

[a] Data from Saskatchewan Soil Testing Laboratory, 1978-82 (Tp 12-25, Rg 1-12, W2).

[b] Crop requirements vary depending upon soil type, crop grown and estimated yield in relation to anticipated soil moisture conditions.

Phosphorus

Total phosphorus in the upper 15 cm (6 in) of Saskatchewan soils averages about 1000 kg/ha (900 lb/ac). However, since most of this phosphorus is insoluble and strongly adsorbed to the mineral soil particles, only an infinitesimal part is available for immediate uptake by the plant at any one time. As a result, most soils in these municipalities, with the possible exception of those having recently received either manure or relatively high levels of phosphorus fertilizers, are deficient in available phosphorus and will give yield increases to fertilizer phosphorus applications in most years. Moreover, since relatively large quantities of phosphorus are required in the early stages of plant growth, even soils having high soil test levels of available phosphorus will sometimes respond if soil moisture and temperature conditions are low and if the fertilizer phosphorus is placed near the seed.

Because of phosphorus precipitation and adsorption in soil, fertilizer phosphorus is often placed in a band near the seed to minimize contact with the soil but to be close enough to young roots. Even using this technique, less than 30% of the phosphorus added is used by the crop during the season the phosphorus is applied. The unused or residual portion remains in the surface layer of the soil and can be used by succeeding crops, although its availability decreases with time.

Single applications of large amounts of phosphorus, greater than 200 kg/ha (180 lb/ac), with the intent of eliminating annual applications, is feasible but is not a common practice because of the high initial investment cost and the slight decrease in phosphorus availability with time. This practice may also have merit as a supplement to normal phosphorus applications in parts of the field, such as eroded knolls, where available phosphorus levels are typically low in comparison to the rest of the field.

Sulfur, Potassium, and Micronutrients

Deficiencies in sulfur, potassium and micronuients for common field crops have not been documented in the soils of these municipalities. If such deficiencies do exist, particularly for sulfur or micronutrients, they most likely occur either in sandy, low-organic matter soils or in soils that have been severely eroded.

Soil Testing

The supply of available nutrients in the soil at a given time is a function of numerous, often interrelated, factors: the soil's texture, pH and organic matter content; the soil temperature and soil moisture conditions during the previous year; and the past management history in terms of the crops grown, the yields obtained, and the type and amount of fertilizers recently applied.

For this reason, wide, unpredictable variations in available nutrient levels commonly occur not only from year to year, but between one field and another, and even from place to place within the same field (see Table 6). Thus, the only reliable method of assessing the nutrient status of the soil is a soil test.

Ideally, a soil test should be carried out for each field. In fact, if the field is characterized by several different soil types, each type should be sampled separately. If the latter is deemed impractical on an annual basis, it should at least be used to establish fertility patterns; once the pattern is established, conventional sampling practices would suffice in subsequent years.

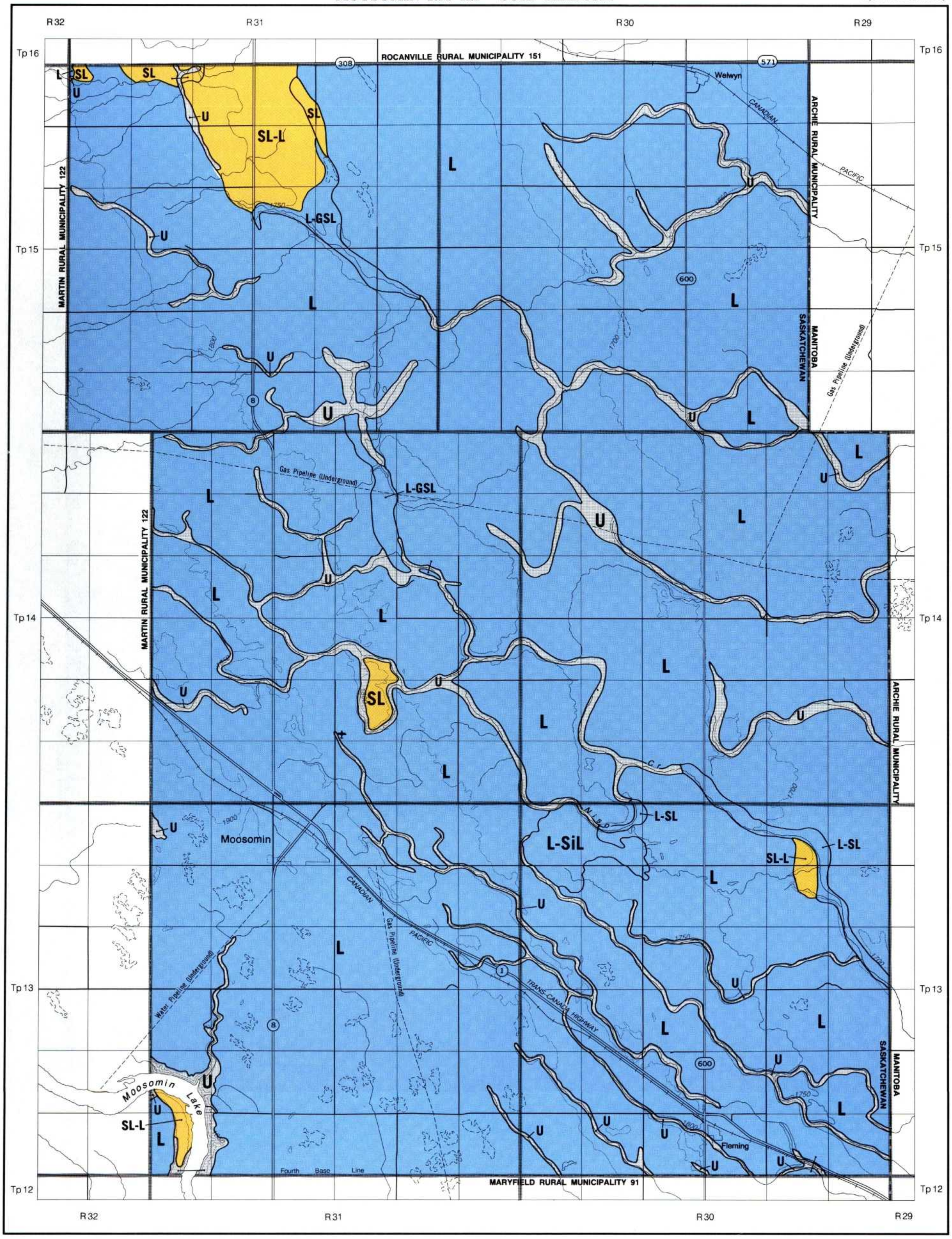
The extension of soil test results from field to field is valid to a degree, provided that the fields have tested similarly in the past, that the crops grown, yields obtained and fertilizers applied have been the same in recent years, and that the soil type is reasonably similar. Information about the soils in these municipalities is given in various other sections of this publication.

Additional information on soil fertility, soil testing and fertilizer use can be obtained from the **Saskatchewan Soil Testing Laboratory** and **Department of Soil Science, University of Saskatchewan, Saskatoon;** or through **District Agricultural Representatives** and **Regional Soils and Crop Specialists, Saskatchewan Agriculture.**

by **G.A. Padbury**

MOOSOMIN RM 121 - SOIL TEXTURE

by G.A. Padbury



LEGEND

MAP SYMBOL	SOIL TEXTURE CLASS
	Coarse-Textured
GS	Gravelly sand
S	Sand
GLS	Gravelly loamy sand
LS	Loamy sand
	Moderately Coarse-Textured
GSL	Gravelly sandy loam
GL	Gravelly loam
SL	Sandy loam
FL	Fine sandy loam
VL	Very fine sandy loam

MAP SYMBOL	SOIL TEXTURE CLASS
	Medium-Textured
SCL	Sandy clay loam
FCL	Fine sandy clay loam
VCL	Very fine sandy clay loam
L	Loam
	Moderately Fine-Textured
SiL	Silt loam
CL	Clay loam
SiCL	Silty clay loam

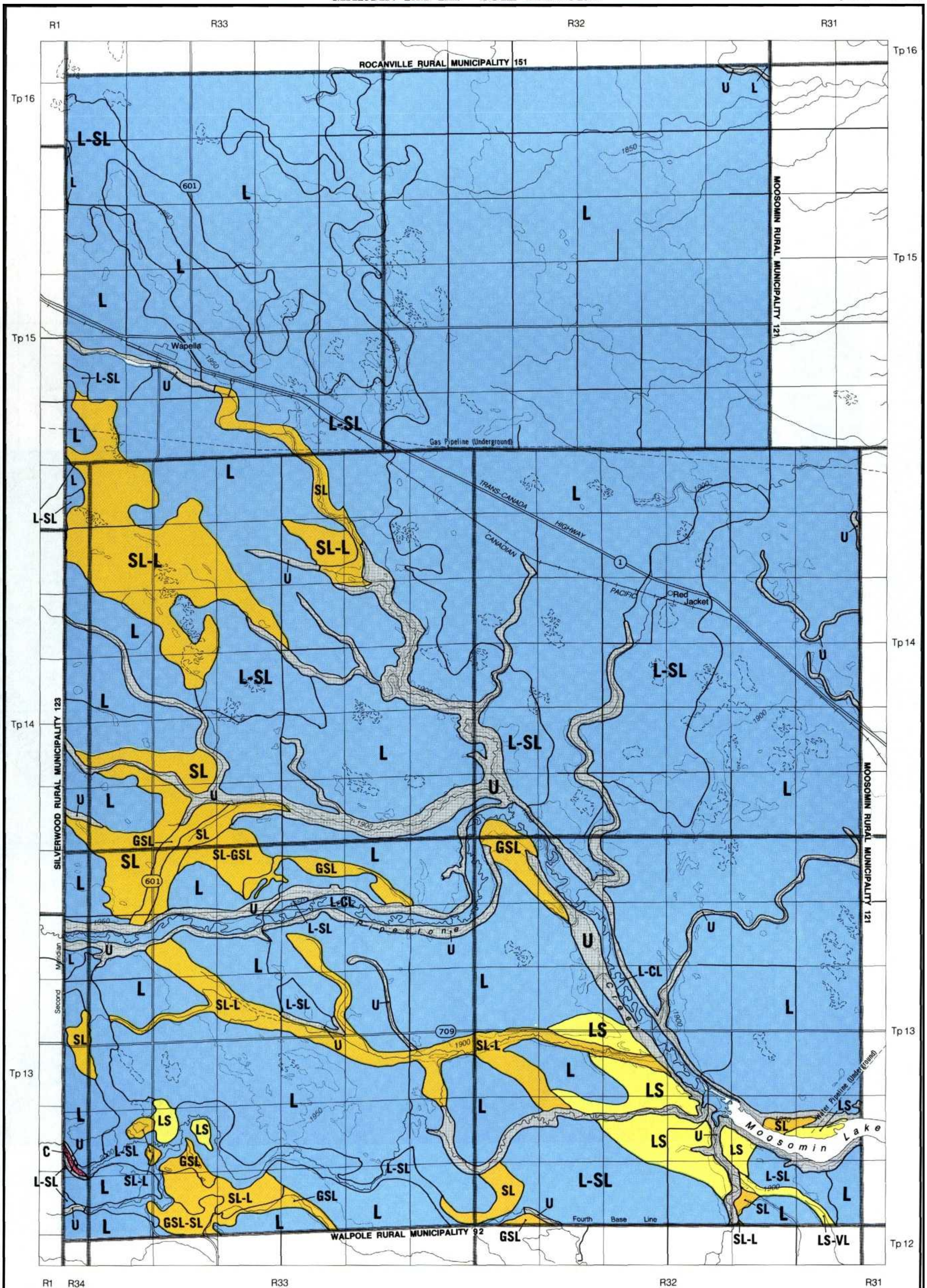
MAP SYMBOL	SOIL TEXTURE CLASS
	Fine-Textured
C	Clay
SiC	Silty clay
HC	Heavy clay
	Miscellaneous
U	Unclassified

1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

MARTIN RM 122 - SOIL TEXTURE by G.A. Padbury



LEGEND

MAP SYMBOL	SOIL TEXTURE CLASS
	Coarse-Textured
GS	Gravelly sand
S	Sand
GLS	Gravelly loamy sand
LS	Loamy sand
	Moderately Coarse-Textured
GSL	Gravelly sandy loam
GL	Gravelly loam
SL	Sandy loam
FL	Fine sandy loam
VL	Very fine sandy loam

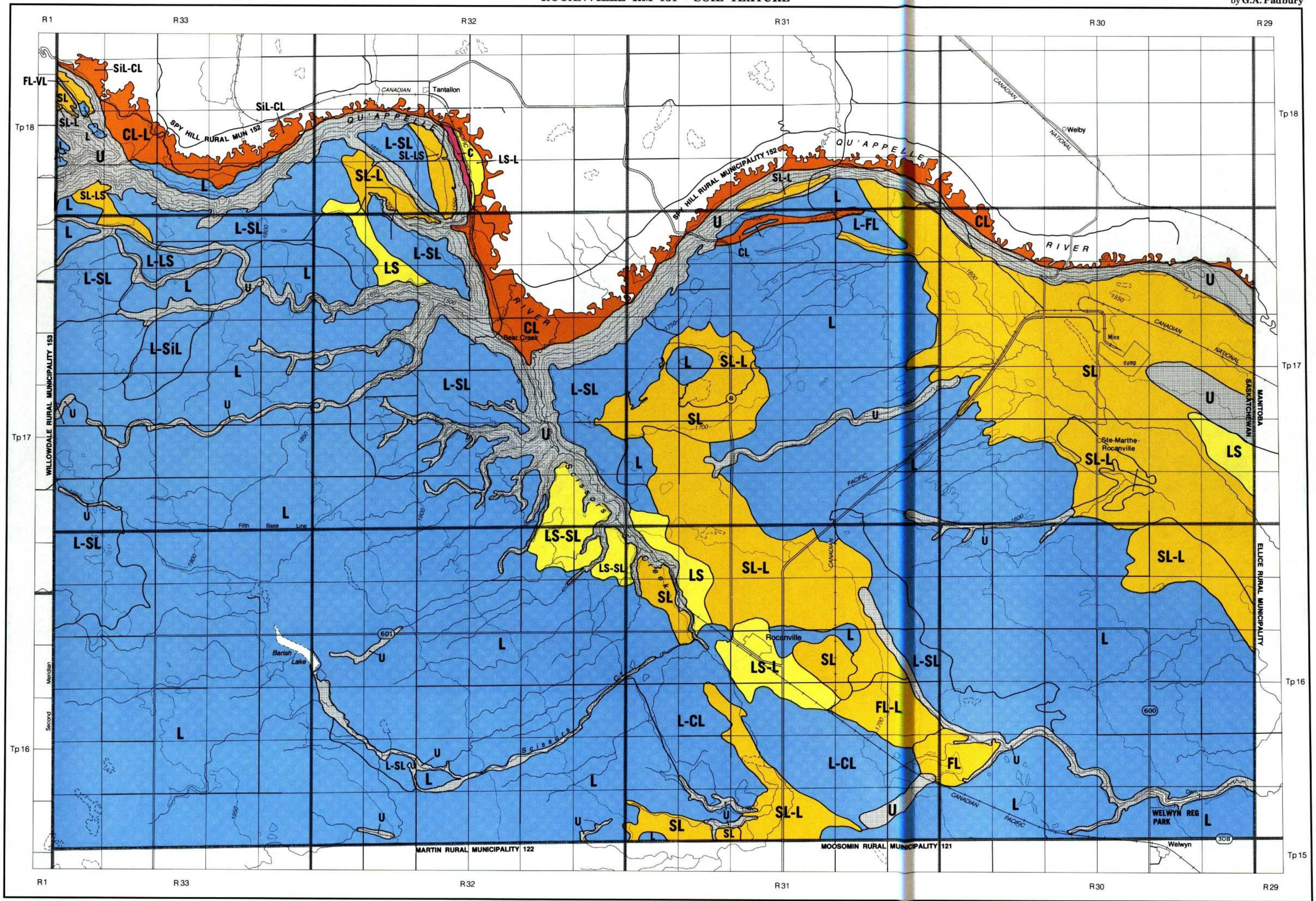
MAP SYMBOL	SOIL TEXTURE CLASS
	Medium-Textured
SCL	Sandy clay loam
FCL	Fine sandy clay loam
VCL	Very fine sandy clay loam
L	Loam
	Moderately Fine-Textured
SiL	Silt loam
CL	Clay loam
SiCL	Silty clay loam

MAP SYMBOL	SOIL TEXTURE CLASS
	Fine-Textured
C	Clay
SiC	Silty clay
HC	Heavy clay
	Miscellaneous
U	Unclassified

1:100,000

ROCANVILLE RM 151 - SOIL TEXTURE

by G.A. Padbury



LEGEND

MAP SYMBOL	SOIL TEXTURE CLASS
	Coarse-Textured
GS	Gravelly sand
S	Sand
GLS	Gravelly loamy sand
LS	Loamy sand
	Moderately Coarse-Textured
GSL	Gravelly sandy loam
GL	Gravelly loam
SL	Sandy loam
FL	Fine sandy loam
VL	Very fine sandy loam

MAP SYMBOL	SOIL TEXTURE CLASS
	Medium-Textured
SCL	Sandy clay loam
FCL	Fine sandy clay loam
VCL	Very fine sandy clay loam
L	Loam
	Moderately Fine-Textured
SiL	Silt loam
CL	Clay loam
SiCL	Silty clay loam

MAP SYMBOL	SOIL TEXTURE CLASS
	Fine-Textured
C	Clay
SiC	Silty clay
HC	Heavy clay
	Miscellaneous
U	Unclassified

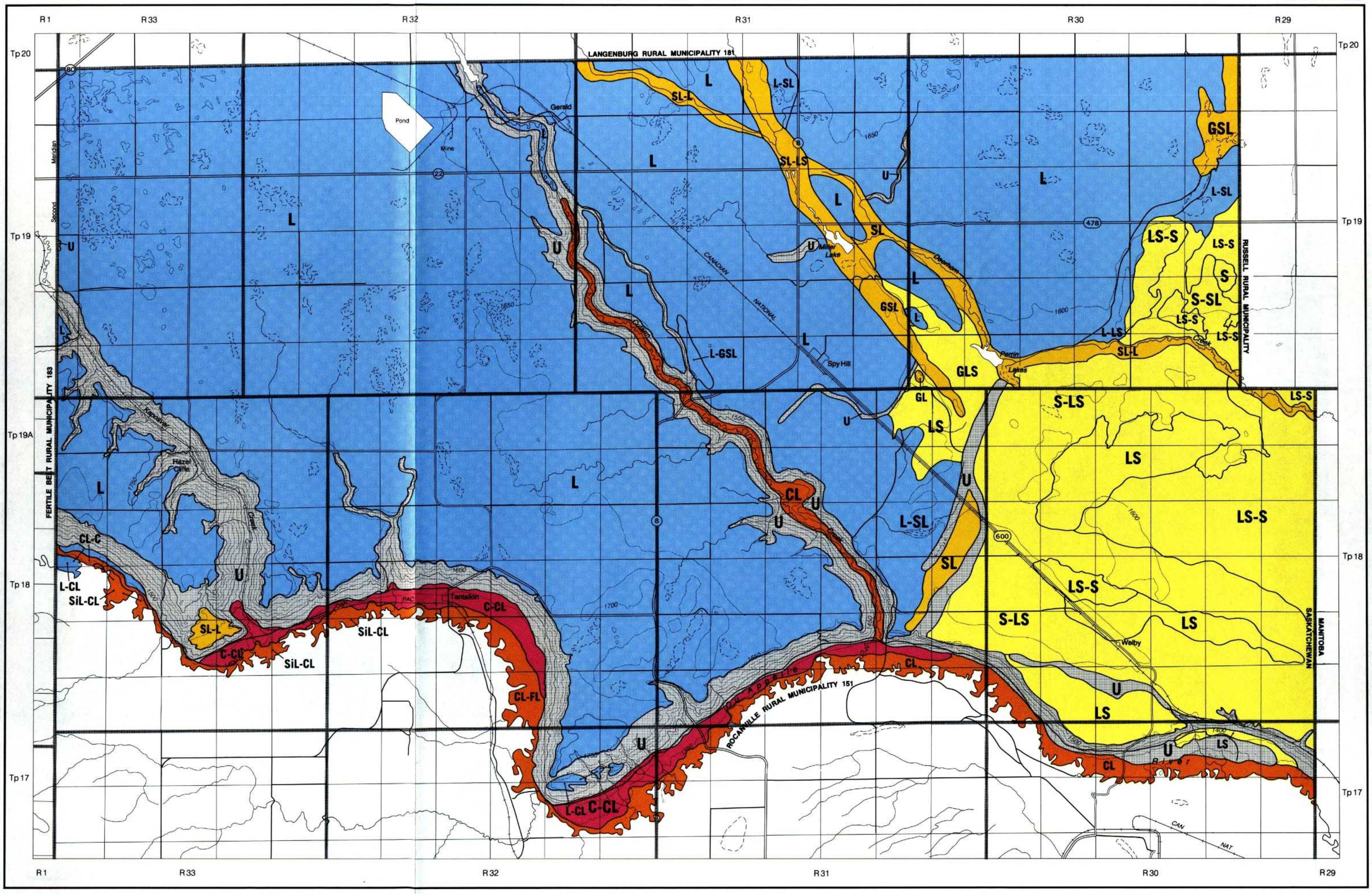
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SPY HILL RM 152 - SOIL TEXTURE

by G.A. Padbury



LEGEND

MAP SYMBOL	SOIL TEXTURE CLASS
	Coarse-Textured
GS	Gravelly sand
S	Sand
GLS	Gravelly loamy sand
LS	Loamy sand
	Moderately Coarse-Textured
GSL	Gravelly sandy loam
GL	Gravelly loam
SL	Sandy loam
FL	Fine sandy loam
VL	Very fine sandy loam

MAP SYMBOL	SOIL TEXTURE CLASS
	Medium-Textured
SCL	Sandy clay loam
FCL	Fine sandy clay loam
VCL	Very fine sandy clay loam
L	Loam
	Moderately Fine-Textured
SiL	Silt loam
CL	Clay loam
SiCL	Silty clay loam

MAP SYMBOL	SOIL TEXTURE CLASS
	Fine-Textured
C	Clay
SiC	Silty clay
HC	Heavy clay
	Miscellaneous
U	Unclassified

1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SOIL SALINITY

Soil salinity was a part of Saskatchewan soils long before they were touched by the settler's plow. In recent years, however, a greater awareness and concern has developed over the occurrence and spread of salt affected soils. The concern, indeed the alarm, over the loss of land due to increasing levels of soil salinity, has been heightened by the high cost of replacing this land on a farm unit basis. Regionally or nationally this land, which has become affected by soil salinity, is irreplaceable and methods of controlling the spread of soil salinity and reclaiming salinized land must be found.

The following discussion comprises a brief description of the nature and origin of saline soils and general management methods for saline soils. The maps on the following pages depict the salinity status of the soils in each municipality and estimates the effect of this salinity on crop production.

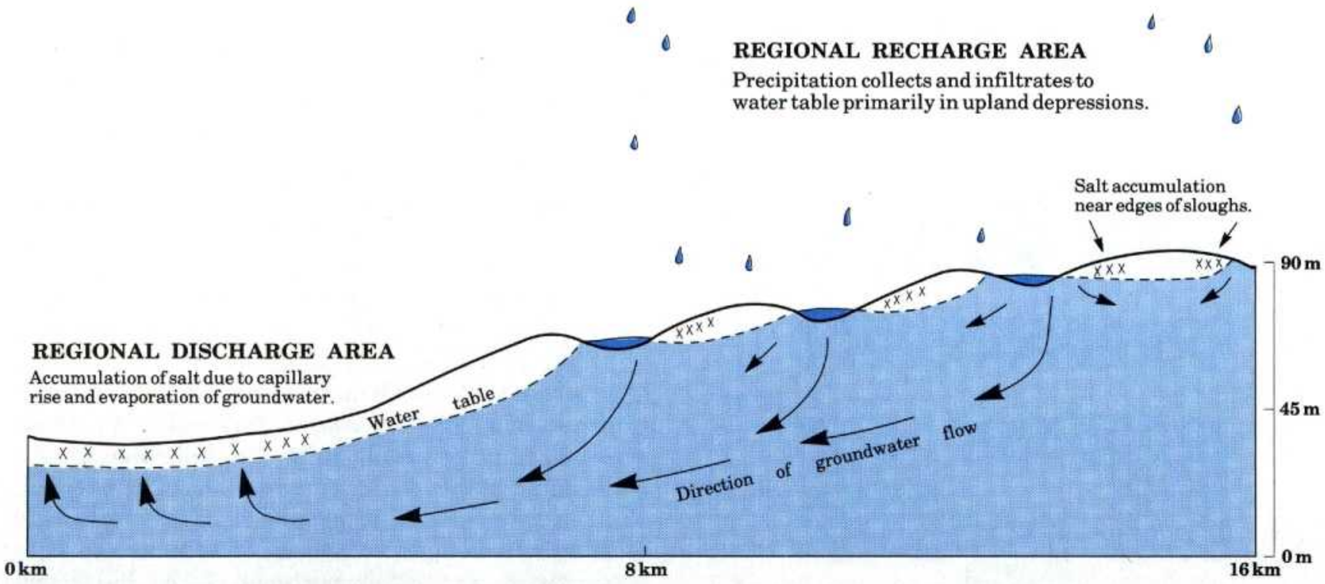


Fig. 66 Sketch showing how salts may accumulate around sloughs in upland areas as well as move through the regional groundwater flow system and accumulate at the surface in lower areas, some distance from the source.

Properties of Saline Soils

A saline soil is a soil with sufficient amounts of water soluble salts to inhibit the uptake of moisture by plants. This inhibition of water uptake results in moisture stress and reduced plant growth. The most common soluble salts in Saskatchewan soils are magnesium and sodium sulfates. Calcium sulfates also occur but are not as easily dissolved and are less harmful. Calcium, magnesium and sodium chlorides may also be present.

The presence of saline soils can often be recognized by bare spots in the crop or as uneven stands of grain or forage (Fig. 65). Very strongly saline soils usually develop a white surface crust during dry weather. Where less salt is present, the soil is grayish in color when dry and the subsoil often has streaks or specks of salt at a depth of 5 to 25 cm (2 to 10 in.) or deeper. In some cases, it may not be possible to see the salt and a soil analysis must be carried out.

Fig. 65 Saline soils associated with high water tables in a nearby slough result in bare spots and patchy crops.

Development of Saline Soils

Most of the soluble salts present in our soils originated millions of years ago when much of the area which now constitutes the prairie provinces was covered by huge inland seas. These seas deposited great amounts of soluble salts in their sediments. Eventually these seas disappeared but the salt-rich sediments became a part of the material in which our soils have formed.

Most salts are soluble in water, so groundwater flow systems are a major pathway for the removal, transport and concentration of these salts within the landscape. In well-drained portions of the landscape, most of the soluble salts have been removed from the plant rooting zone by infiltration of precipitation. In areas where drainage is impeded, soluble salts may be concentrated and may cause soil salinity problems.

Patterns of recharge and discharge and mechanisms of salt redistribution in a landscape are illustrated in Fig. 66.

Management of Saline Soils

Saline soils should be managed in such a way as to either prevent further spread or intensification of the problem and where possible to reclaim land which has already become salinized. Since most of the salinity is the result of groundwater movement, the key to control lies in the effective management of groundwater flow and water table levels.

One method of achieving this objective is to use precipitation where it falls, preventing it from entering the groundwater system. Extending the cropping rotation in saline areas will cycle more precipitation through crops rather than allowing it to reach the water table. This practice is most effective in areas of recharge where water that reaches the water table is very often responsible for soil salinization on lower slopes. Saline soils should be cropped continuously or seeded to long-term forage crops. High moisture use crops will intercept incoming groundwater and may lower the water table.

Crop production on saline soils may also be improved by using farmyard manure or green manure, growing salt tolerant crops and improving surface or subsoil drainage. Fertilizer may help if soils are weakly or moderately saline. The choice of crops which can be grown on saline soils should be based on a soil test. Table 7 indicates the relative tolerance of the common agricultural crops to saline soil conditions. It must be recognized, however, that even though a crop is considered to be tolerant to a specified degree of salinity, some yield reduction can be expected.

On some soils the use of subsurface drainage installations may be effective in lowering the water table and reducing soil salinity. These drainage installations are most effective in relatively permeable materials affected by shallow water tables. Subsurface drainage may be costly and potential sites need to be studied and water tables monitored for a period of time to determine the feasibility of this drainage method to produce the desired results.

Drainage of water ponded in sloughs may be beneficial in controlling soil salinity. In some areas, the source of water entering the shallow groundwater flow systems is the water ponded in these sloughs.

Drainage of any type, however, requires an approved permit. In Saskatchewan, anyone installing drainage works may be held responsible for any subsequent damage caused by the drained water.

Further information on soil salinity and drainage can be found in the publication **Understanding Salt-Affected Soils.**

Table 7. The relative tolerance of common field crops to soil salinity. (Differences of one or two places in the ranking may not be significant.)

	Degree of Salinity Tolerated		
	Nonsaline to Weakly Saline	Moderately Saline	Strongly to Very Strongly Saline
		Annual - Field Crops	
Increasing Tolerance	Soybeans Field Beans Fababeans Peas Corn Sunflowers	Rapeseed Mustard Wheat Flax Fall Rye[a] Oats Barley[a] Sugar Beets	Barley may produce some crop but this land best suited to tolerant forages.
		Forage Crops	
Increasing Tolerance	Red Clover Alsike Timothy	Reed Canary Meadow Fescue Intermediate Wheat Crested Wheat Brome Alfalfa Sweetclover[a]	Altai Wild Rye Russian Wild Rye Slender Wheatgrass[a] Tall Wheatgrass[b]

[a] These crops not tolerant of flooding, which is common in some saline areas.

[b] Under dry conditions slender wheatgrass is more tolerant than tall wheatgrass.

Mapping Criteria for Soil Salinity

The salinity maps on the pages to follow indicate the extent and degree of the salt-affected soils and are based on field observations alone. The extent of soil salinity was estimated as a percentage of the area of the map delineation in which soil salinity occurred, as shown in Table 8.

Table 8. Soil salinity extent class limits.

Extent Class	Percent of area affected by salinity
0	0
1	0-3
2	3-10
3	10-20
4	20-40
5	40-70
6	>70

Estimates of the degree of soil salinity were based on the observed effect of the salinity on crop growth and are defined in Table 9.

Table 9. Description of soil salinity degree classes.

Salinity Degree	Electrical Conductivity[a] (mS/cm)[b] (av. 0-60 cm depth)	Effect on Crop Growth
Nonsaline	0 - 2	There are no visible effects of salts on the growth of crops.
Weak	2 - 4	Yields of very sensitive crops may be restricted.
Moderate	4 - 8	Yields of many crops are restricted.
Strong	8 - 16	Only tolerant crops yield satisfactorily.
Very Strong	16 +	Only a few very tolerant crops yield satisfactorily.

[a] Electrical conductivities determined on a saturated paste basis. When determined by the 1:1 soil:water method currently used by the Saskatchewan Soil Testing Laborbtory, these limits will be reduced to almost 50% of saturated paste values for sandy soils, 60% for loamy soils and 70% for clay soils. For example, a loamy soil with an electrical conductivity of 5 determined on a 1:1 basis is equivalent to an electrical conductivity of approximately 8, when determined on a saturated paste basis.

[b] Salinity levels are expressed in millisiemans per centimetre. Note: 1 mS/cm (Metric System) = 1 mmho/cm (Imperial System).

The degree of soil salinity which best describes each area is depicted on the map, however, minor amounts of salinity of degrees other than that depicted may occur.

The effect of different degrees of salinity on the productivity of cereal crops has been studied and recent research in Saskatchewan indicates that salinity of moderate, strong and very strong degrees may result in yield reductions of approximately 30, 60 and 80 to 100%, respectively, compared to nonsaline soils. The colors on the map represent the effect of soil salinity on the total agricultural productivity of each map delineation. They are based on groupings of the extent and degree of soil salinity in each map unit. These groupings represent the average yield reduction which could be expected from the various soil salinity extents and degrees as shown in Table 10.

For a more accurate assessment of the severity of the salinity problem in a particular area, soil tests should be carried out.

Table 10. Average percent reduction in yields as affected by the extent and degree of soil salinity.

EXTENT CLASS	SALINITY DEGREE: Moderate	Strong	Very Strong	AFFECT ON PRODUCTIVITY
0	0	0	0	None
1	0.5	0.9	1.2	Very slight
2	2.0	3.9	5.2	Slight
3	4.5	9.0	12.0	Moderate
4	9.0	18.0	24.0	
5	16.5	33.0	44.0	Severe
6	25.5	51.0	68.0	

[a] Based on yield reductions of 30, 60 and 80% for salinity degrees of moderate, strong and very strong respectively.

Soil Salinity in the Moosomin, Martin, Rocanville and Spy Hill Municipalities.

The extent of saline soils varies with location in these municipalities. A number of areas, primarily in the western half of the Rocanville municipality, the eastern part of the Spy Hill municipality, and a number of small areas adjacent to the Pipestone Creek channel in the southern portion of the Martin municipality, are nearly devoid of saline soils. They are indicated on the salinity map as unaffected by salinity. The majority of the soils, however, contain minor extents of saline soils and are shown on the maps as very slightly affected. Other areas, of variable size, with more extensive salinity occur scattered throughout the municipalities and are indicated on the maps as slightly to moderately affected.

The large areas indicated as only very slightly affected as well as the slightly affected areas in the southeastern portion of the Moosomin municipality contain saline soils which occur sporadically and affect relatively small areas. Most of these saline soils occur at the margins of sloughs and depressional areas, occasionally extending into low areas adjacent to the sloughs. In these very slightly affected areas, the saline soils probably result from a redistribution of salts from within and around the depressions due to local groundwater conditions. Occasionally, these saline soils occur in the bottoms of small dissections or drainage channels where the soil surface has been lowered to a level where capillary rise from the water table can salinize these soils.

The saline soils which occur in the extreme southern portion of the Martin municipality may be influenced by groundwater discharge from a deep intertill aquifer, as shown in Fig. 5; DD' and Fig. 6 of the Geology and Groundwater Resources section of this report. It is likely that this aquifer is recharged in the area of higher elevation southwest of the municipality by deep drainage of excess precipitation to the aquifer where it is channelled laterally. This water is eventually forced upward as the aquifer thins. When the water reaches the soil surface, or sufficiently near the surface, it evaporates, causing the soil to become saline. The occurrence of a flowing well in this area, as indicated in Fig. 6 of the Geology and Groundwater Resources section, is further evidence of upward water movement.

Saline soils in the slightly affected area in the west-central part of Martin municipality appear to be the result of groundwater discharge from a shallow intertill aquifer as indicated in Fig. 5; BB'. The aquifer thins and disappears in this vicinity and the groundwater is forced upwards towards the soil surface. As the water evaporates at or near the ground surface, salts are deposited in the soil.

Groundwater discharge, resulting in saline soils, occurs to varying degrees in the bottoms of the Qu'Appelle Valley and Pipestone Creek. Discharge into the Qu'Appelle Valley alluvium primarily occurs from the Empress Group aquifer, as shown in Fig. 5; EE'. Saline soils in the bottom of the Pipestone Creek channel in the southern portion of the Martin municipality result from evaporation of water from a high water table which is contiguous with the groundwater level in the deep intertill aquifer, as shown in Fig. 5; CC'.

The slightly affected areas in the west-central part of the Moosomin and central part of the Rocanville municipalities appear to be due to high water tables induced by discharging of groundwater from a deep intertill aquifer, shown in Figure 6 of the Geology and Groundwater Resources section of this report, as part of a regional groundwater flow system. The occurrence of a flowing well, as indicated on Fig. 6, near the area of slightly affected soils in the Rocanville municipality is evidence of these discharging groundwater conditions.

Capillary rise and evaporation of water from a high water table is the main cause of the saline soils in the slightly affected area in the northeast portion of the Rocanville municipality. As indicated on the soils map and Fig. 6 in earlier sections of this report, this is an area of mixed sand and till materials which form a surficial aquifer. The saline soils occur predominantly in the lower portions of the landscape where the water table is nearest the soil surface.

The slightly affected soils occurring in the north-central portion of the Spy Hill municipality and those east of the Cutarm Creek coincide with a boundary of a deep intertill aquifer, as shown in Fig. 6 and Fig. 5 DD' and EE' of the Geology and Groundwater Resources section of this report. Several flowing wells near the town of Gerald indicate that groundwater from this aquifer is under sufficient pressure to force it to the surface in places, resulting in the occurrence of saline soils. In addition to this, the slightly affected soils southeast of Gerald may have some salinity which result from a redistribution of salts from within and around the depressions due to shallow, local groundwater conditions acting above the groundwater flow conditions induced by the deep intertill aquifer.

The origin of the saline soils in the south-central portion of the Spy Hill municipality is unclear due to a lack of information on the geological deposits in this area. These saline soils may be the result of a naturally high, local water table salinizing some of the low areas of the landscape, although, as stated in the Geology and Groundwater Resources section, the deep intertill aquifer may extend west of the Cutarm Creek and aid in their formation.

Effective management of saline soils depends, in large part, on the factors which are responsible for the saline soils. Due to the complexity of these factors, the origin of the saline soils in these municipalities cannot be stated with absolute certainty. The preceding descriptions of the origin of soil salinity in these municipalities were based on the best information available and the following discussion of management practices is based on these descriptions.

In the locally salinized areas, such as the majority of the area indicated as very slightly affected, management practices which promote infiltration of moisture in the local knoll or upland areas and limit the amount of water ponding in sloughs or depressions may be the most effective way of dealing with the salinity problem. Saline soils which occur in the bottoms of dissections may best be managed by seeding to a suitable forage in order to prevent further erosion and use as much soil moisture as possible. Continuously cropping the surrounding land may also result in lowering the water table within these areas thus reducing the potential for salinization in the low-lying portions of the landscape.

Areas which are affected by regional groundwater discharge and/or high water tables tend to have saline soils throughout the bottoms of low-lying depressional areas and sloughs. These groundwater flow systems have been operating for thousands of years (since deglaciation) and it is likely that the soils have been saline for a similar period of time. Due to this, the individual farm operator can help keep the salinity from worsening by maintaining a continuous vegetative cover on the saline soils to reduce the amount of evaporation from the soil surface, and by the use of salt-tolerant, high moisture-use crops, to obtain production from this land. Complete reclamation of these soils, however, may be out of his control. Where soil salinity appears to be due to groundwater discharge from an aquifer, there is the possibility of using the water from the aquifer for irrigation before it has a chance to move through the overlying materials and salinize the surface soils. Providing this practice is feasible, using this water for irrigation could result in reducing the pressure which forces the water upwards from the aquifer, thereby lowering the water table. The water used for irrigation then has the potential for moving the salts in the soil downward, below the depth of rooting, as well as providing more moisture for crop growth.

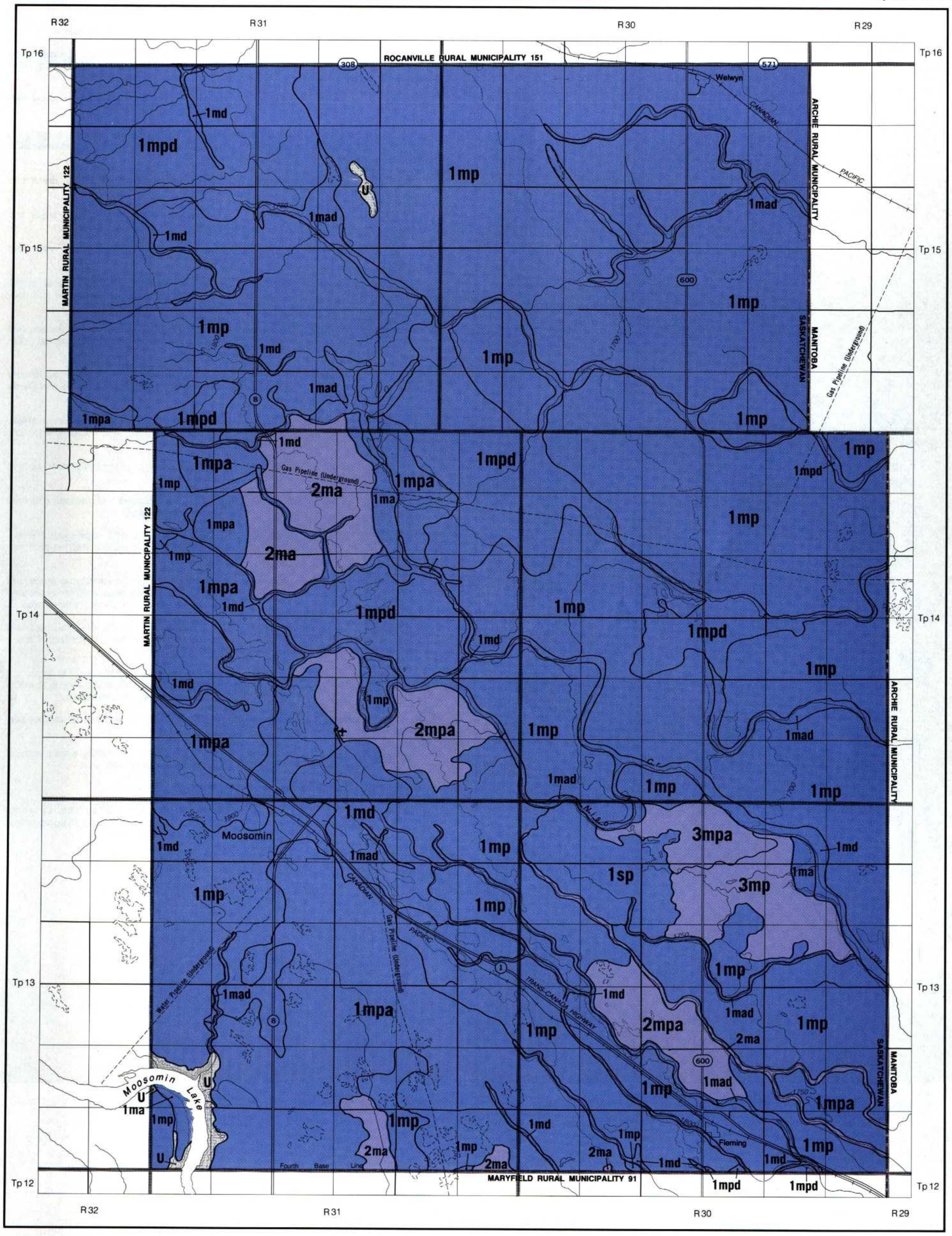
by W.D. Eilers

Fig. 67 Salinity that occurs throughout the bottom of the depressional portion of the landscape is represented on the salinity map by the symbol "a". The salinity in this illustration is very strong.

Fig. 68 Salinity that occurs on the edge of small depressional areas is shown on the salinity map with a symbol "p". Note that the crop growth in the bottom of the depression is virtually unaffected by soil salinity. A strong degree of salinity is represented in this illustration.

MOOSOMIN RM 121 - SOIL SALINITY

by W.D. Eilers



1:100,000

Km 2 1 0 2 4 Km

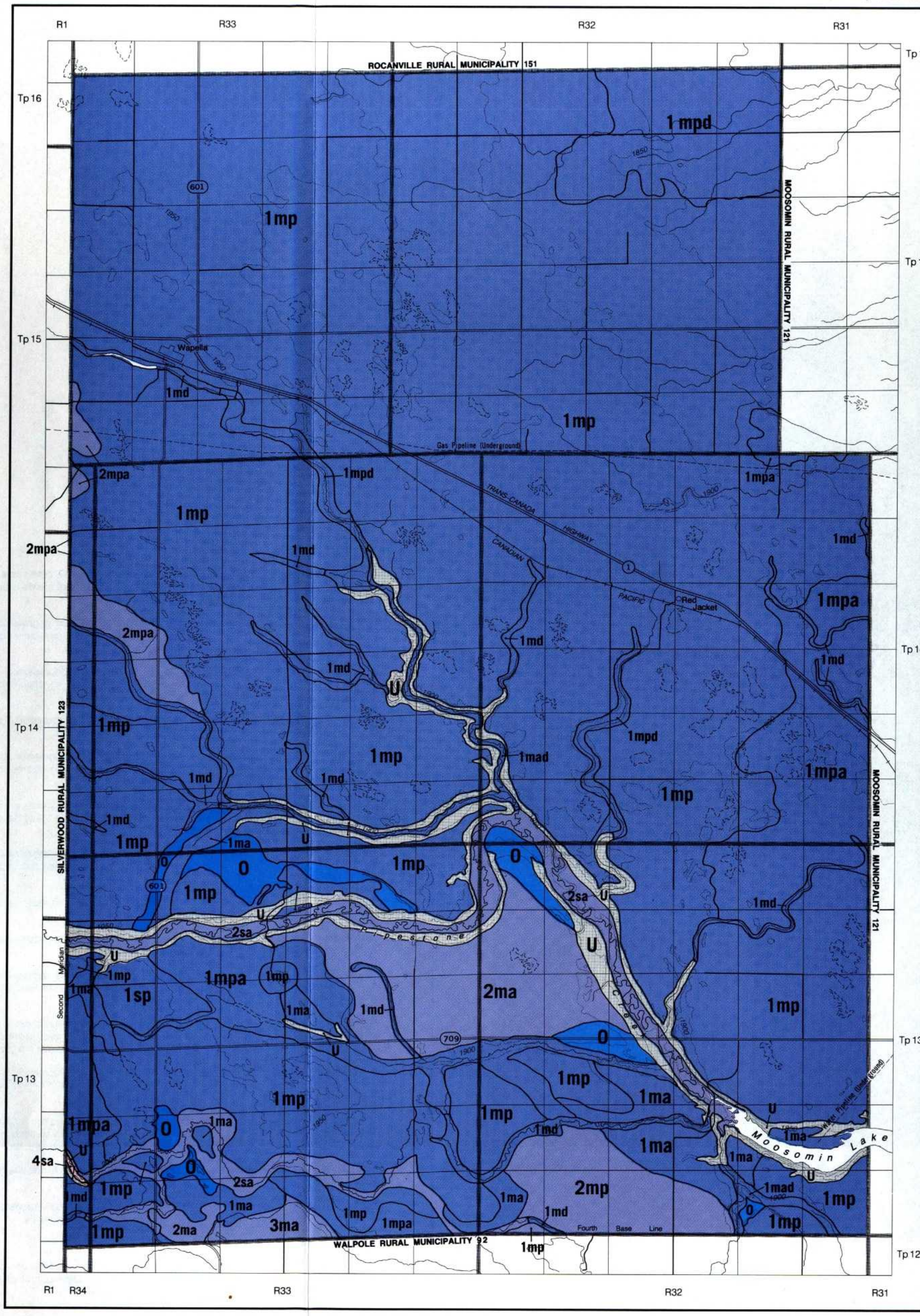
Miles 2 1 0 2 Miles

LEGEND

Map Symbol	Extent	Degree	Position in Landscape
Slightly affected areas - The agricultural productivity of these areas is slightly affected by soil salinity. Reduction in yields of 2 to 5% of normal yields on nonsaline areas may occur.			
3mp	10-20%	Moderate	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
3mpa	10-20%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
2ma	3-10%	Moderate	Throughout low-lying depressional areas and sloughs.
2mpa	3-10%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
Very slightly affected areas - The agricultural productivity of these areas is very slightly affected by soil salinity. Reduction in yields of less than 2% of normal yields on nonsaline areas may occur.			
1sp	0-3%	Strong	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
1ma	0-3%	Moderate	Throughout low-lying depressional areas and sloughs.
1md	0-3%	Moderate	Bottoms of dissections and drainage channels cut into the landscape.
1mp	0-3%	Moderate	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
1mad	0-3%	Moderate	Throughout low-lying depressional areas and sloughs, and the bottoms of some dissections and drainage channels cut into the landscape.
1mpa	0-3%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
1mpd	0-3%	Moderate	Margins of sloughs and depressional areas, and throughout the bottoms of dissections or drainage channels cut into the landscape.
Nonaffected areas - The agricultural productivity of these areas is not affected by soil salinity.			
0			No occurrences of soil salinity were observed during the mapping of these soils.
Unclassified - These areas were not classified for soil salinity.			
U			Soil salinity was not classified because excessive wetness or steeply sloping topography limited access to these areas.

MARTIN RM 122 - SOIL SALINITY

by W.D. Eilers



1:100,000

Km 2 1 0 2 4 Km

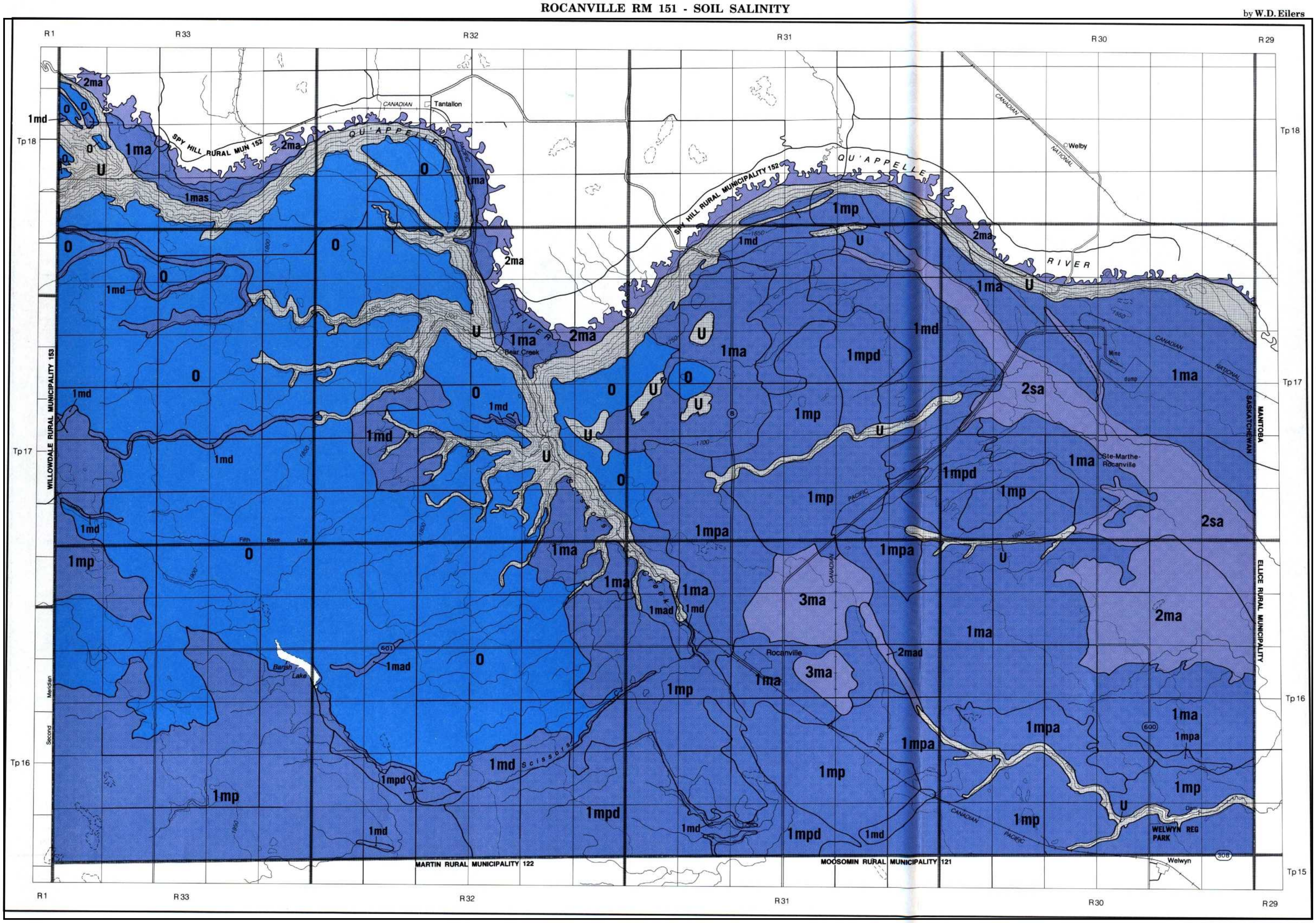
Miles 2 1 0 2 Miles

LEGEND

Map Symbol	Extent	Degree	Position in Landscape
Moderately affected areas - The agricultural productivity of these areas is moderately affected by soil salinity. Reduction in yields of 5 to 20% of normal yields on nonsaline areas may occur.			
4sa	20-40%	Strong	Throughout low-lying depressional areas and sloughs.
Slightly affected areas - The agricultural productivity of these areas is slightly affected by soil salinity. Reduction in yields of 2 to 5% of normal yields on nonsaline areas may occur.			
3ma	10-20%	Moderate	Throughout low-lying depressional areas and sloughs.
2sa	3-10%	Strong	Throughout low-lying depressional areas and sloughs.
2ma	3-10%	Moderate	Throughout low-lying depressional areas and sloughs.
2mp	3-10%	Moderate	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
2mpa	3-10%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
Very slightly affected areas - The agricultural productivity of these areas is very slightly affected by soil salinity. Reduction in yields of less than 2% of normal yields on nonsaline areas may occur.			
1sp	0-3%	Strong	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
1ma	0-3%	Moderate	Throughout low-lying depressional areas and sloughs.
1md	0-3%	Moderate	Bottoms of dissections and drainage channels cut into the landscape.
1mp	0-3%	Moderate	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
1mad	0-3%	Moderate	Throughout low-lying depressional areas and sloughs, and the bottoms of some dissections and drainage channels cut into the landscape.
1mpa	0-3%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
1mpd	0-3%	Moderate	Margins of sloughs and depressional areas, and throughout the bottoms of dissections or drainage channels cut into the landscape.
Nonaffected areas - The agricultural productivity of these areas is not affected by soil salinity.			
0			No occurrences of soil salinity were observed during the mapping of these soils.
Unclassified - These areas were not classified for soil salinity.			
U			Soil salinity was not classified because excessive wetness or steeply sloping topography limited access to these areas.

ROCANVILLE RM 151 - SOIL SALINITY

by W.D. Eilers



LEGEND

Slightly affected areas - The agricultural productivity of these areas is slightly affected by soil salinity. Reduction in yields of 2 to 5% of normal yields on nonsaline areas may occur.

Map Symbol	Extent	Degree	Position in Landscape
3ma	10-20%	Moderate	Throughout low-lying depressional areas and sloughs.
2sa	3-10%	Strong	Throughout low-lying depressional areas and sloughs.
2ma	3-10%	Moderate	Throughout low-lying depressional areas and sloughs.
2mad	3-10%	Moderate	Throughout low-lying depressional areas and sloughs, and the bottoms of some dissections and drainage channels cut into the landscape.

Very slightly affected areas - The agricultural productivity of these areas is very slightly affected by soil salinity. Reduction in yields of less than 2% of normal yields on nonsaline areas may occur.

Map Symbol	Extent	Degree	Position in Landscape
1ma	0-3%	Moderate	Throughout low-lying depressional areas and sloughs.
1md	0-3%	Moderate	Bottoms of dissections and drainage channels cut into the landscape.
1mp	0-3%	Moderate	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
1mad	0-3%	Moderate	Throughout low-lying depressional areas and sloughs, and the bottoms of some dissections and drainage channels cut into the landscape.
1mas	0-3%	Moderate	Throughout low-lying depressional areas and sloughs, and on some side slopes.
1mpa	0-3%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
1mpd	0-3%	Moderate	Margins of sloughs and depressional areas, and throughout the bottoms of dissections or drainage channels cut into the landscape.

Nonaffected areas - The agricultural productivity of these areas is not affected by soil salinity.

Map Symbol	Extent	Degree	Position in Landscape
0			No occurrences of soil salinity were observed during the mapping of these soils.

Unclassified - These areas were not classified for soil salinity.

Map Symbol	Extent	Degree	Position in Landscape
U			Soil salinity was not classified because excessive wetness or steeply sloping topography limited access to these areas.

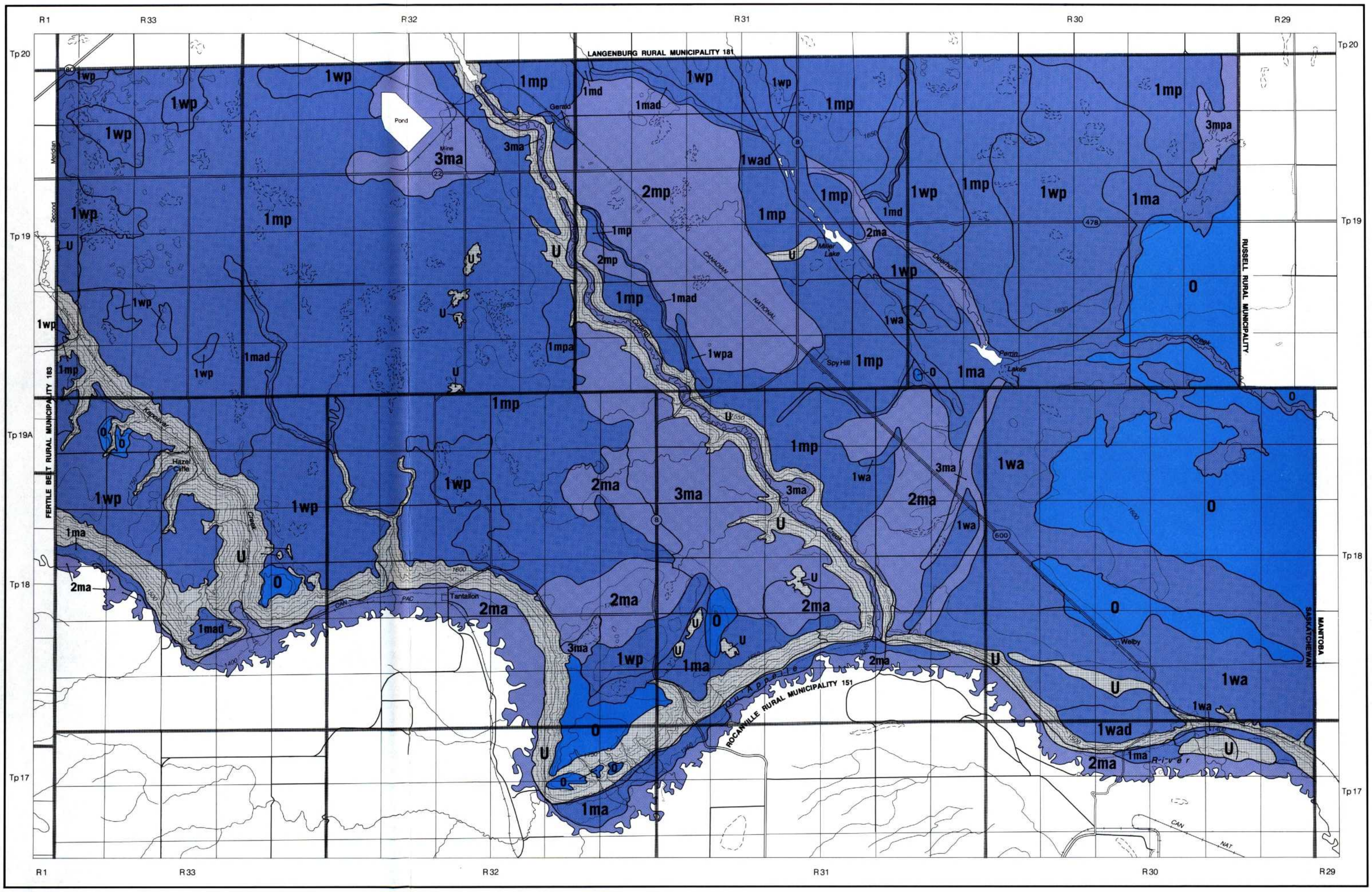
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SPY HILL RM 152 - SOIL SALINITY

by W.D. Eilers



LEGEND

Map Symbol	Extent	Degree	Position in Landscape

Slightly affected areas - The agricultural productivity of these areas is slightly affected by soil salinity. Reduction in yields of 2 to 5% of normal yields on nonsaline areas may occur.

Map Symbol	Extent	Degree	Position in Landscape
3ma	10-20%	Moderate	Throughout low-lying depressional areas and sloughs.
3mpa	10-20%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
2ma	3-10%	Moderate	Throughout low-lying depressional areas and sloughs.
2mp	3-10%	Moderate	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.

Very slightly affected areas - The agricultural productivity of these areas is very slightly affected by soil salinity. Reduction in yields of less than 2% of normal yields on nonsaline areas may occur.

Map Symbol	Extent	Degree	Position in Landscape
1ma	0-3%	Moderate	Throughout low-lying depressional areas and sloughs.
1md	0-3%	Moderate	Bottoms of dissections and drainage channels cut into the landscape.
1mp	0-3%	Moderate	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
1mad	0-3%	Moderate	Throughout low-lying depressional areas and sloughs, and the bottoms of some dissections and drainage channels cut into the landscape.
1mpa	0-3%	Moderate	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.
1wa	0-3%	Weak	Throughout low-lying depressional areas and sloughs.
1wp	0-3%	Weak	Margins of sloughs and depressional areas. Soils within the sloughs are leached and nonsaline.
1wad	0-3%	Weak	Throughout low-lying depressional areas and sloughs, and the bottoms of some dissections and drainage channels out into the landscape.
1wpa	0-3%	Weak	Margins of sloughs and depressional areas, and throughout some low-lying depressional areas and sloughs.

Nonaffected areas - The agricultural productivity of these areas is not affected by soil salinity.

Map Symbol	Extent	Degree	Position in Landscape
0			No occurrences of soil salinity were observed during the mapping of these soils.

Unclassified - These areas were not classified for soil salinity.

Map Symbol	Extent	Degree	Position in Landscape
U			Soil salinity was not classified because excessive wetness or steeply sloping topography limited access to these areas.

1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SURFACE DRAINAGE AND WETLANDS

SURFACE DRAINAGE

Surface drainage, or runoff, refers to the loss of water from an area by flow over the land surface. The water either ends up in local undrained depressions or, following a network of local channels, creeks and streams, is carried out of the area. Surface drainage is controlled principally by two factors: (1) the texture and structural characteristics of the land, and (2) the direction, steepness and frequency of slopes, often referred to as the topography.

The texture and structural characteristics of the soil, through their effect on its perviousness and water-holding capacity, dictate, to a considerable degree, the amount of surface runoff that takes place. For example, sandy soils, being very pervious, readily absorb most, if not all, of the water that falls on them, whereas clayey soils absorb water slowly or, in some cases, not at all. The latter results from the fact that clay particles, when they become wet, expand, thus effectively eliminating the cracks and pores in the soil necessary to transmit water downward. Thus, all other factors being equal, the higher the clay content of the soil, the more surface runoff.

Also of importance is the actual moisture content of the soil, particularly just prior to freeze-up, which can have a substantial effect on the amount of runoff that occurs the following spring.

The topography of an area also has a marked effect on the extent and type of drainage pattern that develops, and controls to a large extent the size, location and direction of the resulting drainage channels.

The following drainage classes are used to describe the surface drainage characteristics of landscapes in these municipalities.

Surface Drainage Classes

A. **Areas of Regional Surface Water Runoff** These are landscapes where most, if not all, of the water that is shed locally is carried out of the area to major creeks, rivers or lakes. They are usually characterized by the presence of gullies, as depicted in Fig. 69.

B. **Areas of Local Runoff and Accumulation of Surface Water** These are landscapes where water that is shed from upper slopes collects in local depressions that are too small to be shown on the map. They are usually recognized by chaotic, hummocky landscapes with numerous, enclosed depressions or sloughs, as depicted in Fig. 70.

C. **Areas of Major Accumulation of Surface Water** These are typically low-lying flat or depressional landscapes that receive surface runoff from surrounding areas resulting in temporary periods of wetness due to occasional flooding, as depicted in Fig. 71.

D. **Wetland Areas** These are areas that receive sufficient water from runoff and other sources to be considered a wetland. They are primarily nonagricultural lands made up of wet, poorly drained soils, or organic soils. These areas are described in greater detail in the following section.

Fig. 69 Surface drainage class A, where runoff water is carried out of the map delineation by gullies and channels.

Fig. 70 Surface drainage class B, where runoff water collects in local depressions within the map delineation.

Fig. 71 Surface drainage class C, where runoff water accumulates from areas beyond the map delineation.

Fig. 72 Wet meadows are areas that are flooded for a relatively short period of the year and may be used for hay or pasture.

Fig. 73 Marshes are areas where flooding persists until late summer and perhaps throughout the year. They have little agricultural value.

Fig. 74 Open water wetlands are areas that are permanently flooded.

WETLANDS

Wetlands, commonly referred to as sloughs, ponds or marshes, develop in depressional areas that receive surface runoff from the surrounding landscape, but lack external surface drainage. They are frequently flooded in the spring and may contain water throughout the year. Although most are considered agricultural wastelands, they are often critical wildlife habitats.

Four types of wetlands, based on the duration of flooding and the proportion of the area permanently occupied by open water and the occurrence of organic materials, are recognized: wet meadows, marshes, open water wetlands, and organic wetlands.

1. **Wet Meadows.** These areas consist mainly of wet, poorly drained soils. Flooding occurs mainly in the spring but can last until mid-summer. These are often hayland areas but may be partially cultivated during periods of drought as depicted in Fig. 72.

2. **Marshes.** These areas consist of wet, poorly drained soils near the edges with shallow open water in the centre as depicted in Fig. 73. Flooding usually persists until late summer and occasionally throughout the year. Haying may take place around the slough margins but these areas are rarely cultivated.

3. **Open Water Wetlands.** These areas are dominated by shallow open water with wet, poorly drained soils around the outer fringes as depicted in Fig. 74. They are permanently flooded.

4. **Organic Wetlands.** These areas are dominated by shallow organic soils. Wet poorly drained soils occur near the margins and all soils remain saturated for most of the year.

Only wetlands greater than about 15 to 20 ha (30 to 50 ac.) are shown on the map. The smaller wetland areas, considered as a group irrespective of their individual moisture status, were classified according to the percentage of the landscape that they occupied.

DRAINAGE AND WETLANDS MAP

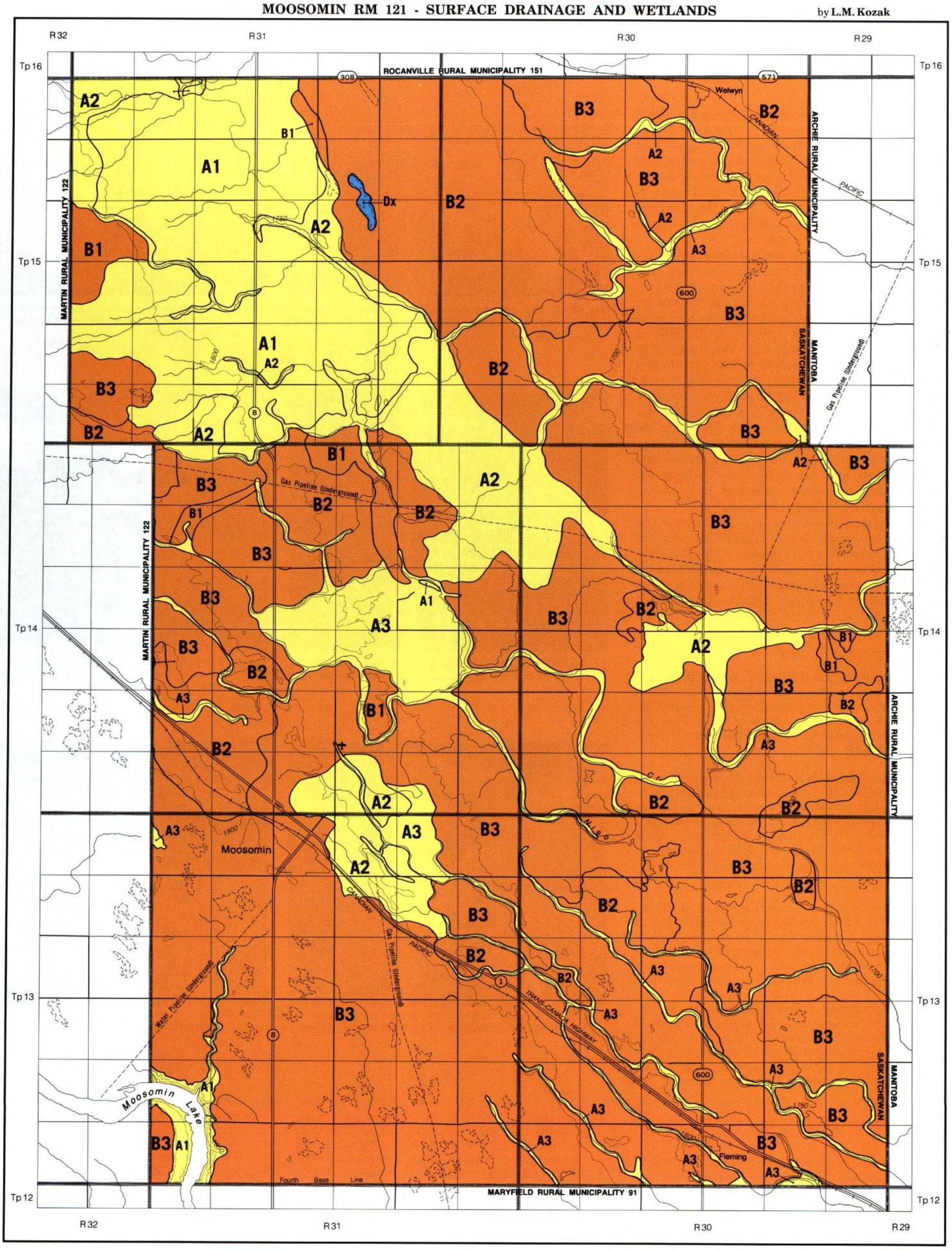
The drainage and wetlands maps, on the following pages, depict the surface drainage characteristics and the extent of wetlands in the delineated areas, as well as the major characteristics of those wetlands greater than about 15 to 20 ha (30 to 50 ac.) in size, which have been delineated separately.

The map symbols consist of an upper case letter representing the surface drainage class, followed either by a number, which indicates the extent of wetlands, or by a lower case letter which describes the type of wetland. The type of wetland is shown only for those wetlands of sufficient size to be delineated separately on the map.

by L.M. Kozak

MOOSOMIN RM 121 - SURFACE DRAINAGE AND WETLANDS

by L.M. Kozak



LEGEND

REGIONAL RUNOFF

Map Symbol	Extent of Wetlands
A1	0 - 5%
A2	5 - 15%
A3	15 - 40%

LOCAL RUNOFF AND ACCUMULATION

Map Symbol	Extent of Wetlands
B1	0 - 5%
B2	5 - 15%
B3	15 - 40%

MAJOR ACCUMULATION

Map Symbol	Extent of Wetlands
C1	0 - 5%
C2	5 - 15%
C3	15 - 40%
C4	40 - 70%

WETLANDS

Map Symbol	
Dw	Organic Wetlands
Dx	Wet Meadows
Dy	Marshes
Dz	Open Water Wetlands

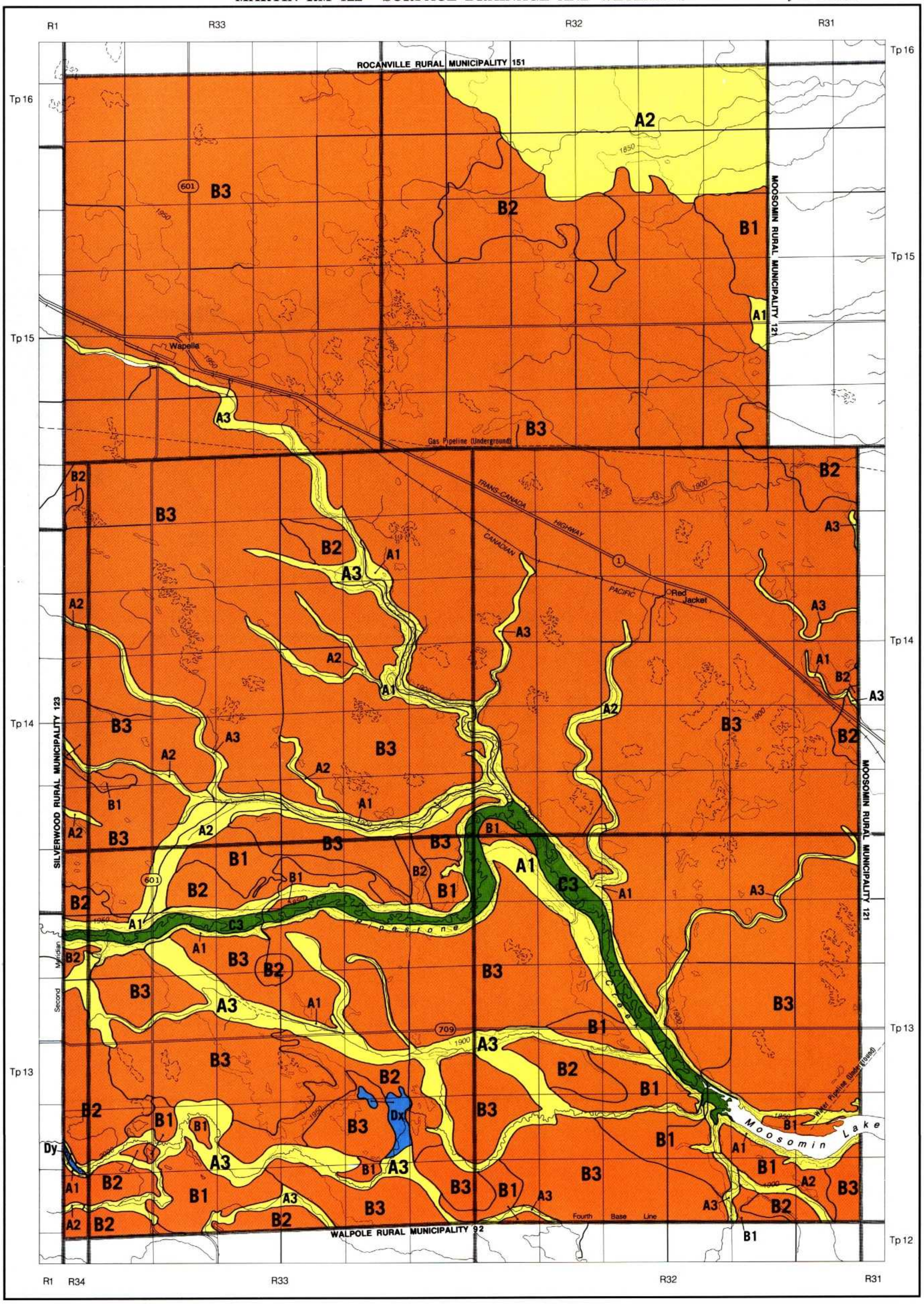
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

MARTIN RM 122 - SURFACE DRAINAGE AND WETLANDS

by L.M. Kozak



LEGEND

REGIONAL RUNOFF

Map Symbol	Extent of Wetlands
A1	0- 5%
A2	5-15%
A3	15-40%

LOCAL RUNOFF AND ACCUMULATION

Map Symbol	Extent of Wetlands
B1	0- 5%
B2	5-15%
B3	15-40%

MAJOR ACCUMULATION

Map Symbol	Extent of Wetlands
C1	0- 5%
C2	5-15%
C3	15-40%
C4	40-70%

WETLANDS

Map Symbol	
Dw	Organic Wetlands
Dx	Wet Meadows
Dy	Marshes
Dz	Open Water Wetlands

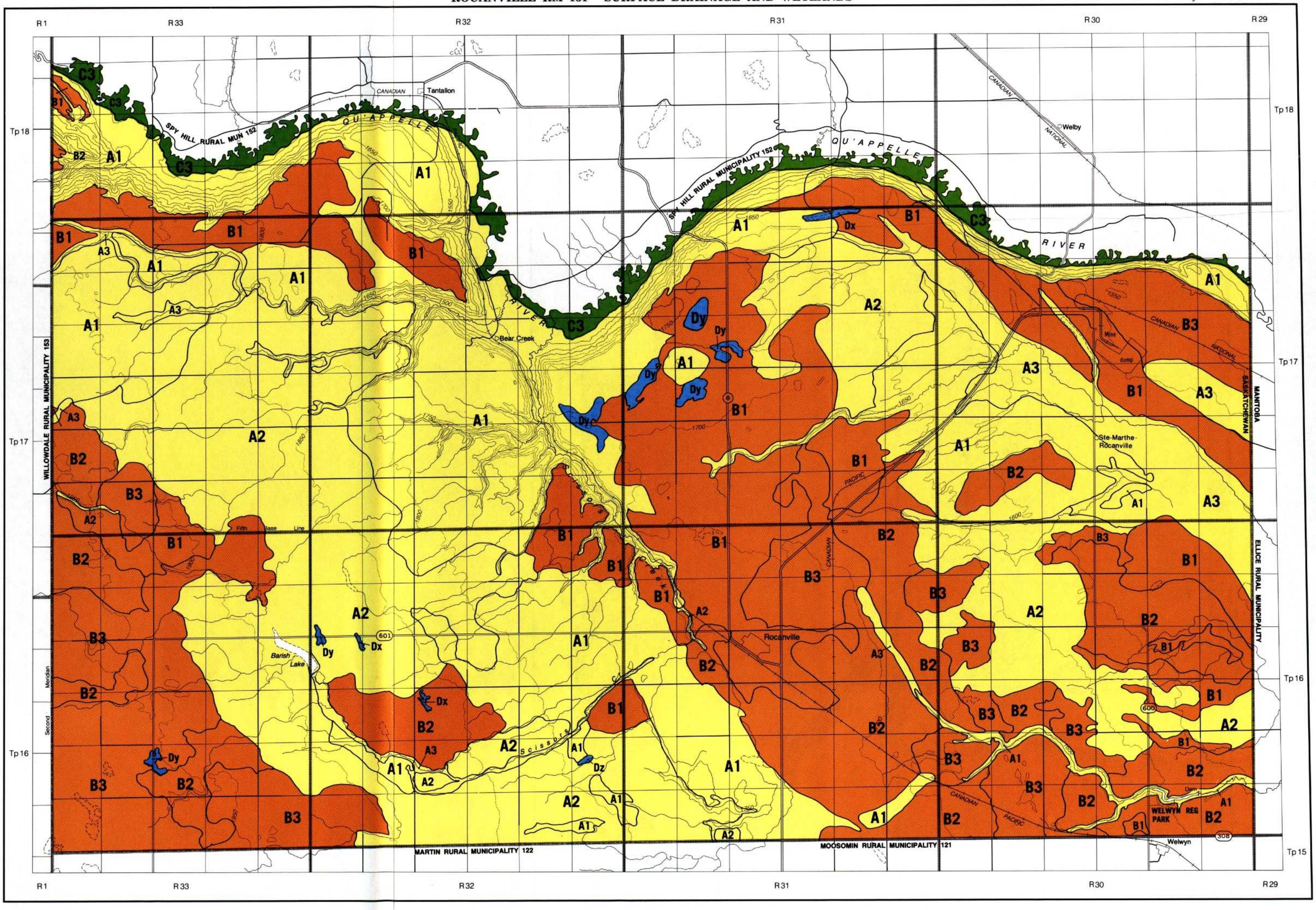
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

ROCANVILLE RM 151 - SURFACE DRAINAGE AND WETLANDS

by L.M. Kozak



LEGEND

REGIONAL RUNOFF

Map Symbol	Extent of Wetlands
A1	0 - 5%
A2	5 - 15%
A3	15 - 40%

LOCAL RUNOFF AND ACCUMULATION

Map Symbol	Extent of Wetlands
B1	0 - 5%
B2	5 - 15%
B3	15 - 40%

MAJOR ACCUMULATION

Map Symbol	Extent of Wetlands
C1	0 - 5%
C2	5 - 15%
C3	15 - 40%
C4	40 - 70%

WETLANDS

Map Symbol	
Dw	Organic Wetlands
Dx	Wet Meadows
Dy	Marshes
Dz	Open Water Wetlands

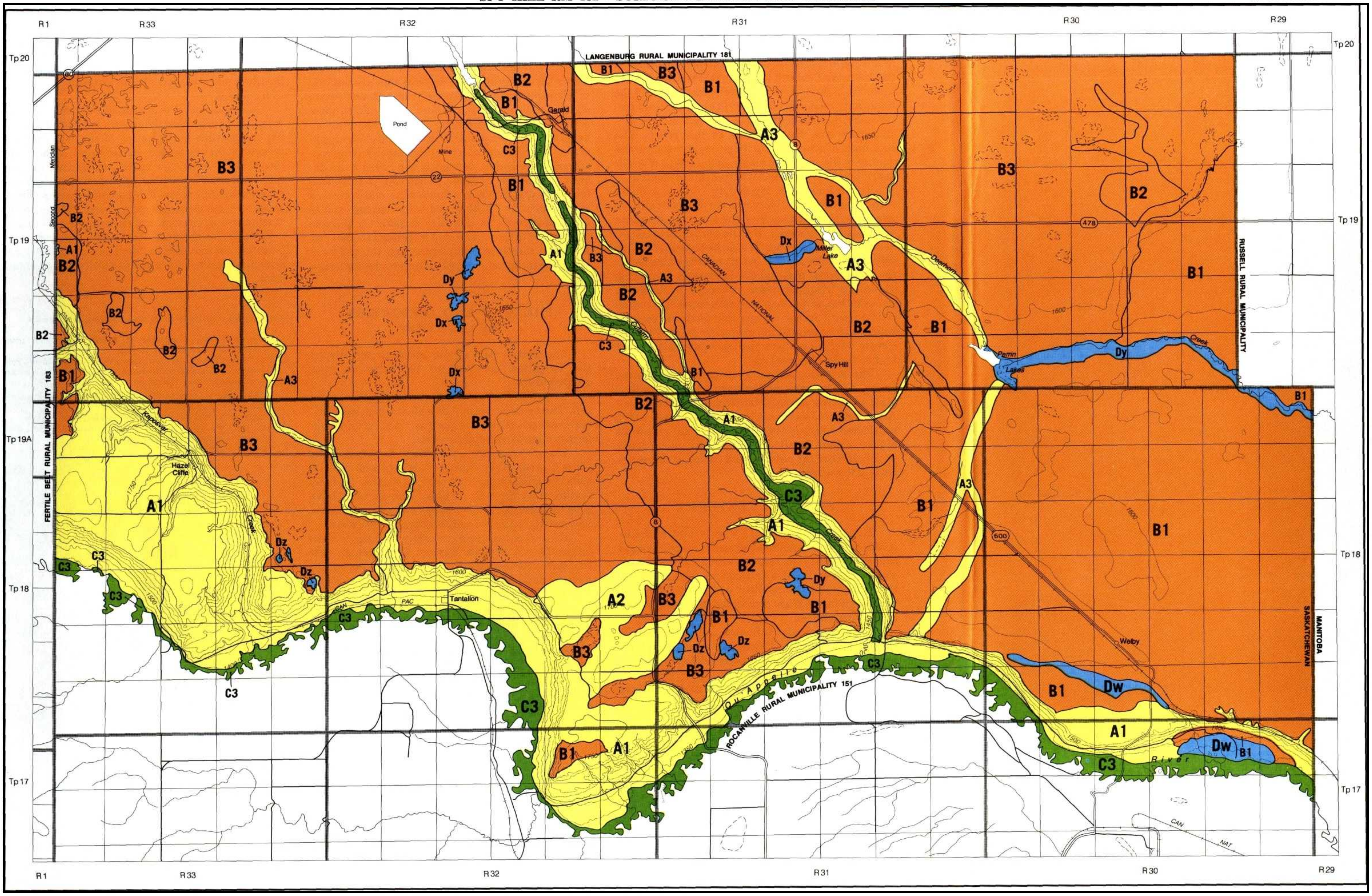
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SPY HILL RM 152 - SURFACE DRAINAGE AND WETLANDS

by L.M. Kozak



LEGEND

REGIONAL RUNOFF

Map Symbol	Extent of Wetlands
A1	0 - 5%
A2	5 - 15%
A3	15 - 40%

LOCAL RUNOFF AND ACCUMULATION

Map Symbol	Extent of Wetlands
B1	0 - 5%
B2	5 - 15%
B3	15 - 40%

MAJOR ACCUMULATION

Map Symbol	Extent of Wetlands
C1	0 - 5%
C2	5 - 15%
C3	15 - 40%
C4	40 - 70%

WETLANDS

Map Symbol	
Dw	Organic Wetlands
Dx	Wet Meadows
Dy	Marshes
Dz	Open Water Wetlands

1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

INITIAL IRRIGATION POTENTIAL

The irrigation potential of the soils in these municipalities is based on the combined influences of the following field-soil features: (1) the soil's surface texture, (2) the type of soil development, and (3) the uniformity of the soil deposit. These individual features are illustrated, or may be interpreted from, specific maps and their legends in this report. The economics of converting to irrigation, the source and quality of the irrigation water, and the type of water distribution system **are not** part of this evaluation.

The influence of topography, which includes such features as the differences in relief or height between one place and another, the direction, steepness and frequency of slopes, and the comparative roughness of the land's surface, **is also not** considered. The soils and landform maps in this report, which depict the topography, may aid the landowner in making his initial irrigation plans, although it should be stressed that, at the map scale presented, it is impossible to show minor topographic features, some of which may be critical for irrigation. In general, the steeper or more complex the landscape pattern, the higher the development costs.

The irrigation suitability maps, on the following pages, are therefore preliminary and simply illustrate whether a potential for irrigation exists or not. Areas indicated as having no potential should not be considered further. Areas with marginal potentials require a more detail characterization, particularly with respect to the physical and chemical characteristics of the subsoil.

SURFACE TEXTURES

The surface soil texture is important in the initial irrigation evaluation because of its influence on the soil's ability to absorb, retain, and transmit water. Fine-textured soils (high in clay) are downrated due to slow drainability, while coarse-textured soils (high in sand) are downrated due to low water-holding capacities.

Soil textures also influence irrigation costs as the number of water applications required to obtain maximum productivity is directly related to the soil's ability to absorb and retain water.

On the basis of surface texture alone, medium-textured (loamy) soils have the highest irrigation potential; coarse- (sandy) and fine- (clayey) textured soils have the lowest. The moderately coarse- and moderately fine-textured groups are intermediate and downrated because of increases in coarse material, or fine material, compared to the medium-textured soils.

SOIL DEVELOPMENT

Soil morphological characteristics that indicate the state and type of soil development may be observed from the soil profile. Those important to an evaluation of the soil's irrigation potential include: (1) the soil's structure, (2) flecks, streaks, or clusters of salt crystals indicative of soil salinity, and (3) orange or reddish-colored mottles and dull matrix colors indicative of impeded or poor drainage.

On the basis of soil development, the profiles with the highest irrigation potential occur in permeable, salt-free, well-drained deposits. Those questionable or in doubt for irrigation purposes are profiles with dense, hard structures caused by high contents of clay or salt, or both; profiles containing sufficient soluble salts to adversely affect crop growth; and poorly drained profiles, especially those in enclosed basins where external surface drainage cannot be improved.

Irrigating areas having undesirable soil profiles may result in perched water tables, salinization, waterlogging, nutrient imbalances, and overall nonproductivity. These problems are often difficult or nearly impossible to correct.

UNIFORMITY OF THE SOIL DEPOSITS

The importance of the uniformity of the soil deposit for irrigation is related to its textural variability both within the soil profile itself and horizontally across the landscape. Soil deposits that are uniform in texture throughout absorb, transmit, and retain water uniformly. In nonuniform soil profiles, these processes vary significantly, which may have an adverse effect on the plant's rooting ability. The application of irrigation water to landscapes having considerable horizontal variability can result in an uneven distribution of water, which can, in turn, lead to the accumulation of soluble salts and increased soil salinity, to flooding and waterlogging, and to water erosion. Thus, the more variable the soil texture, either in the vertical plane through the soil profile, or in the horizontal plane across the soil landscape, the more the soil area is downgraded for irrigation.

THE MAP AND IRRIGATION EVALUATION

The colored maps on the following pages depict the irrigation potential of the soils in these municipalities.

Class 1 areas have the highest irrigation potential. They consist mainly of well-drained, medium-textured soils of good composition[a] that occur on uniform to slightly variable deposits.

Class 2 areas are more costly[b] to irrigate than Class 1 areas. They consist mainly of well-drained soils of slightly finer- (heavier), or coarser- (lighter) texture than the soils in Class 1 areas. They have good composition, a moderately permeable structure, and occur on uniform to slightly variable deposits.

Class 3 areas are more costly to irrigate than either Class 1 or Class 2 areas. They include soils that have poorer structures, higher salt contents, and more varied textures than those of Class 1 or Class 2 areas.

Class 4 areas are considered unsuitable for irrigation. They include soils whose structures are not suitable because of high clay or salt contents, soils whose textures are highly variable, soils whose deposits lack uniformity either horizontally across the landscape or vertically through the soil profile, and soils whose internal drainage is restricted or impeded.

[a] Good composition when applied to surface soils, implies that their structures are easily crushed to finer-sized aggregates and whose organic or humus content prevents them from breaking down into individual, single-grained particles. When applied to subsoil structures, it implies that they are not compact, hard, or cemented. Soils of good composition have good tilth and are easily cultivated.

[b] More costly indicates that innovative management and cultural practices will have to be applied to produce nearly similar responses to those obtained in areas having a higher initial irrigation potential.

THE DECISION TO IRRIGATE

In addition to the soil factors evaluated in the preparation of these irrigation suitability maps, landowners may also find other maps and descriptive materials in this report dealing with slope classes, landform patterns, and surface stones useful in decision making.

In conclusion, it is suggested that irrigation development not proceed if there are any doubts regarding the possible deterioration of the soil, or if the monetary inputs appear extravagant. Other concerns that a landowner might consider are his personal reactions to possible differences in the types of crop grown, differences in land requirements, differences in marketing specialty crops, differences in machinery requirements, differences in labor-management relationships, and finally, differences in personal choices due to the more disciplined endeavours required for a successful irrigation enterprise.

Sources of information for those contemplating irrigation are:

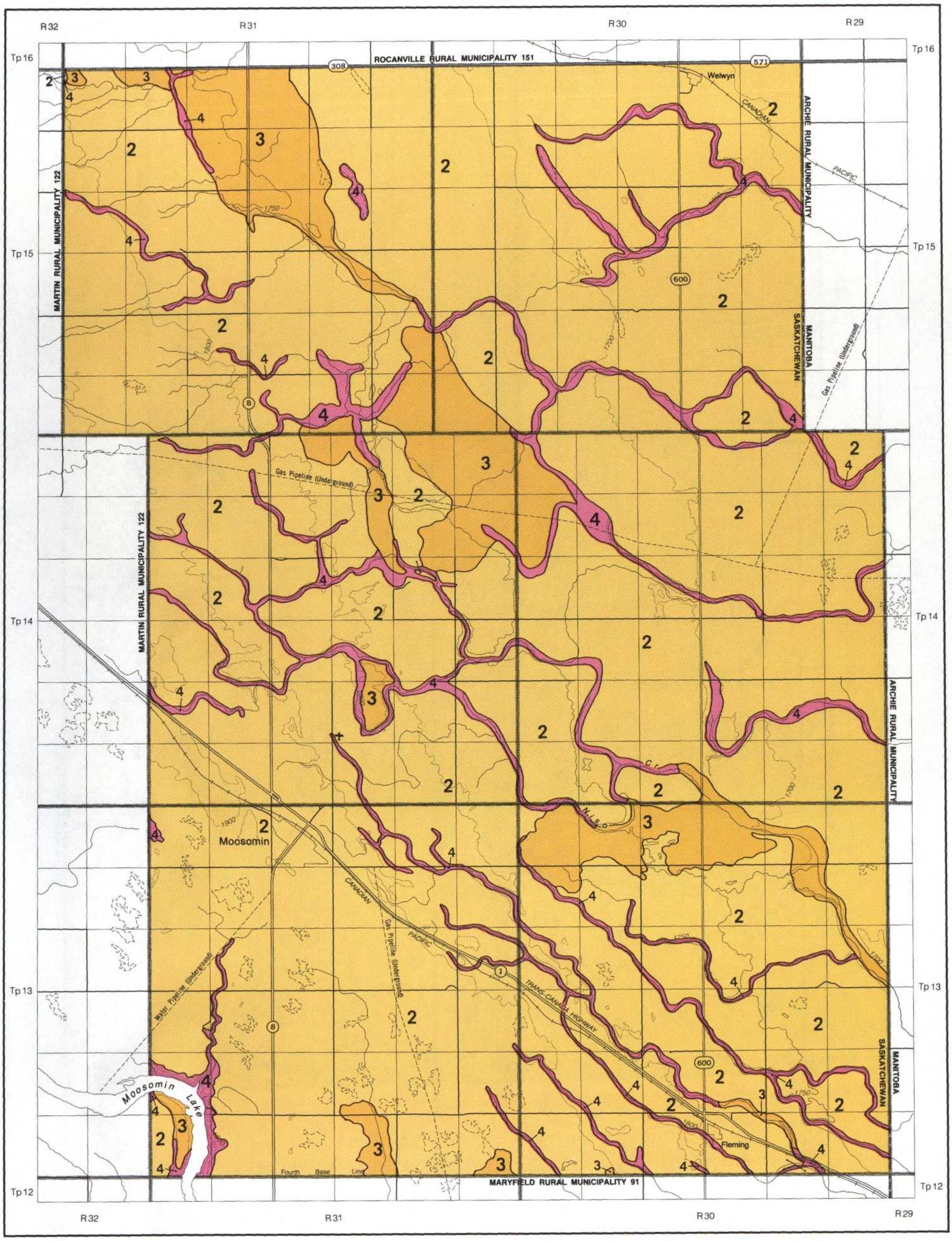
1. Irrigation Division, Conservation and Development Branch, Saskatchewan Government, Regina.
2. Soil Testing Laboratory, Soil Science Department and Soil Survey Section of the Saskatchewan Institute of Pedology, University of Saskatchewan, Saskatoon.
3. Agricultural Engineering, and Crop Science Departments, University of Saskatchewan, Saskatoon.
4. Irrigation Section, P.F.R.A., Motherwell Building, Regina.
5. Soil and Crop Specialists, Regional Extension Branch, Saskatchewan Department of Agriculture.
6. Registered Consultants.

by **J.G. Ellis**

Fig. 75 Irrigation systems such as the "Reel Irrigator" provide the capability to irrigate land with steeper slopes than is possible by flood irrigation techniques.

MOOSOMIN RM 121 - IRRIGATION POTENTIAL

by J.G. Ellis



1:100,000

Km 2 1 0 2 4 Km

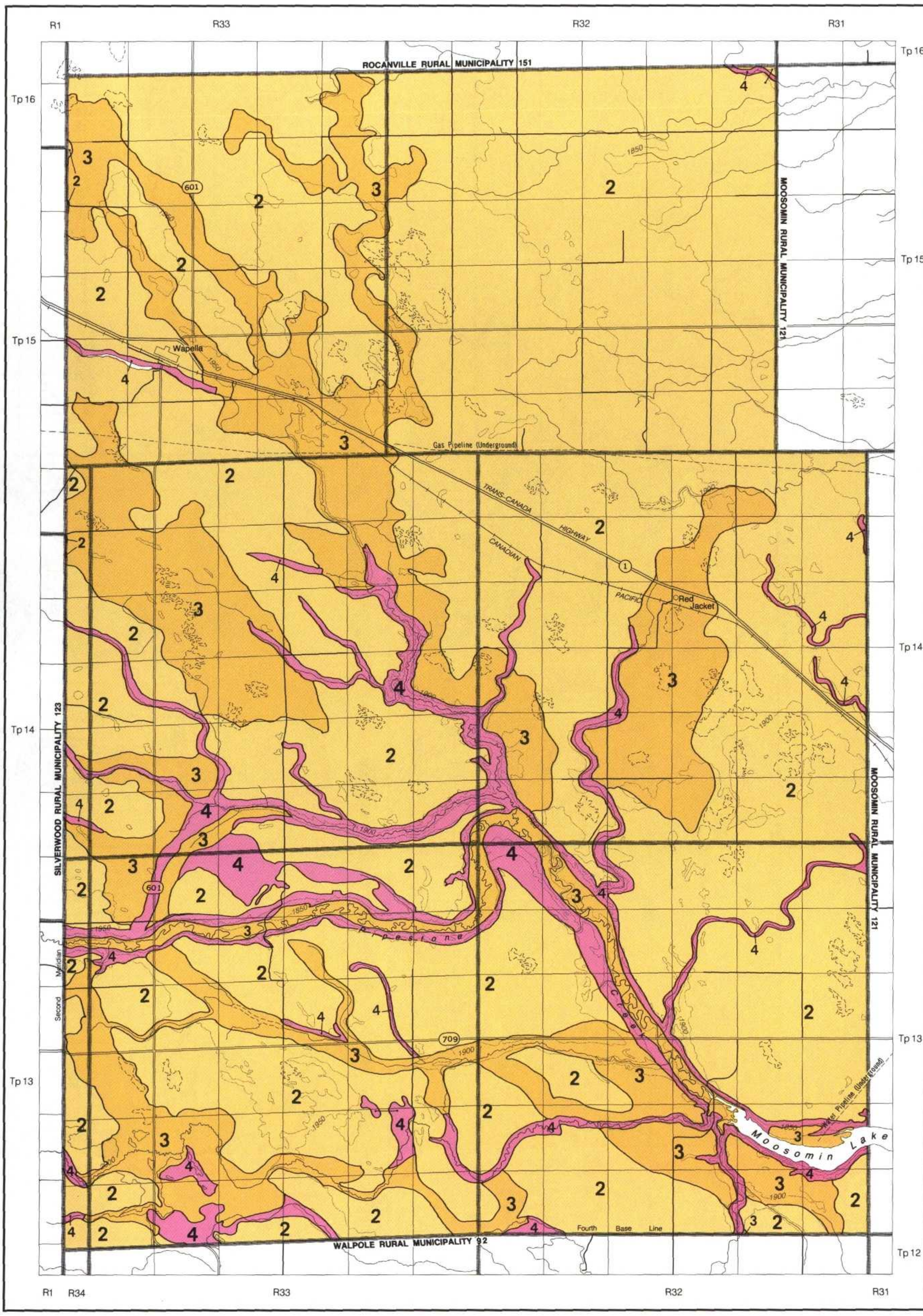
Miles 2 1 0 2 Miles

LEGEND

Class	Suitability
1	Good
2	Fair
3	Marginal
4	Unsuited

MARTIN RM 122 - IRRIGATION POTENTIAL

by J.G. Ellis



1:100,000

Km 2 1 0 2 4 Km

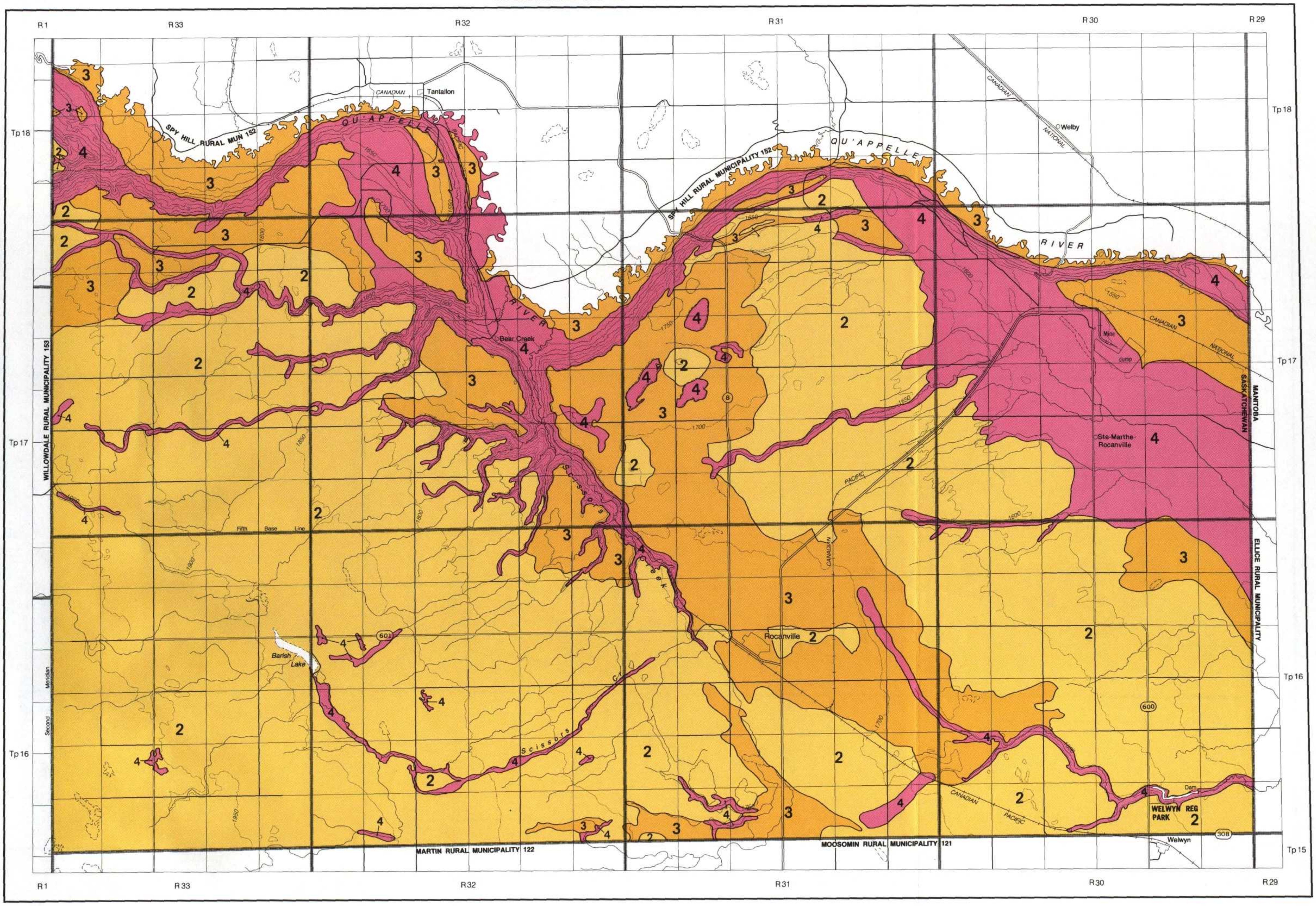
Miles 2 1 0 2 Miles

LEGEND

Class	Suitability
1	Good
2	Fair
3	Marginal
4	Unsuited

ROCANVILLE RM 151 - IRRIGATION POTENTIAL

by J.G. Ellis



1:100,000

Km 2 1 0 2 4 Km

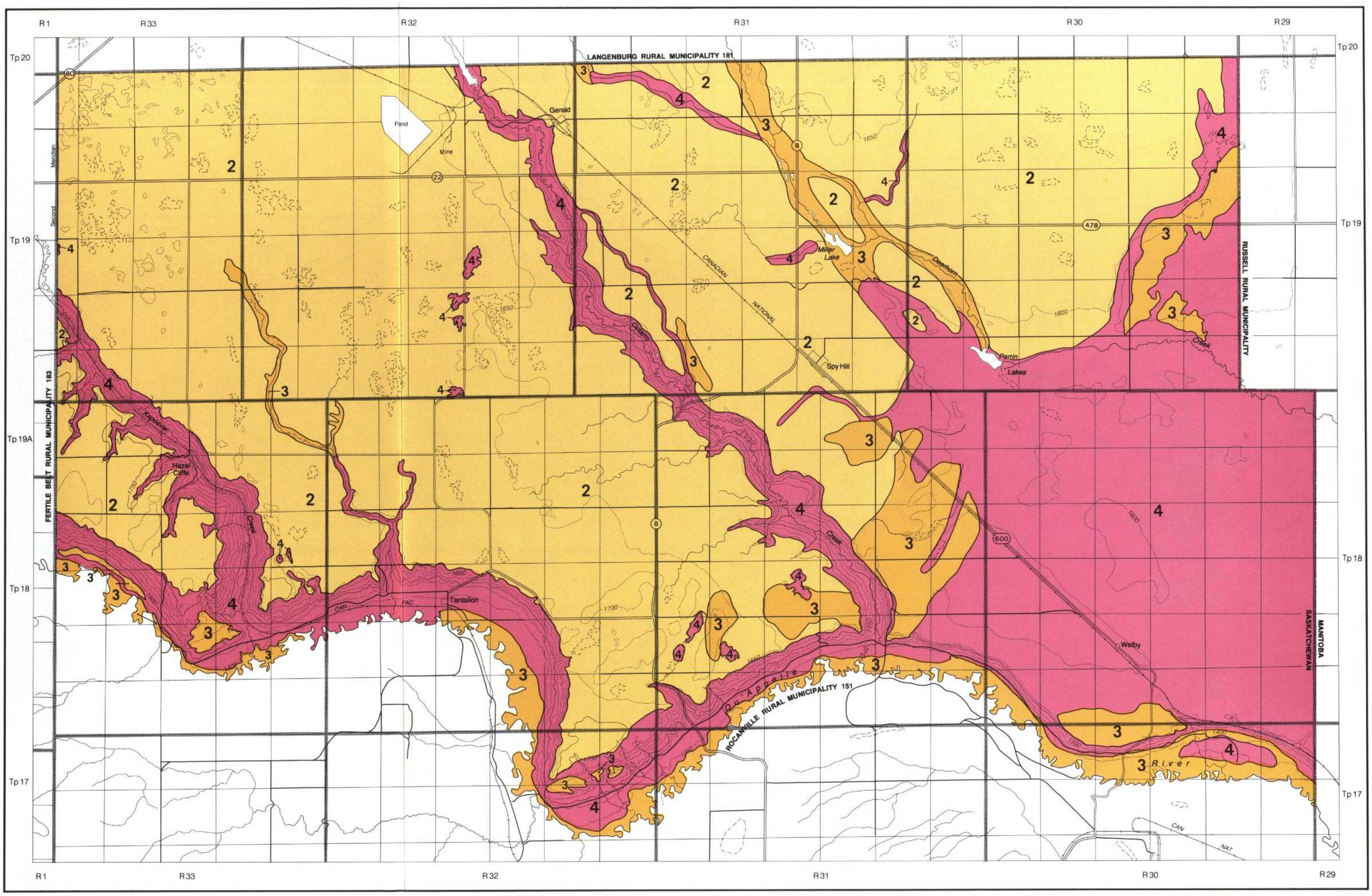
Miles 2 1 0 2 Miles

LEGEND

Class	Suitability
1	Good
2	Fair
3	Marginal
4	Unsuited

SPY HILL RM 152 - IRRIGATION POTENTIAL

by J.G. Ellis



1:100,000

Km 2 1 0 2 4 Km

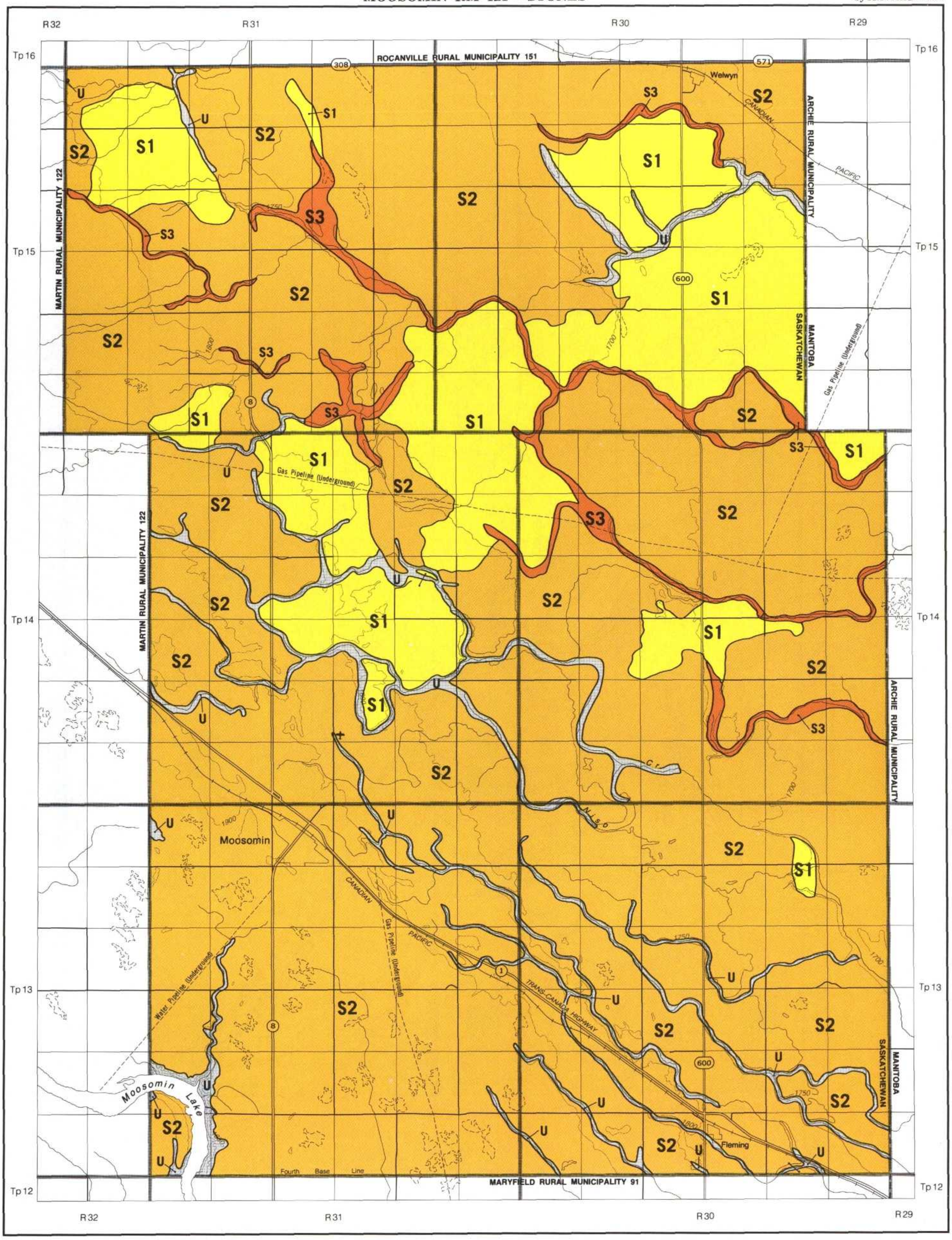
Miles 2 1 0 2 Miles

LEGEND

Class	Suitability
1	Good
2	Fair
3	Marginal
4	Unsuited

MOOSOMIN RM 121 - STONES

by A.J. Anderson



LEGEND

Map Symbol	Description
S0	Non stony.
S1	Slightly stony - stones seldom hinder cultivation. Light clearing is occasionally required.
S2	Moderately stony - stones are a moderate hinderance to cultivation. Annual clearing is usually required.
S3	Very stony - stones are a serious hinderance to cultivation. Sufficient stones to require clearing on an annual basis.
S4	Excessively stony - stones prohibit cultivation or make clearing a major task. Cultivation is usually severely hindered, even after regular, heavy clearing.
U	Unclassified.

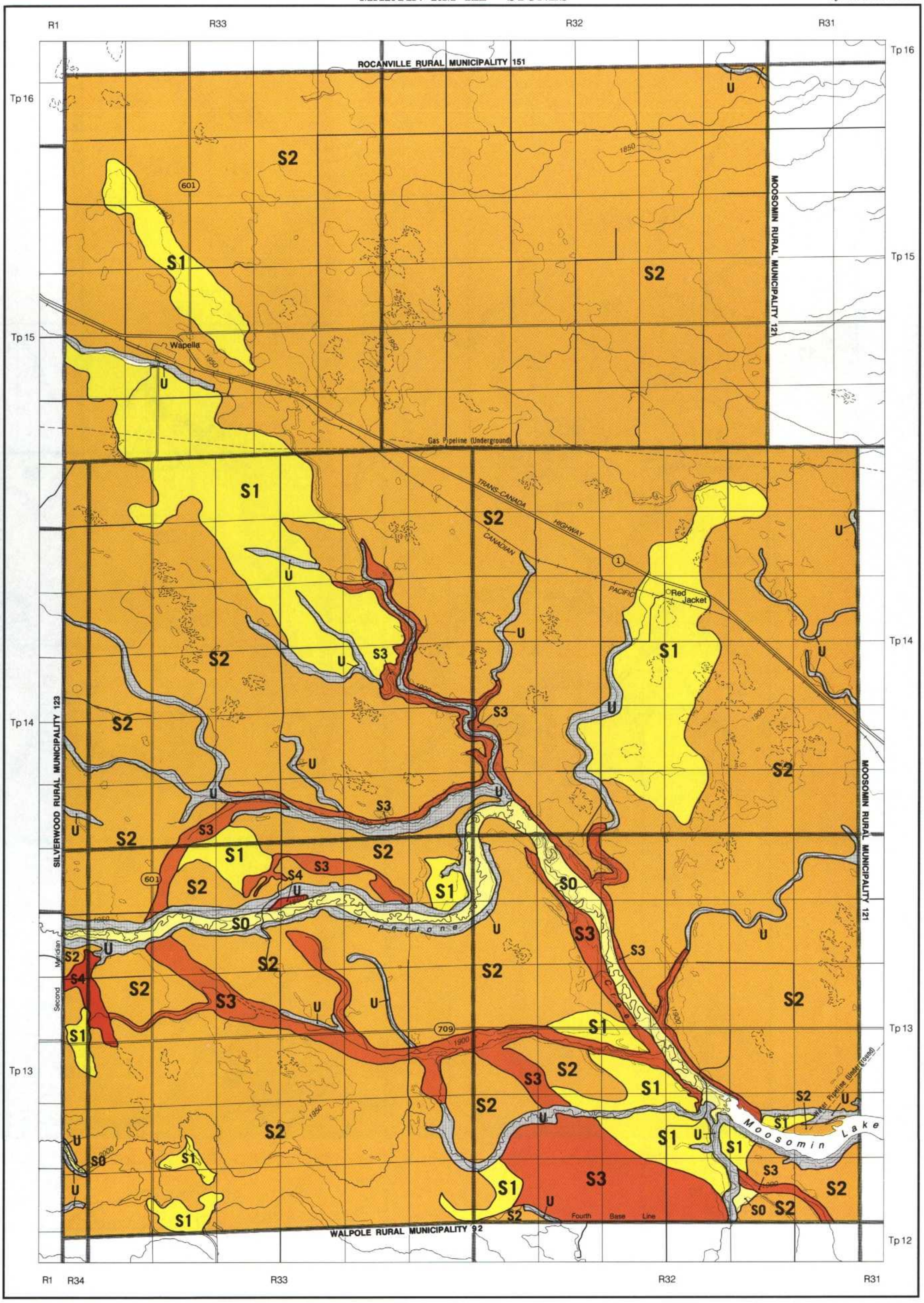
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

MARTIN RM 122 - STONES

by A.J. Anderson



LEGEND

Map Symbol	Description
S0	Non stony.
S1	Slightly stony - stones seldom hinder cultivation. Light clearing is occasionally required.
S2	Moderately stony - stones are a moderate hinderance to cultivation. Annual clearing is usually required.
S3	Very stony - stones are a serious hinderance to cultivation. Sufficient stones to require clearing on an annual basis.
S4	Excessively stony - stones prohibit cultivation or make clearing a major task. Cultivation is usually severely hindered. even after regular, heavy clearing.
U	Unclassified.

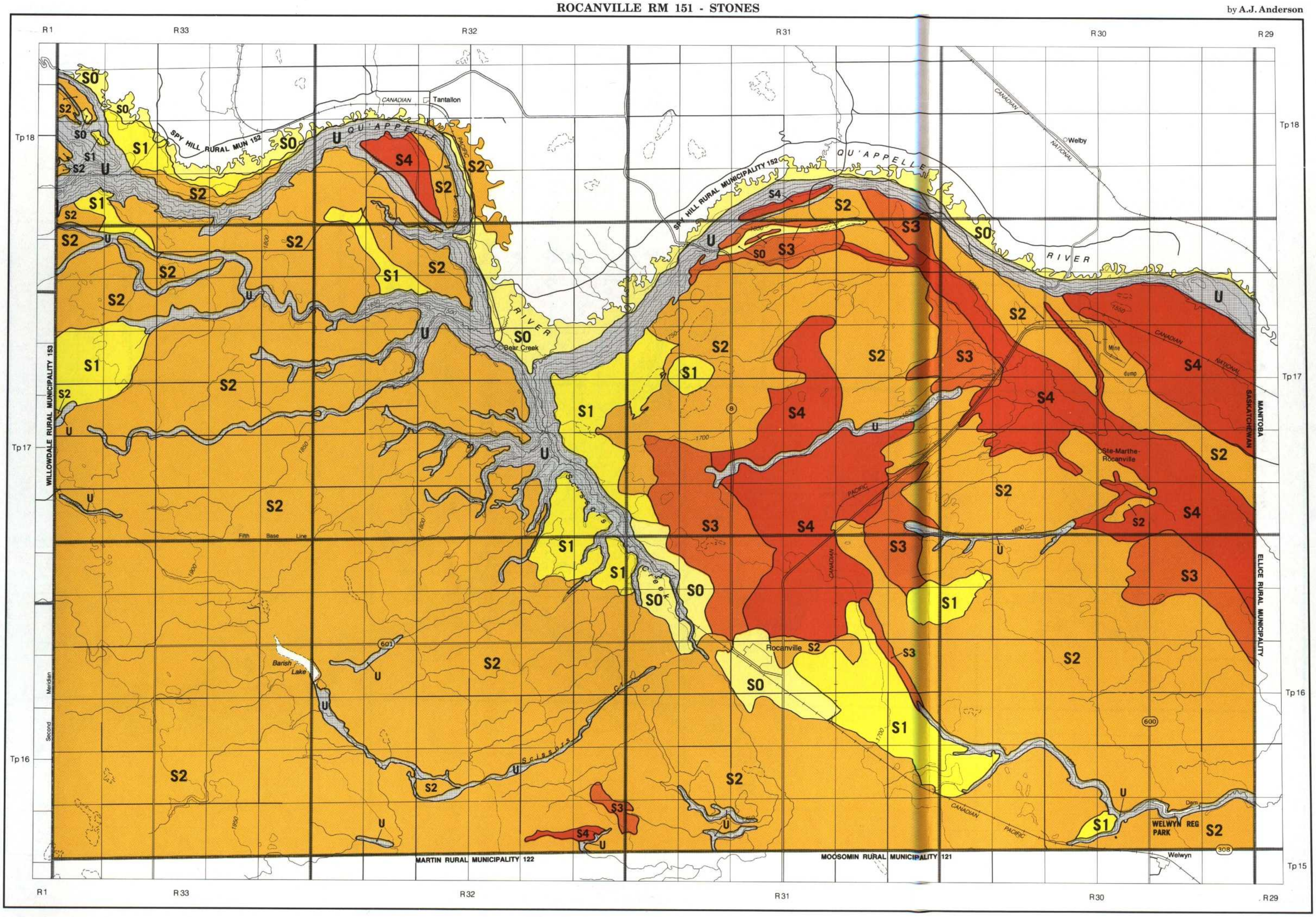
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

ROCANVILLE RM 151 - STONES

by A.J. Anderson



LEGEND

Map Symbol	Description
S0	Non stony.
S1	Slightly stony - stones seldom hinder cultivation. Light clearing is occasionally required.
S2	Moderately stony - stones are a moderate hinderance to cultivation. Annual clearing is usually required.
S3	Very stony - stones are a serious hinderance to cultivation. Sufficient stones to require clearing on an annual basis.
S4	Excessively stony - stones prohibit cultivation or make clearing a major task. Cultivation is usually severely hindered, even after regular, heavy clearing.
U	Unclassified.

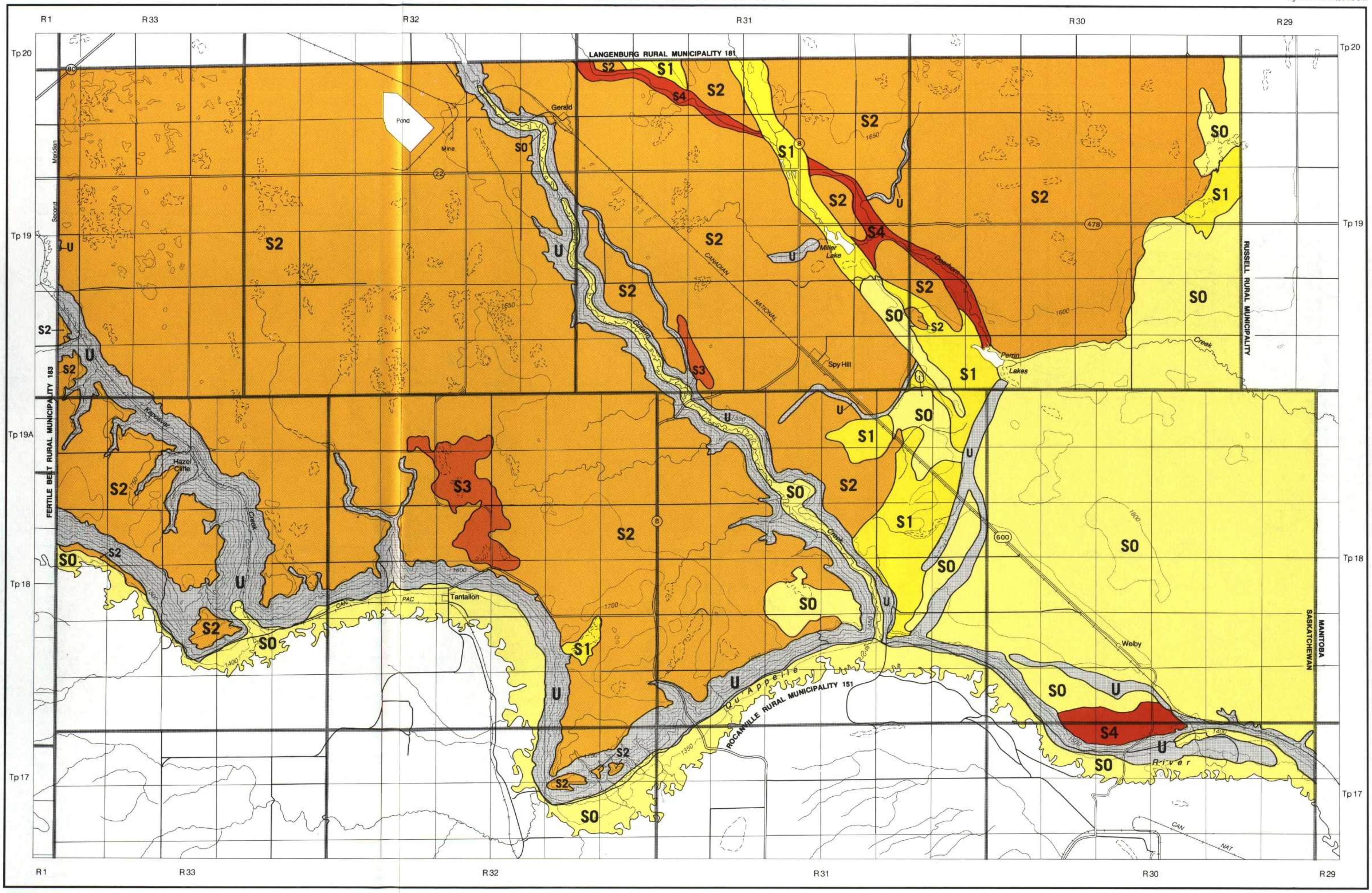
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SPY HILL RM 152 - STONES

by A.J. Anderson



LEGEND

Map Symbol	Description
S0	Non stony.
S1	Slightly stony - stones seldom hinder cultivation. Light clearing is occasionally required.
S2	Moderately stony - stones are a moderate hinderance to cultivation. Annual clearing is usually required.
S3	Very stony - stones are a serious hinderance to cultivation. Sufficient stones to require clearing on an annual basis.
S4	Excessively stony - stones prohibit cultivation or make clearing a major task. Cultivation is usually severely hindered, even after regular, heavy clearing.
U	Unclassified.

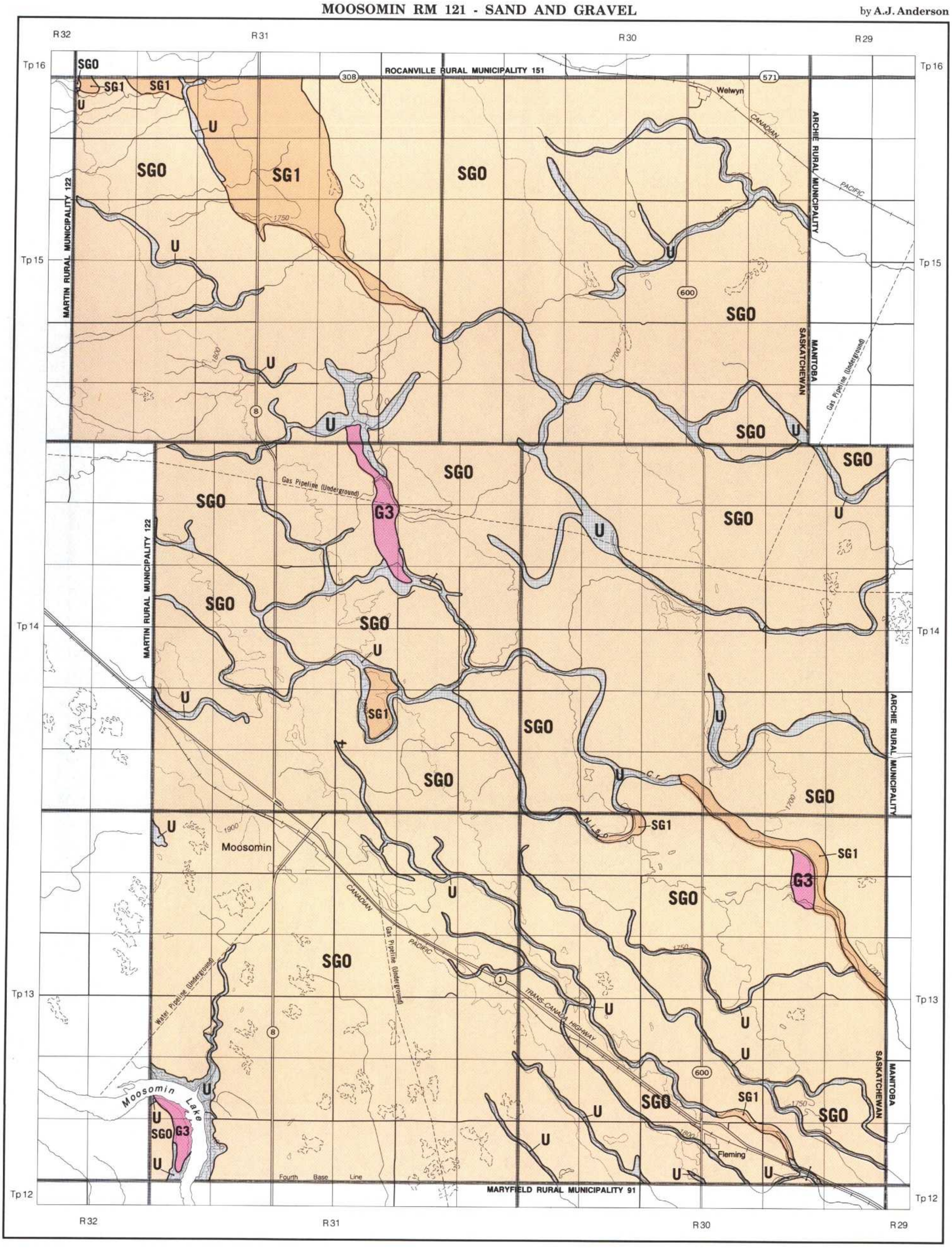
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

MOOSOMIN RM 121 - SAND AND GRAVEL

by A.J. Anderson



Explanation

This map shows the location of near surface sources of sandy and gravelly materials. The materials can range from mixtures of sand and silt to coarse gravelly sand. These materials may be used for concrete, sub-base for roads, traffic gravel and pervious borrow for fill purposes. This map does not suggest whether any of these areas contain sands and gravels of sufficient volume or quality to enable commercial development.

The term sand refers to materials with greater than 50% sand and with less than 15% clay. Gravel refers to materials having a significant component of particles greater than 2 mm in diameter.

1:100,000

Km 2 1 0 2 4 Km

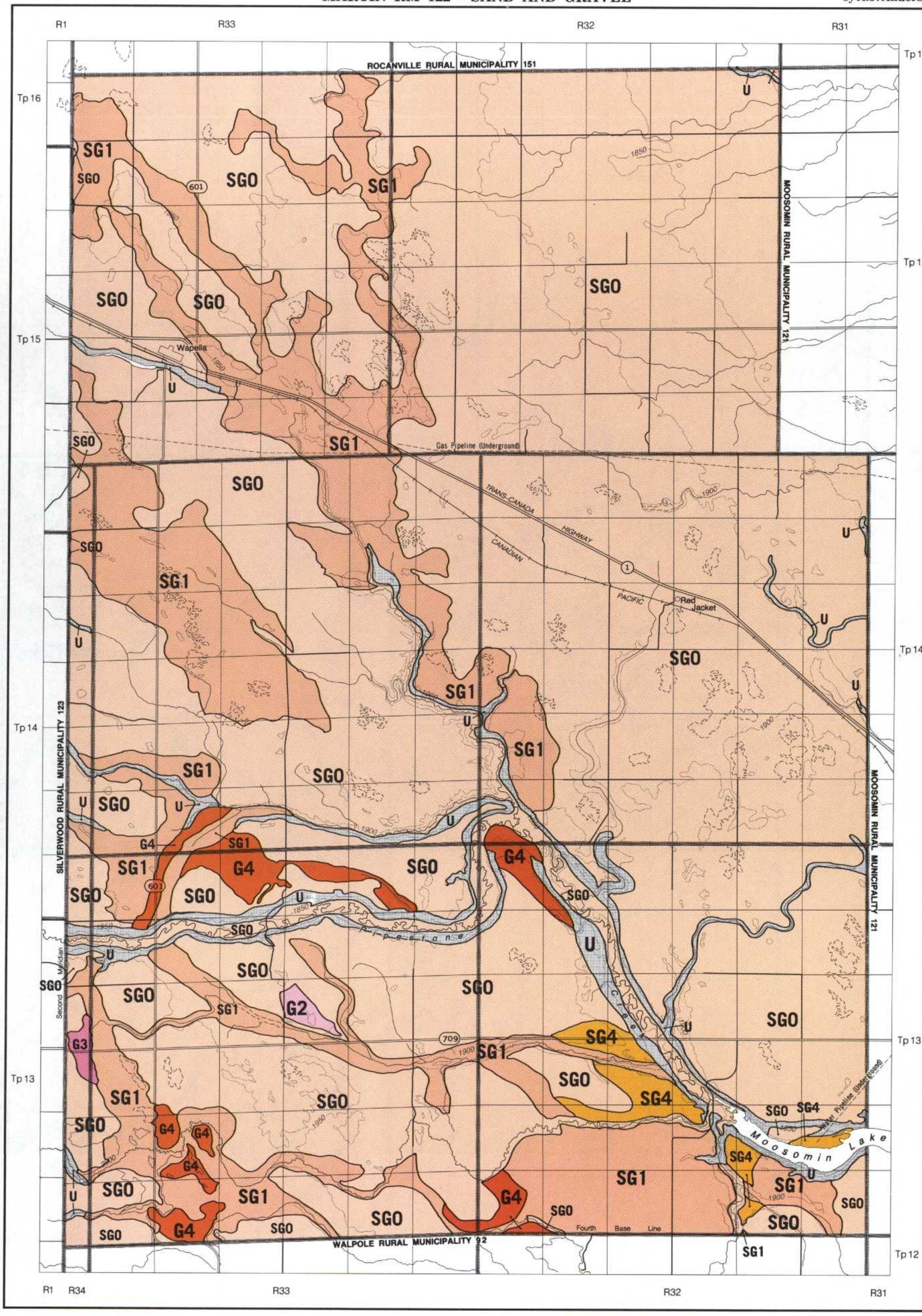
Miles 2 1 0 2 Miles

LEGEND

Map Symbol	Description
SGO	Little or no sandy or gravelly materials.
SG1	Minor amounts (5-10% of landscape) of sandy or gravelly materials occurring as pockets, on knolls, or as ridges. These areas rarely represent a significant source of granular construction material.
G3	Extensive areas (40-70% of landscape) of gravelly materials are present at the surface.
U	Unclassified.

MARTIN RM 122 - SAND AND GRAVEL

by A.J. Anderson



Explanation

This map shows the location of near surface sources of sandy and gravelly materials. The materials can range from mixtures of sand and silt to coarse gravelly sand. These materials may be used for concrete, sub-base for roads, traffic gravel and pervious borrow for fill purposes. This map does not suggest whether any of these areas contain sands and gravels of sufficient volume or quality to enable commercial development.

The term sand refers to materials with greater than 50% sand and with less than 15% clay. Gravel refers to materials having a significant component of particles greater than 2 mm in diameter.

1:100,000

Km 2 1 0 2 4 Km

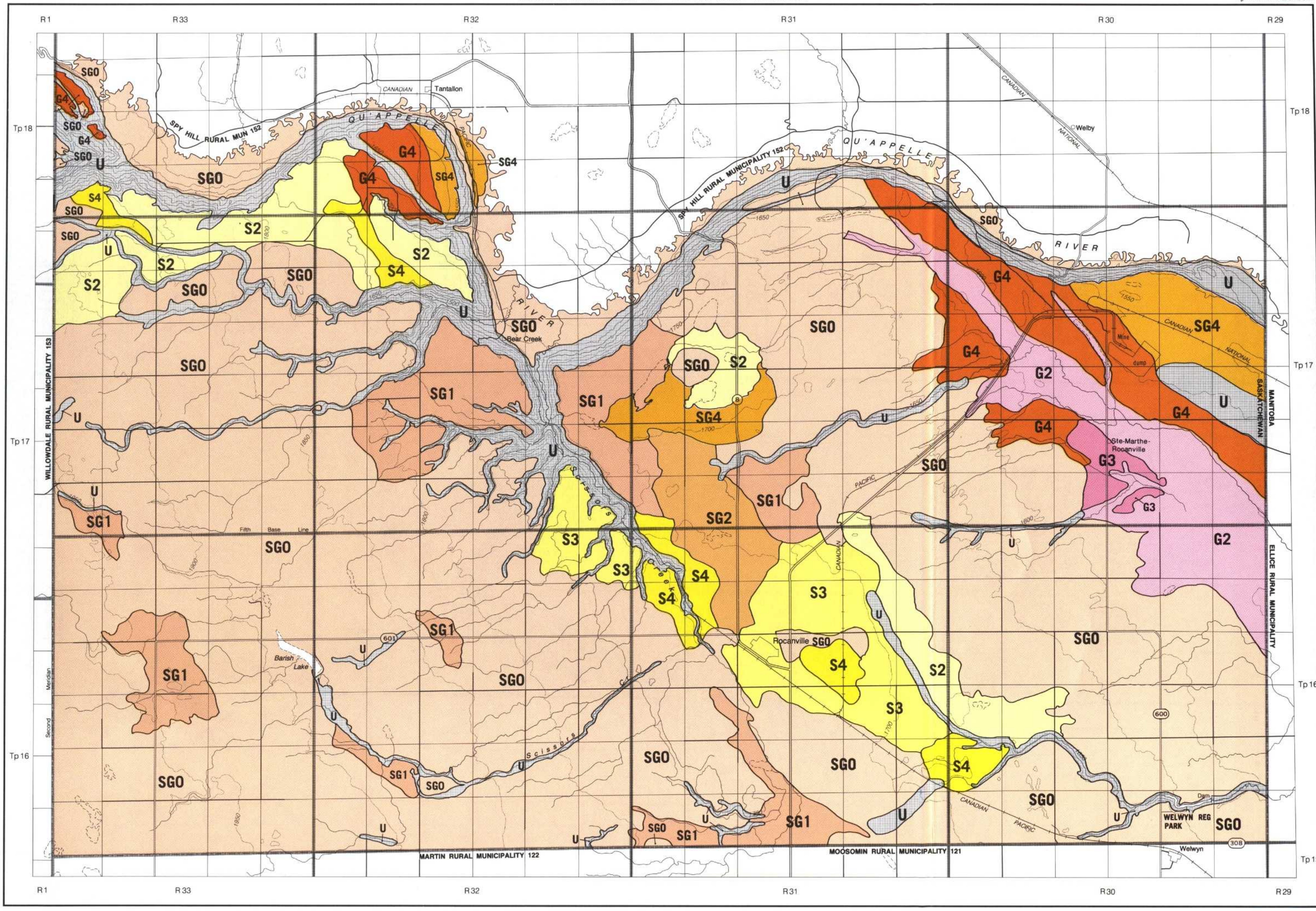
Miles 2 1 0 2 Miles

LEGEND

Map Symbol	Description
SG0	Little or no sandy or gravelly materials.
SG1	Minor amounts (5-10% of landscape) of sandy or gravelly materials occurring as pockets, on knolls, or as ridges. These areas rarely represent a significant source of granular construction material.
G2	Moderate amounts (15-40% of landscape) of gravelly materials are present at the surface.
G3	Extensive areas (40-70% of landscape) of gravelly materials are present at the surface.
G4	Very extensive areas (greater than 70% of landscape) of gravelly materials are present at the surface.
SG4	Very extensive areas (greater than 70% of landscape) of sandy or gravelly materials are present at the surface.
U	Unclassified.

ROCANVILLE RM 151 - SAND AND GRAVEL

by A.J. Anderson



LEGEND

Map Symbol	Description
SGO	Little or no sandy or gravelly materials.
SG1	Minor amounts (5-10% of landscape) of sandy or gravelly materials occurring as pockets, on knolls, or as ridges. These areas rarely represent a significant source of granular construction material.
S2	Moderate amounts (15-40% of landscape) of sandy materials are present at the surface.
G2	Moderate amounts (15-40% of landscape) of gravelly materials are present at the surface.
SG2	Moderate amounts (15-40% of landscape) of sandy or gravelly materials are present at the surface.
S3	Extensive areas (40-70% of landscape) of sandy materials are present at the surface.
G3	Extensive areas (40-70% of landscape) of gravelly materials are present at the surface.
S4	Very extensive areas (greater than 70% of landscape) of sandy materials are present at the surface.
G4	Very extensive areas (greater than 70% of landscape) of gravelly materials are present at the surface.
SG4	Very extensive areas (greater than 70% of landscape) of sandy or gravelly materials are present at the surface.
U	Unclassified.

Explanation

This map shows the location of near surface sources of sandy and gravelly materials. The materials can range from mixtures of sand and silt to coarse gravelly sand. These materials may be used for concrete, sub-base for roads, traffic gravel and pervious borrow for fill purposes. This map does not suggest whether any of these areas contain sands and gravels of sufficient volume or quality to enable commercial development.

The term sand refers to materials with greater than 50% sand and with less than 15% clay. Gravel refers to materials having a significant component of particles greater than 2 mm in diameter.

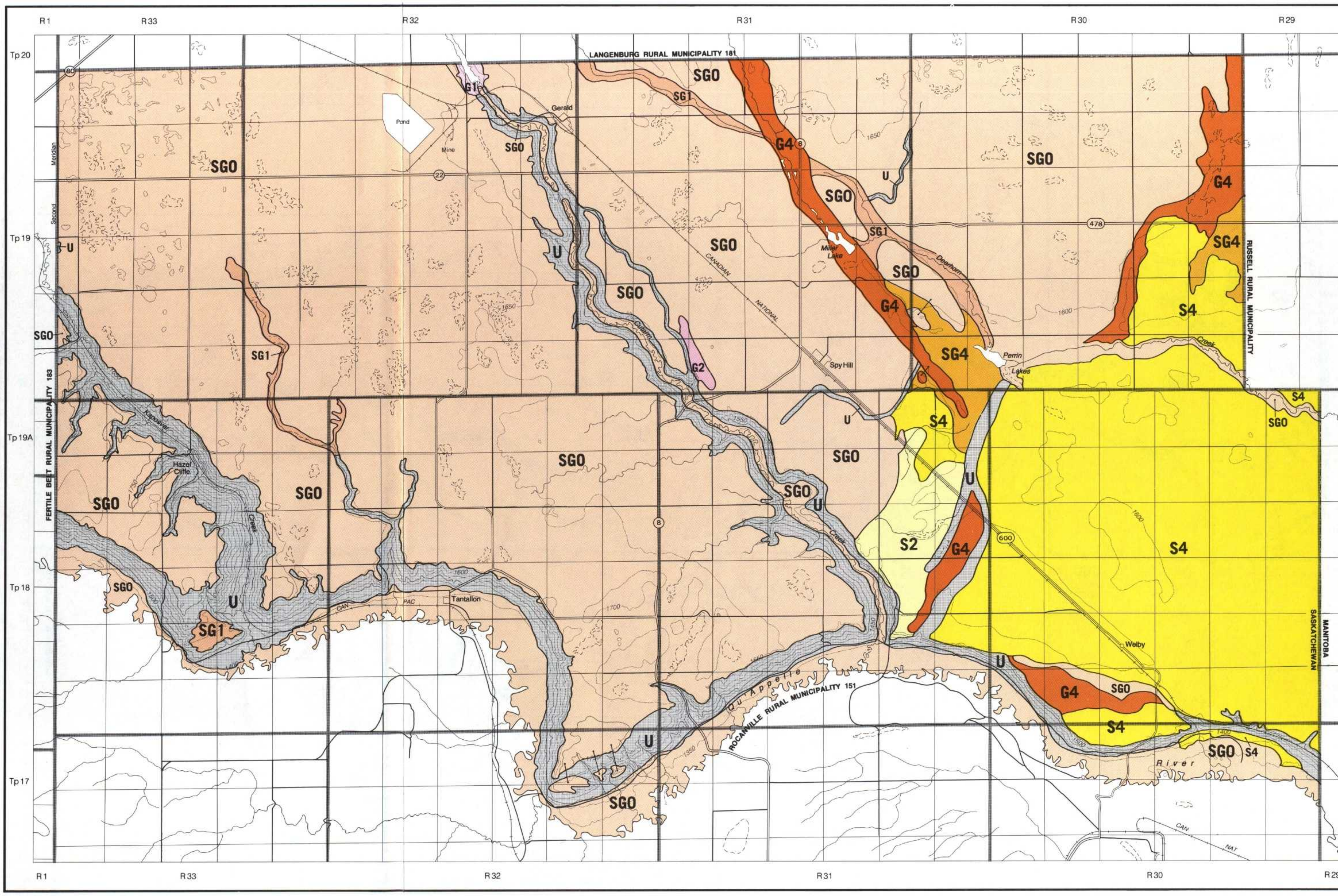
1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

SPY HILL RM 152 - SAND AND GRAVEL

by A.J. Anderson



Explanation

This map shows the location of near surface sources of sandy and gravelly materials. The materials can range from mixtures of sand and silt to coarse gravelly sand. These materials may be used for concrete, sub-base for roads, traffic gravel and pervious borrow for fill purposes. This map does not suggest whether any of these areas contain sands and gravels of sufficient volume or quality to enable commercial development.

The term sand refers to materials with greater than 50% sand and with less than 15% clay. Gravel refers to materials having a significant component of particles greater than 2 mm in diameter.

1:100,000

Km 2 1 0 2 4 Km

Miles 2 1 0 2 Miles

LEGEND

Map Symbol	Description
SGO	Little or no sandy or gravelly materials.
G1	Very limited areas of gravelly materials (1-15% of landscape).
SG1	Minor amounts (5-10% of landscape) of sandy or gravelly materials occurring as pockets, on knolls, or as ridges. These areas rarely represent a significant source of granular construction material.
S2	Moderate amounts (15-40% of landscape) of sandy materials are present at the surface.
G2	Moderate amounts (15-40% of landscape) of gravelly materials are present at the surface.
S4	Very extensive areas (greater than 70% of landscape) of sandy materials are present at the surface.
G4	Very extensive areas (greater than 70% of landscape) of gravelly materials are present at the surface.
SG4	Very extensive areas (greater than 70% of landscape) of sandy or gravelly materials are present at the surface.
U	Unclassified.

REFERENCES

Agriculture Canada

The Canadian System of Soil Classification. Publ. 1646, 1978
Management of Saline Soils. Publ. 1624-E, 1982
Salinity Map of the Agricultural Region of Saskatchewan, 1984

Saskatchewan Agriculture

Save the Soil - A Study in Soil Conservation and Erosion Control, 1964
Soil Salinity - A Study in Crop Tolerance and Cropping Practices, 1983
Understanding Salt-Affected Soils, 1982

Saskatchewan Research Council
(Publications in the Canadian Journal of Earth Sciences)

Pleistocene Stratigraphy of the Saskatoon Area, 1968
A Thin Till in West-Central Saskatchewan, 1968
The Wisconsinan Deglaciation of Southern Saskatchewan and Adjacent Areas, 1979
The Empress Group in Southern Saskatchewan, 1972

University of Saskatchewan
(Division of Extension and Community Relations)

Guide to Farm Practice in Saskatchewan
Guide to Soil Capability and Land Inventory Maps in Saskatchewan, S.I.P. Publ. M8, 1968
Guide to Understanding Saskatchewan Soils. Publ. 175, 1965
Saskatchewan Soils, Their Productivity and Management. Publ. 201, 1967
Saskatchewan Soil Survey Report No. 12, 1947
The Soils of the Hudson Bay-Swan Lake Map Area. Publ. 307, 1983
The Soils of the Regina Map Area. Publ. 176, 1965
The Soils of the Rosetown Map Area. Publ. 202, 1968
The Soils of the Saskatoon Map Area. Publ. 306, 1978
The Soils of the Willow Bunch Lake Map Area. Publ. 200, 1967
The Soils of the Swift Current Map Area 72J Saskatchewan, Publ. 481, 1985
The Soils of the Wolseley Rural Municipality. Publ. 493, 1984
The Soils of the Chester Rural Municipality. Publ. 495, 1985
The Soils of the Indian Head Rural Municipality. Publ. 494, 1986
The Soils of the Montmartre Rural Municipality. Publ. 496, 1987
The Soils of the Francis Rural Municipality. Publ. 497, 1987
The Soils of the Silverwood, Kingsley, Willowdale and Elcapo Rural Municipalities. Publ. 510, 1987