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Rural Municipality of Lawrence

Information Bulletin 99-30

Soils and Terrain

An introduction
to the land resource

Land Resource Unit
Brandon Research Centre

Canada

Rural Municipality of Lawrence

Information Bulletin 99-30

Prepared by:

Land Resource Unit,
Brandon Research Centre, Research Branch,
Agriculture and Agri-Food Canada.

Department of Soil Science, University of Manitoba.

Manitoba Soil Resource Section,
Soils and Crops Branch, Manitoba Agriculture.

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PREFACE

This is one of a new series of information bulletins for individual rural municipalities of Manitoba. They serve to introduce the newly developed digital soil databases and illustrate several typical derived and interpretive map products for agricultural land use planning applications. The bulletins will also be available in diskette format for each rural municipality.

Information contained in this bulletin may be quoted and utilized with appropriate reference to the originating agencies. The authors and originating agencies assume no responsibility for the misuse, alteration, re-packaging, or re-interpretation of the information.

This information bulletin serves as an introduction to the land resource information available for the municipality. More detailed information, including copies of the primary soil and terrain maps at larger scales, may be obtained by contacting

Land Resource Unit
Room 360 Ellis Bldg, University of Manitoba
Winnipeg, Manitoba R3T 2N2
Phone: 204-474-6118 FAX: 204-474-7633

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Managerial and administrative support was provided by:

R.G. Eilers, Head, Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada.
G.J. Racz, Head, Department of Soil Science, University of Manitoba.

Technical support was provided by:

G.W. Lelyk, and P. Cyr, Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada.
J. Fitzmaurice, and A. Waddell, Department of Soil Science, University of Manitoba.
G.F. Mills, P. Ag, Winnipeg, Manitoba
J. Griffiths, and C. Aglugub, Soil Resource Section, Soils and Crops Branch, Manitoba Agriculture.
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P. Haluschak and G. Podolsky, Soil Resource Section, Soils and Crops Branch, Manitoba Agriculture.

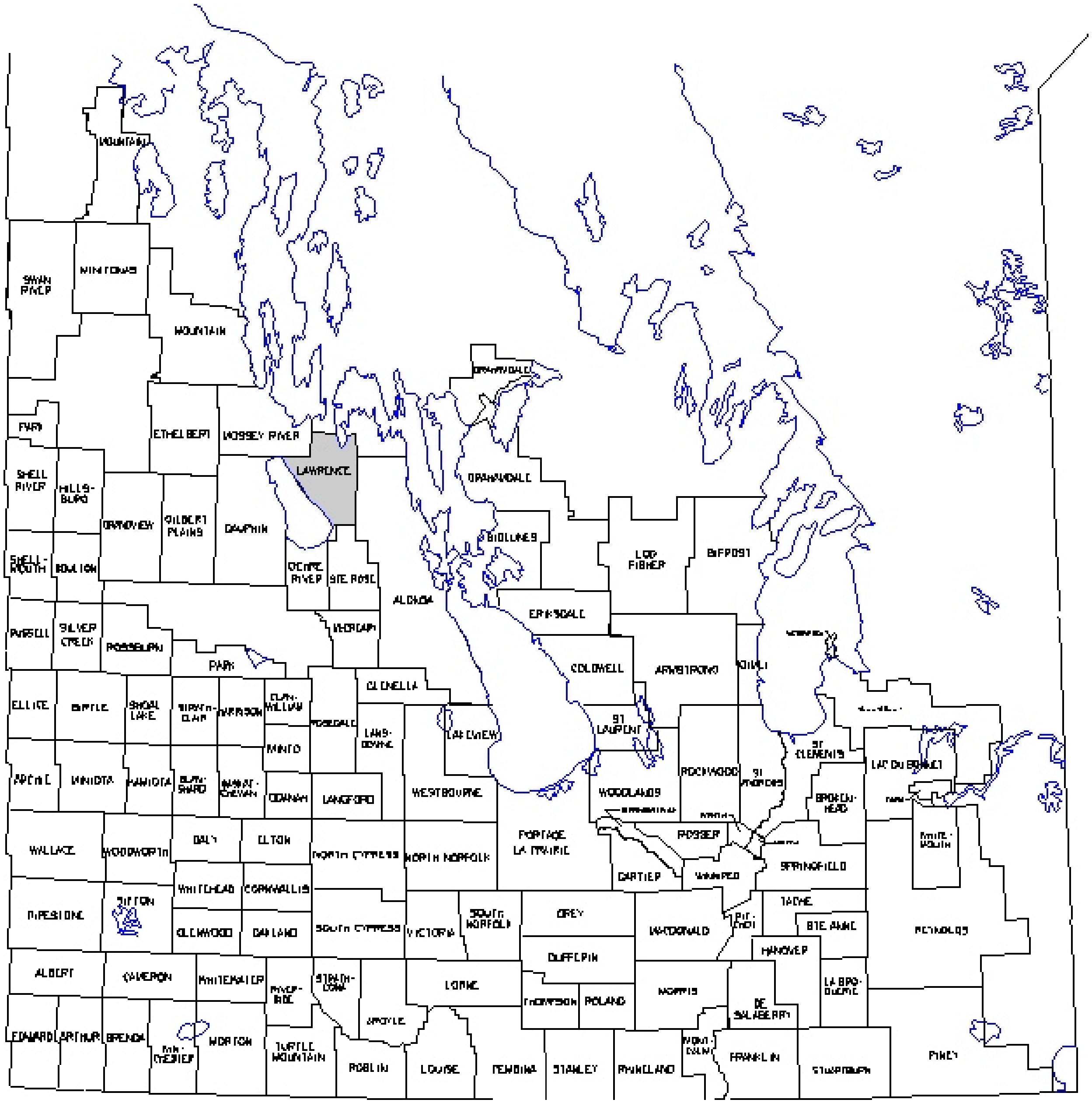


Figure 1. Rural municipalities of southern Manitoba.

INTRODUCTION

The location of the Rural Municipality of Lawrence is shown in Figure 1. A brief overview of the database information, and general environmental conditions for the municipality are presented. A set of maps derived from the data for typical agricultural land use and planning applications are also included.

The soil map and database were compiled and registered using the Geographic Information System (PAMAP GIS) facilities of the Land Resource Unit. These databases were used in the GIS to create the generalized, derived and interpretive maps and statistics in this report. The final maps were compiled and printed using Coreldraw.

This bulletin is available in printed or digital format. The digital bulletin is a Windows based executable file which offers additional display options, including the capability to print any portion of the bulletin.

LAND RESOURCE DATA

The soil and terrain information presented in this bulletin was compiled as part of a larger project to provide a uniform level of land resource information for agricultural and regional planning purposes throughout Agro-Manitoba. This information was compiled and analysed in two distinct layers as shown in Figure 2.

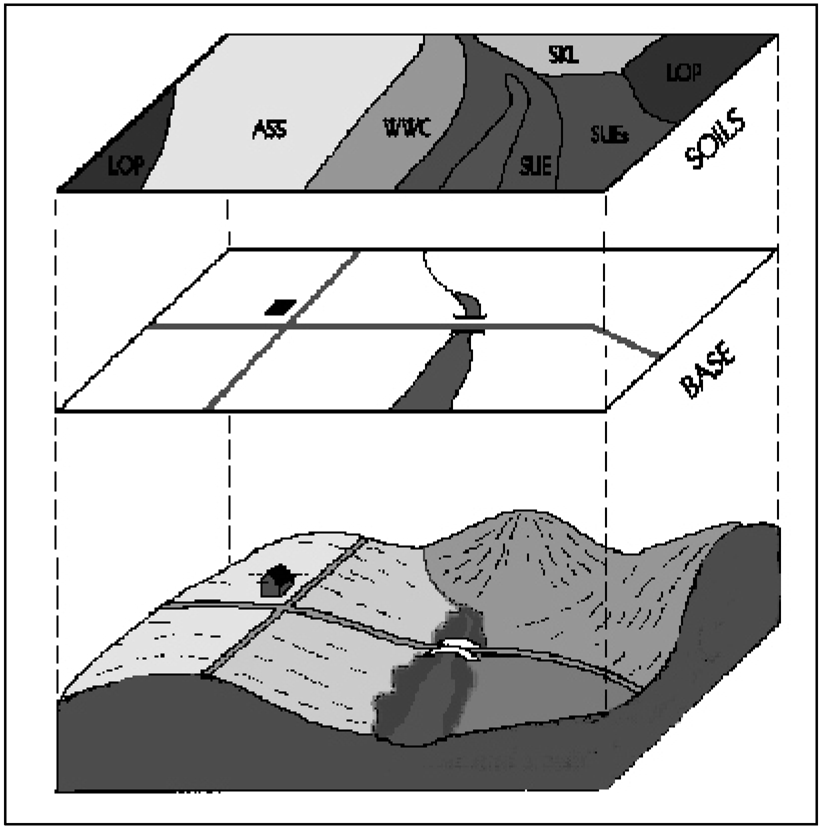


Figure 2. Soil and Base Map data.

Base Layer

Digital base map information includes the municipality and township boundaries, along with major streams, roads and highways. Major rivers and lakes from the base layer were also used as common boundaries for the soil map layer. Water bodies larger than 25 ha in size were digitized as separate polygons.

Soil Layer

The most detailed soil information currently available was selected as the data source for the digital soil layer for each rural municipality.

Comprehensive detailed soil maps (1:20 000 to 1:50 000 scale) have been published for many rural municipalities. Where they were available, the individual soil map sheets were digitized and compiled as a single georeferenced layer to match the digital RM base. Map polygons have one or more soil series components, as well as slope and stoniness classes. Soil database information was produced for each polygon, to meet national standards (MacDonald and Valentine, 1992). Slope length classes were also added.

Older, reconnaissance scale soil maps (1:126 720 scale) represented the only available soil data source for many rural municipalities. These maps were compiled on a **soil association** basis, in which soil landscape patterns were identified with unique surficial geological deposits and textures. Each soil association consists of a range of different soils ("associates") each of which occurs in a repetitive position in the landscape. Modern soil series that best represent the soil association were identified for each soil polygon. The soil and modifier codes provide a link to additional databases of soil properties. In this way, both detailed and reconnaissance soil map polygons were related to soil drainage, surface texture, and other soil properties to produce various interpretive maps. Slope length classes were also added.

SOIL AND TERRAIN OVERVIEW

The Rural Municipality (RM) of Lawrence covers an area of 78 284 ha (approximately 8.5 townships) located adjacent to the east shore of Dauphin Lake in the central Westlake district (page 3). The village of Rorketon is the main population centre as most of the population resides on farms and ranches. Most agricultural and other services are provided from larger centres outside the municipality.

Climatic conditions in the northern part of the area can be related to data from Meadow Portage while data from Ochre River characterize the climate in the southern portion. The mean annual temperature at Meadow Portage (located 14 km north of the municipality) is 0.8˚C and mean annual precipitation is 421 mm. The average frost-free period in the northern portion is 106 days and the degrees-days above 5˚C accumulated from May to September average 1556 (Environment Canada, 1982). In contrast, the mean annual temperature at Ochre River (located 22 km southwest of the municipality) is 2.0˚C and the mean annual precipitation is 527 mm. The average frost-free period in the south is 113 days and degree-days above 5˚C accumulated from May to September average 1682 (Environment Canada, 1982). An evaluation of growing conditions in this region of Manitoba can be related to estimates of seasonal moisture deficit and effective growing degree-days (EGDD) above 5˚C. The seasonal moisture deficit calculated between May and September is slightly in excess of 200 mm. The estimated effective growing degree-days accumulated from May to September average around 1400 (Agronomic Interpretations Working Group, 1995). These parameters provide an indication of moisture and heat energy available for crop growth and are generally adequate to support a wide range of crops adapted to western Canada.

Physiographically, the municipality occurs entirely in the Westlake Till Plain (Canada-Manitoba Soil Survey, 1980). Elevation of the land surface varies from 270 metres above sea level (m asl) near the Dauphin Lake shoreline decreasing to 257 m asl on Dauphin Lake and to between 255 and 248 metres along the eastern boundary of the area. This portion of the Westlake Till Plain slopes northeasterly at a rate of 0.9 m/km (5 ft/mi). The land surface is characterized by subdued ridge and swale topography with a north-south orientation. Local relief is generally under 3 metres and slopes are less than 2 percent except for northern and western parts of the area where slopes may range up to 5 percent (page 9). Surface drainage is poorly developed as there are no continuous waterways in this part of the Westlake area. Much of the municipality is characterized by high groundwater levels and surface runoff tends to collect in poorly drained sloughs and meadows found in the many shallow swales throughout the area. A system of drainage ditches has been developed in portions of the area utilized for more intensive agriculture.

Soil materials in the municipality were deposited during the last glaciation and during the time of glacial Lake Agassiz. The Westlake Till Plain is a gently undulating area with subdued ridge and swale topography consisting mainly of extremely calcareous, waterworked, loamy glacial till (page 11). The dominantly low relief, gentle slopes and generally high watertable throughout the municipality result in the majority of soils being classified as imperfectly to poorly drained (page 13).

Soils in the municipality have been mapped at a reconnaissance level (1:126 720 scale) and published in the soil survey report for the Ste. Rose du Lac Area (Mills et al., 1981). According to the Canadian System of Soil Classification (Soil Classification Working Group, 1998), well to imperfectly drained Black Chernozem soils developed on extremely calcareous, stony, loam textured glacial till (Isafold and Lundar series) are dominant. Local areas of Black Chernozem soils (Methley series) in the southern part of the municipality occur on calcareous loamy till which is less stony than the Isafold and Lundar soils. Eutric Brunisol and Dark Gray Chernozem soils (Fairford and Inwood series) are common in well to imperfectly drained sites on the calcareous till in the northern part of the area. Poorly drained sites in these till landscapes are characterized by Humic Gleysol soils of the Clarkleigh and Meleb series. These Gleysol soils in the northern part of the area are characterized by thin peaty surface layers,.

Major management considerations are related to wetness associated with the subdued ridge and swale topographic pattern (page 15). Seasonal high water tables (at 1 to 2 metres) and saturated soils are common and surface water ponds in poorly drained depressional areas and organic terrain throughout the area. Moderately to excessively stony conditions are associated with the till soils and local areas of moderate to strong salinity occur near the southeast shore of Dauphin Lake.

Twenty percent of the soils are rated in **Class 2** for agricultural capability primarily due to wetness and stoniness while 0.4 percent of the area is placed in **Class 3** recognizing moderate stoniness and compact subsoils. About 10 percent of the soils are rated in **Class 5**, primarily due to wetness and **Class 6** soils affected by excess wetness occupy nearly 8 percent of the area. Organic soils which have very limited capability for agriculture in their native state cover 2 percent of the area (page 19). The irrigation suitability of soils in this municipality (page 21) is dominantly **Fair** (76 percent) and **Poor** (19 percent).

One of the issues currently receiving considerable attention is the sustainability of agricultural practices and their potential impact on the soil and groundwater environment. To assist in highlighting this concern to land planners and agricultural producers, the assessment of potential environmental impact (EI) under irrigation shown on page 21 is dominantly **Low** for the glacial till soils with a **Moderate** to **High** rating for saline and coarse textured soils. This EI map is intended to be used in association with the irrigation suitability map.

Another issue of concern to producers, soil conservationists and land use specialists is soil erosion caused by agricultural cropping and tillage practices. Areas with potential for water erosion are shown on page 23. Most of the land in the municipality is at a **Negligible** (45 percent) to **Low** (40 percent) risk of degradation due to water erosion. Glacial till soils with higher local relief and level lacustrine soils underlain by glacial till are at a slightly greater risk of erosion. Current management practices focus on maintaining adequate crop residues to provide sufficient surface cover to adequately protect the soils from both wind and water erosion.

The dominant land use in the RM of Lawrence is agriculture consisting of ranching and feedlot operations for raising cattle. Annual cropping for grain and forage production takes place on the less stony soils in the southern part of the area. An assessment of the status of land use in 1994, obtained through an analysis of satellite imagery, showed annual crops occupy 19 percent of the land area, mainly in the southern part of the municipality with forage crops being produced on 3 percent of the land. Extensive areas of grassland (38 percent) and tree cover (30 percent) are dominant through central and northern parts of the municipality and provide forage and grazing capacity as well as wildlife habitat. Wetlands, including areas of shallow organic soils, cover nearly 6 percent of the area and also provide wildlife habitat. Various non-agricultural uses such as infrastructure for urban areas, transportation and recreation occupy about 2 percent of the municipality (page 25).

The majority of soils in the RM of Lawrence have moderately severe to very severe limitations for arable agriculture. Stony conditions associated with many of the till soils may be improved if stone clearing is included as part of the tillage operation. Till soils characterized by excessive stones and cobbles are best managed as native pasture. A major portion of the area has low relief and a complex association of imperfectly and poorly drained soils which are frequently saturated and subject to surface ponding, particularly during spring runoff or following heavy rains. In addition, the ridge and swale topographic pattern throughout area increases the difficulty of drainage improvement as the ridges are oriented perpendicular to the slope of the land. Where the land pattern permits, improvement and maintenance of water management infrastructure on a regional basis is required to reduce surface ponding while maintaining adequate soil moisture for crop growth.

DERIVED AND INTERPRETIVE MAPS

A large variety of computer derived and interpretive maps can be generated from the digital soil and landscape databases. These maps are based on selected combinations of database values and assumptions.

Derived maps show information that is given in one or more columns in the computer map legend (such as soil drainage or slope class).

Interpretive maps portray more complex land evaluations based on a combination of soil and landscape information. Interpretations are based on soil and landscape conditions in each polygon. Interpretative maps typically show land capabilities, suitabilities, or risks related to sustainability.

Several examples of derived and interpretive maps are included in this information bulletin:

<u>Derived Maps</u>
Slope
Generalized Soil
Drainage
Management Considerations

<u>Interpretative Maps</u>
Agricultural Capability
Irrigation Suitability
Potential Environmental Impact
Water Erosion Risk
Land Use

The maps have all been reduced in size and generalized (simplified) in order to portray conditions for an entire rural municipality on one page. These generalized maps provide a useful overview of conditions within a municipality, but are not intended to apply to site specific land parcels. On-site evaluations are recommended for localized site specific land use suitability requirements.

Digital databases derived from recent detailed soil inventories contain additional detailed information about significant inclusions of differing soil and slope conditions in each map polygon. This information can be portrayed at larger map scale than shown in this bulletin.

Information concerning particular interpretive maps, and the primary soil and terrain map data, can be obtained by contacting the Manitoba Soil Resource Section of Manitoba Agriculture, the local PFRA office, or the Land Resource Unit.

Slope Map.

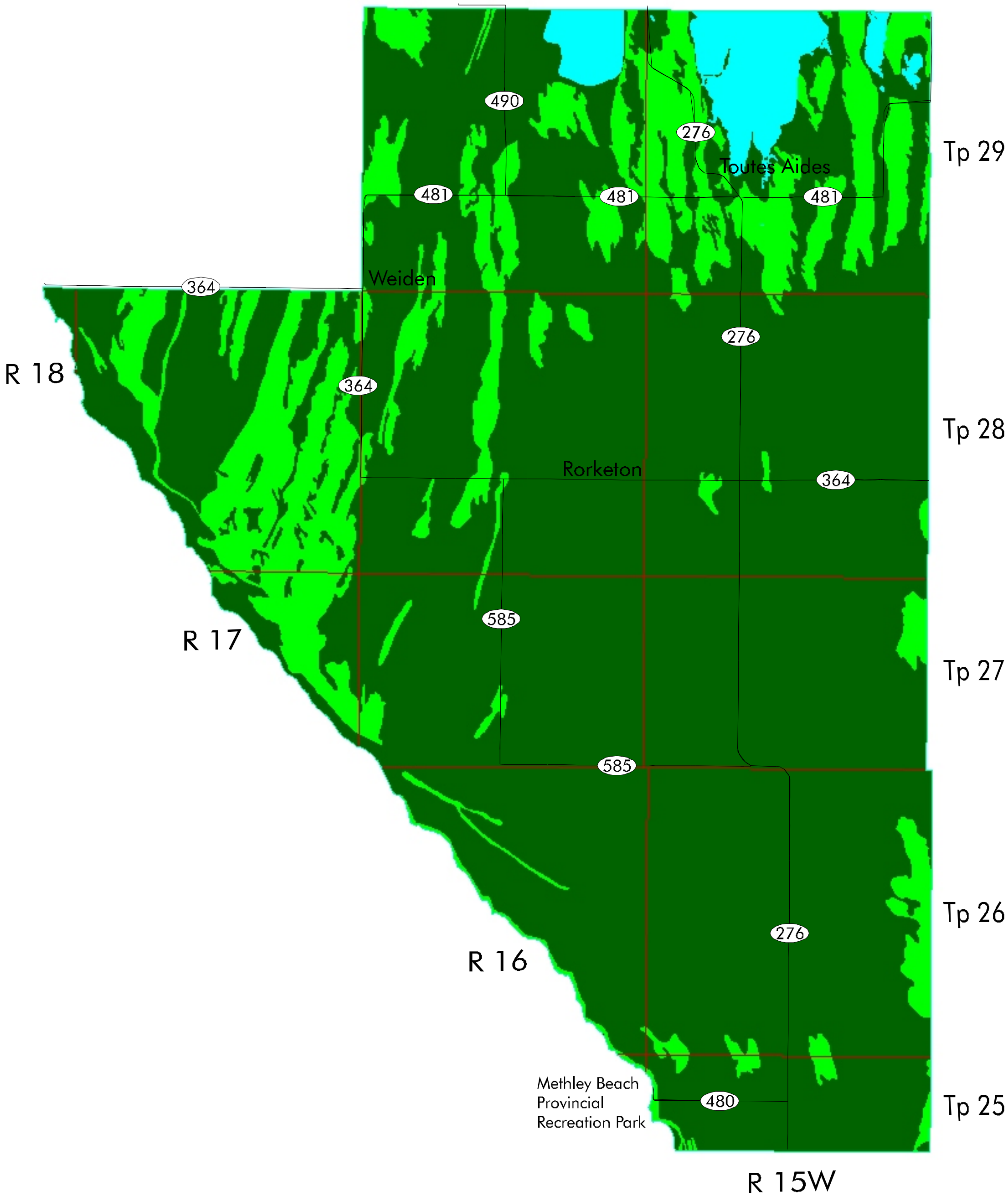
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area, but cannot be portrayed at this reduced map scale.

Table 1. Slope Classes[1]

Slope Class	Area (ha)	Percent of RM
0 - 2 %	62460	79.8
2 - 5 %	13516	17.3
5 - 9 %	0	0.0
9 - 15 %	0	0.0
15 - 30 %	0	0.0
> 30 %	0	0.0
Unclassified	0	0.0
Water	2307	2.9
Total	78284	100.0

[1] Area has been assigned to the dominant slope in each soil polygon.

Slope Map



Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
March 2000

Generalized Soil Map.

The most recently available soil maps were digitized to produce the new digital soil map. For older reconnaissance soil maps, areas of overprinted symbols or significant differences in topography have been delineated as new polygons. All soil polygons have been digitized and translated into modern soil series equivalents.

The general soil groups provide a very simplified overview of the soil information contained in the digital soil map. The hundreds of individual soil polygons have been simplified into broad groups of soils with similar parent material origins, textures, and drainage classes. The dominant soil in each polygon determines the soil group, area, and colour for the generalized soil map. Gleysolic soils groups have poor to very poor drainage, while other mineral soil groups typically have a range of rapid, well, or imperfectly drained soils.

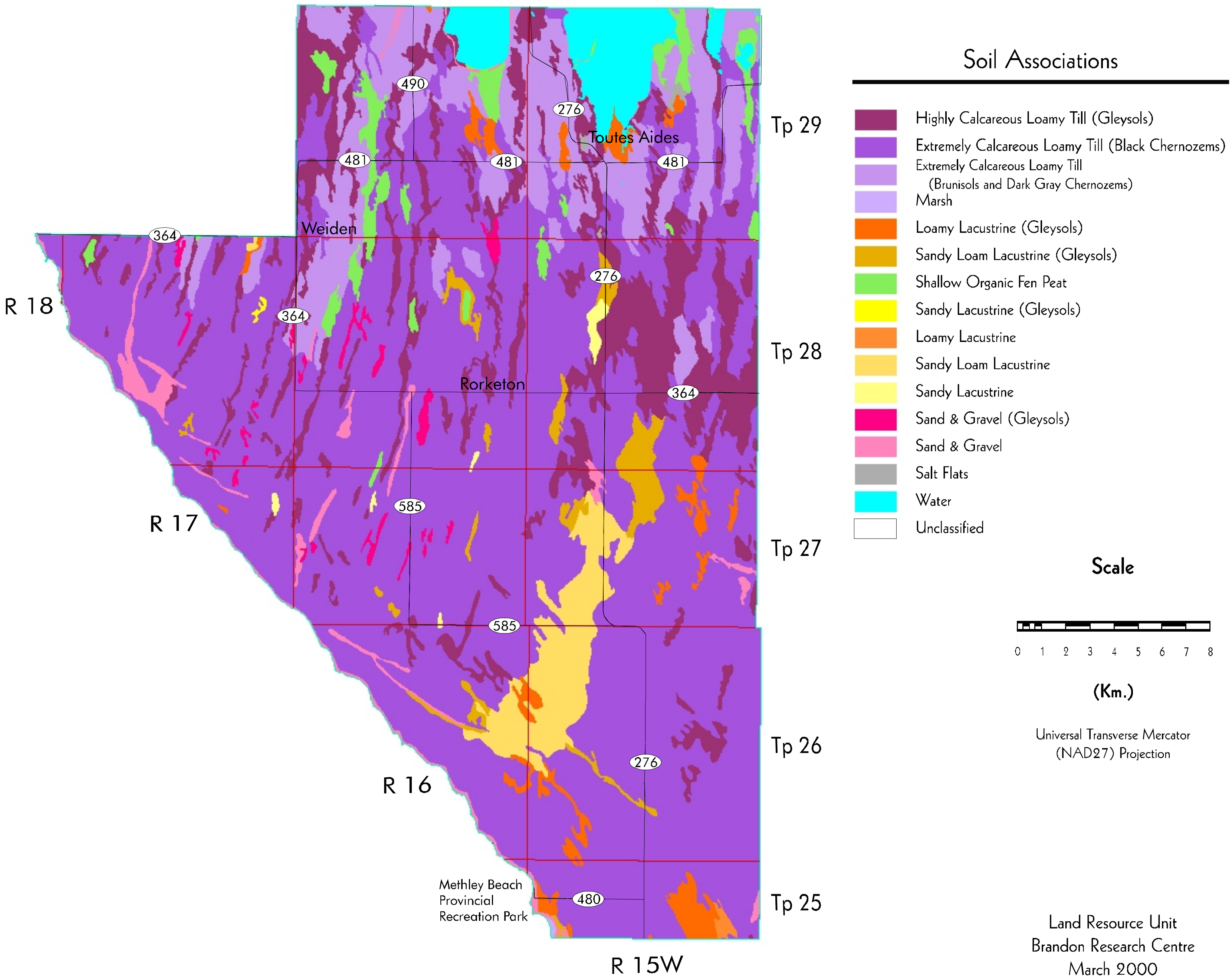
More detailed maps showing the dominant and subdominant soils in each polygon can also be produced at larger map scales.

Table 2. Generalized Soil Groups[1]

Soil Groups	Area (ha)	Percent of RM
Highly Calcareous Loamy Till (Gleysols)	9919	12.7
Extremely Calcareous Loamy Till (Black Chernozems)	48268	61.7
Extremely Calcareous Loamy Till (Brunisols and Dark Gray Chernozems)	8364	10.7
Marsh	21	0.0
Loamy Lacustrine (Gleysols)	1538	2.0
Sandy Loam Lacustrine (Gleysols)	1341	1.7
Shallow Organic Fen Peat	1654	2.1
Sandy Lacustrine (Gleysols)	24	0.0
Loamy Lacustrine	79	0.1
Sandy Loam Lacustrine	2514	3.2
Sandy Lacustrine	183	0.2
Sand and Gravel (Gleysols)	552	0.7
Sand and Gravel	1435	1.8
Salt Flats	85	0.1
Water	2307	2.9
Total	78284	100.0

[1] Based on the **dominant** soil series for each soil polygon.

Generalized Soil Map



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Soil Drainage Map.

Drainage is described on the basis of actual moisture content in excess of field capacity, and the length of the saturation period within the plant root zone. Five drainage classes plus three land classes are shown on this map.

Very Poor - Water is removed from the soil so slowly that the water table remains at or on the soil surface for the greater part of the time the soil is not frozen. Excess water is present in the soil throughout most of the year.

Poor - Water is removed so slowly in relation to supply that the soil remains wet for a large part of the time the soil is not frozen. Excess water is available within the soil for a large part of the time.

Poor, drained - Water is removed slowly in relation to supply and the soil remains wet for a significant portion of the growing season. Although these soils may retain characteristics of poor internal drainage, extensive surface drainage improvements enable these soils to be used for annual crop production.

Imperfect - Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season. Excess water moves slowly down the profile if precipitation is the major source.

Well - Water is removed from the soil readily but not rapidly. Excess water flows downward readily into underlying materials or laterally as subsurface flow.

Rapid - Water is removed from the soil rapidly in relation to supply. Excess water flows downward if underlying material is pervious. Subsurface flow may occur on steep slopes during heavy rainfall.

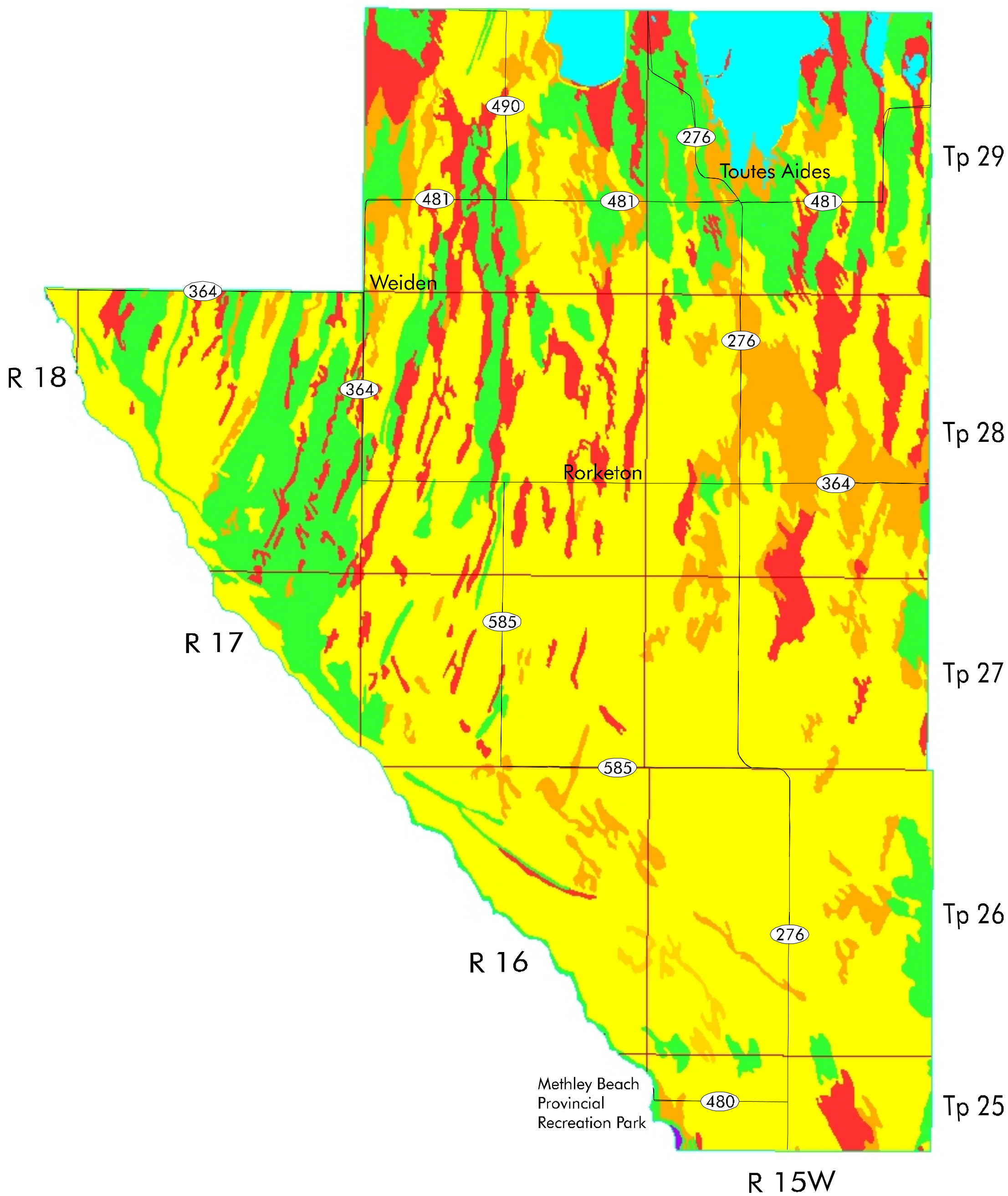
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes[1]

Drainage Class	Area (ha)	Percent of RM
Very Poor	7547	9.6
Poor	7314	9.3
Poor, drained	251	0.3
Imperfect	47327	60.5
Well	13516	17.3
Rapid	0	0.0
Rock	0	0.0
Marsh	21	0.0
Unclassified	0	0.0
Water	2307	2.9
Total	78284	100.0

[1] Area has been assigned to the dominant drainage class for each soil polygon.

Soil Drainage Map



Universal Transverse Mercator
(NAD27) Projection

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March 2000

Management Considerations Map.

Management consideration maps are provided to focus on awareness of land resource characteristics important to land use. This map does not presume a specific land use. Rather it portrays the most common and wide spread attributes that apply to most soil landscapes in the province.

These maps **highlight attributes** of soil-landscapes that the land manager must consider for any intended land use.

- **Fine texture**
- **Medium texture**
- **Coarse texture**
- **Topography**
- **Wetness**
- **Organic**
- **Bedrock**

F = Fine texture - soil landscapes with **fine textured soils (clays and silty clays)**, and thus low infiltration and internal permeability rates. These require special considerations to mitigate surface ponding (water logging), runoff, and trafficability. Timing and type of tillage practices used may be restricted.

M = Medium texture - soil landscapes with medium to moderately fine textures **(loams to clay loams)**, and good water and nutrient retention properties. Good management and cropping practices are required to minimize leaching and the risk of erosion.

C = Coarse texture - soil landscapes with **coarse to very coarse textured soils (loamy sands, sands and gravels)**, have a high permeability throughout the profile, and require special management practices related to application of agricultural chemicals, animal wastes, and municipal effluent to protect and sustain the long term quality of the soil and water resources. The risk of soil erosion can be minimized through the use of shelterbelts and maintenance of crop residues.

T = Topography - soil landscapes with **slopes greater than 5 %** are steep enough to require special management practices to minimize the risk of erosion.

W = Wetness - soil landscapes that have **poorly drained soils and/or >50 % wetlands** (due to seasonal and annual flooding, surface ponding, permanent water bodies (sloughs), and/or high water tables), require special management practices to mitigate adverse impact on water quality, protect subsurface aquifers, and sustain crop production during periods of high risk of water logging.

O = Organic - soil landscapes with organic soils, requiring special management considerations of drainage, tillage, and cropping to sustain productivity and minimize subsidence and erosion.

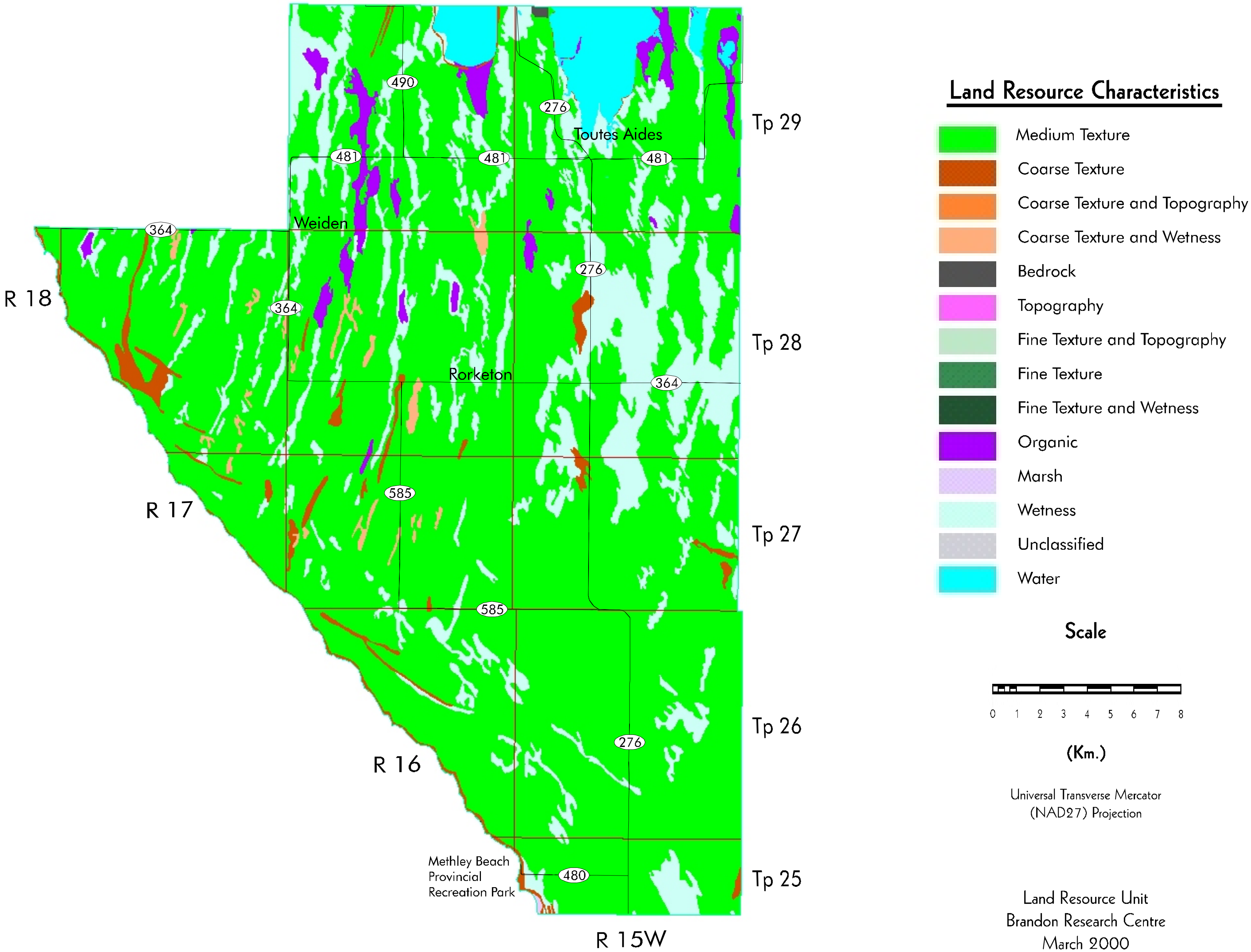
R = Bedrock - soil landscapes that have shallow depth to bedrock (< 50 cm) and/or exposed bedrock which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 4. Management Considerations[1]

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	0	0.0
Fine Texture and Wetness	0	0.0
Fine Texture and Topography	0	0.0
Medium Texture	59193	75.6
Coarse Texture	1618	2.1
Coarse Texture and Wetness	576	0.7
Coarse Texture and Topography	0	0.0
Topography	0	0.0
Bedrock	32	0.0
Wetness	12883	16.5
Organic	1654	2.1
Marsh	21	0.0
Unclassified	0	0.0
Water	2307	2.9
Total	78284	100.0

[1] Based on the **dominant** soil series and slope gradient within each polygon.

Management Considerations Map



Agricultural Capability Map.

This evaluation utilizes the 7 class Canada Land Inventory system (CLI, 1965). Classes 1 to 3 represent the prime agricultural land, class 4 land is marginal for sustained cultivation, class 5 land is capable of perennial forages and improvement is feasible, class 6 land is capable of producing native forages and pasture but improvement is not feasible, and class 7 land is considered unsuitable for dryland agriculture. Subclass modifers include structure and/or permeability (D), erosion (E), inundation (I), moisture limitation (M), salinity (N), stoniness (P), consolidated bedrock (R), topography (T), excess water (W) and cumulative minor adverse characteristics (X).

This generalized interpretive map is based on the dominant soil series and phases for each soil polygon. The CLI subclass limitations cannot be portrayed at this generalized map scale.

Table 5. Agricultural Capability[1]

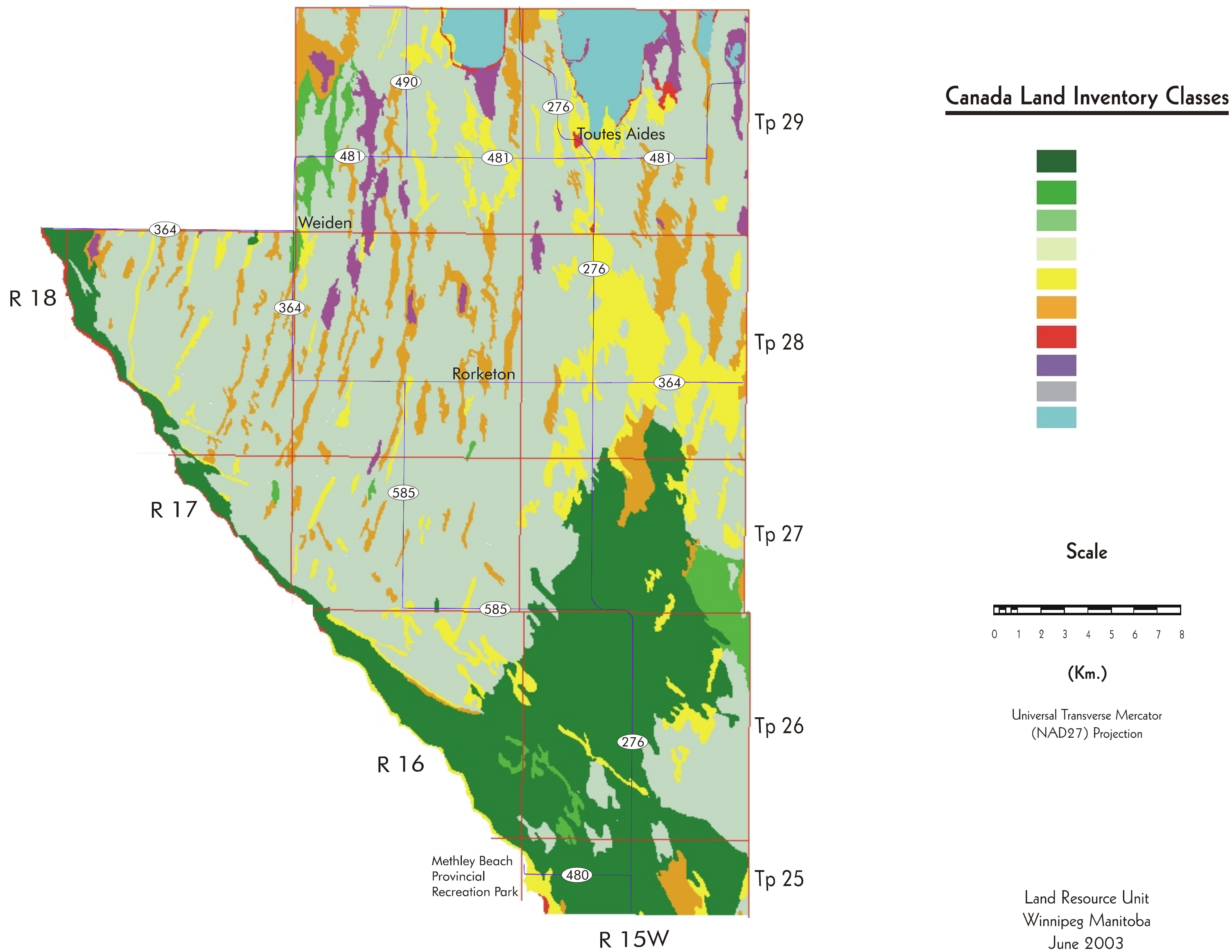
Class Subclass	Area (ha)	Percent of RM
2	**15496**	**19.8**
2M	2506	3.2
2W	80	0.1
2WP	12910	16.5
3	**303**	**0.4**
3M	53	0.1
3W	250	0.3

Table 5. Agricultural Capability[1] (cont.)

Class Subclass	Area (ha)	Percent of RM
4	**44662**	**57.4**
4DP	44084	56.4
4M	461	0.6
4N	117	0.1
5	**7460**	**9.5**
5M	721	0.9
5P	32	0.0
5W	6707	8.6
6	**5895**	**7.5**
6W	5895	7.5
7	**360**	**0.5**
7M	255	0.3
7N	85	0.1
7W	21	0.0
Water	**2308**	**3.0**
Organic	**1654**	**2.1**
Total	**78139**	**100.0**

[1] Based on the **dominant** soil series and slope gradient within each polygon.

Agriculture Capability Map



Irrigation Suitability Map.

Irrigation ratings are based on an assessment of the most limiting combination of soil and landscape conditions. Soils in the same class have a similar relative suitability or degree of limitation for irrigation use, although the specific limiting factors may differ. These limiting factors are described by subclass symbols at detailed map scales. The irrigation rating system does not consider water availability, method of application, water quality, or economics of irrigated land use.

Irrigation suitability is a four class rating system. Areas with no or slight soil and/or landscape limitations are rated **Excellent** to **Good** and can be considered irrigable. Areas with moderate soil and/or landscape limitations are rated as **Fair** and considered marginal for irrigation providing adequate management exists so that the soil and adjacent areas are not adversely affected by water application. Soil and landscape areas rated as **Poor** have severe limitations for irrigation.

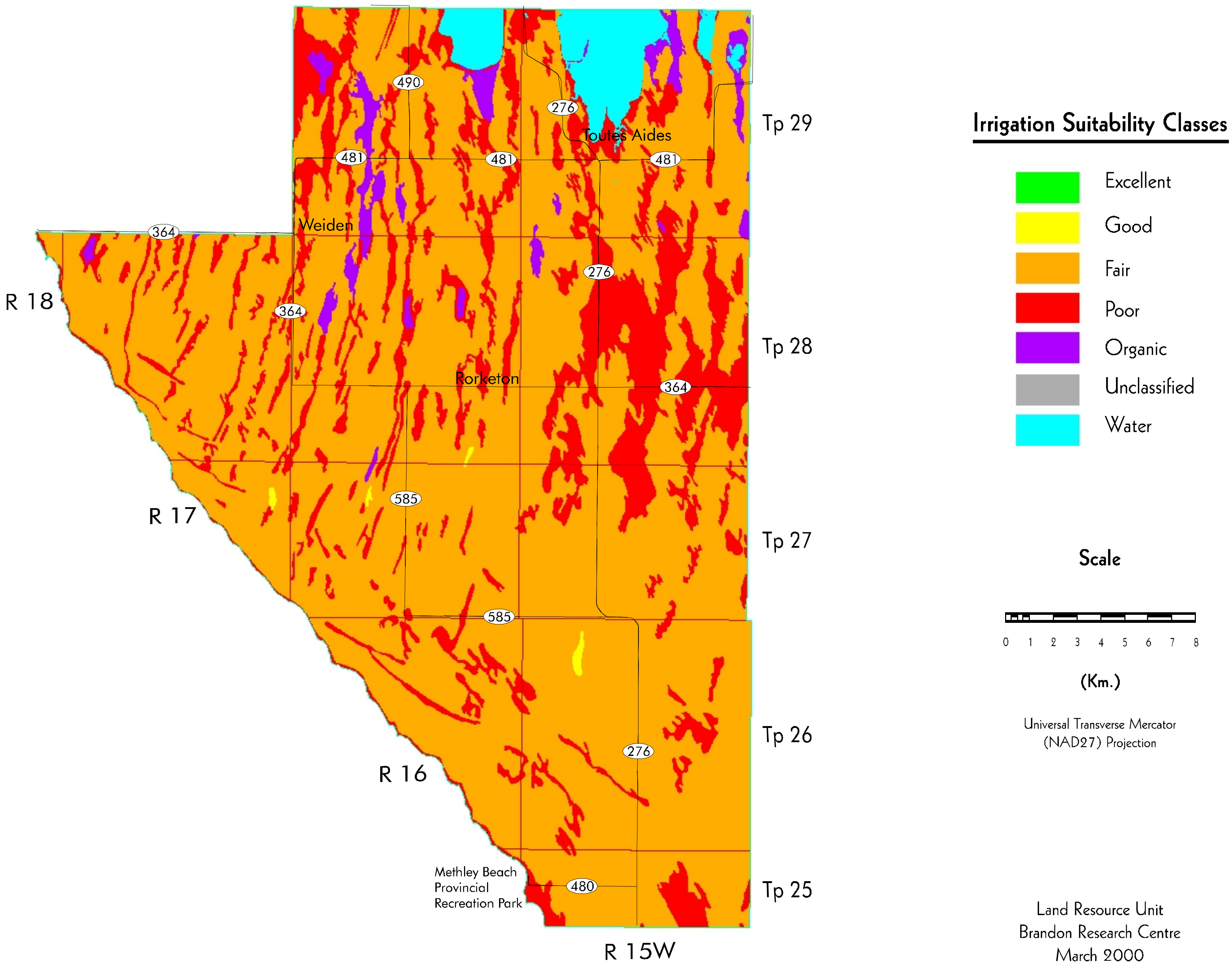
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 6. Irrigation Suitability[1]

Class	Area (ha)	Percent of RM
Excellent	0	0.0
Good	111	0.1
Fair	59564	76.1
Poor	14648	18.7
Organic	1654	2.1
Unclassified	0	0.0
Water	2307	2.9
Total	78284	100.0

[1] Based on the **dominant** soil series and slope gradient within each polygon.

Irrigation Suitability Map



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Potential Environmental Impact Under Irrigation Map.

A major environmental concern for land under irrigated crop production is the possibility that surface and/or ground water may be impacted. The potential environmental impact assessment provides a relative rating of land into 4 classes (minimal, low, moderate and high) based on an evaluation of specific soil factors and landscape conditions that determine the impact potential.

Soil factors considered are those properties that determine water retention and movement through the soil; topographic features are those that affect runoff and redistribution of moisture in the landscape. Several factors are specifically considered: soil texture, hydraulic conductivity, salinity, geological uniformity, depth to water table and topography. The risk of altering surface and subsurface soil drainage regimes, soil salinity, potential for runoff, erosion and flooding is determined by specific criteria for each property.

Use of this rating is intended to serve as a warning of potential environmental concern. It may be possible to design and/or give special consideration to soil-water-crop management practices that will mitigate any adverse impact.

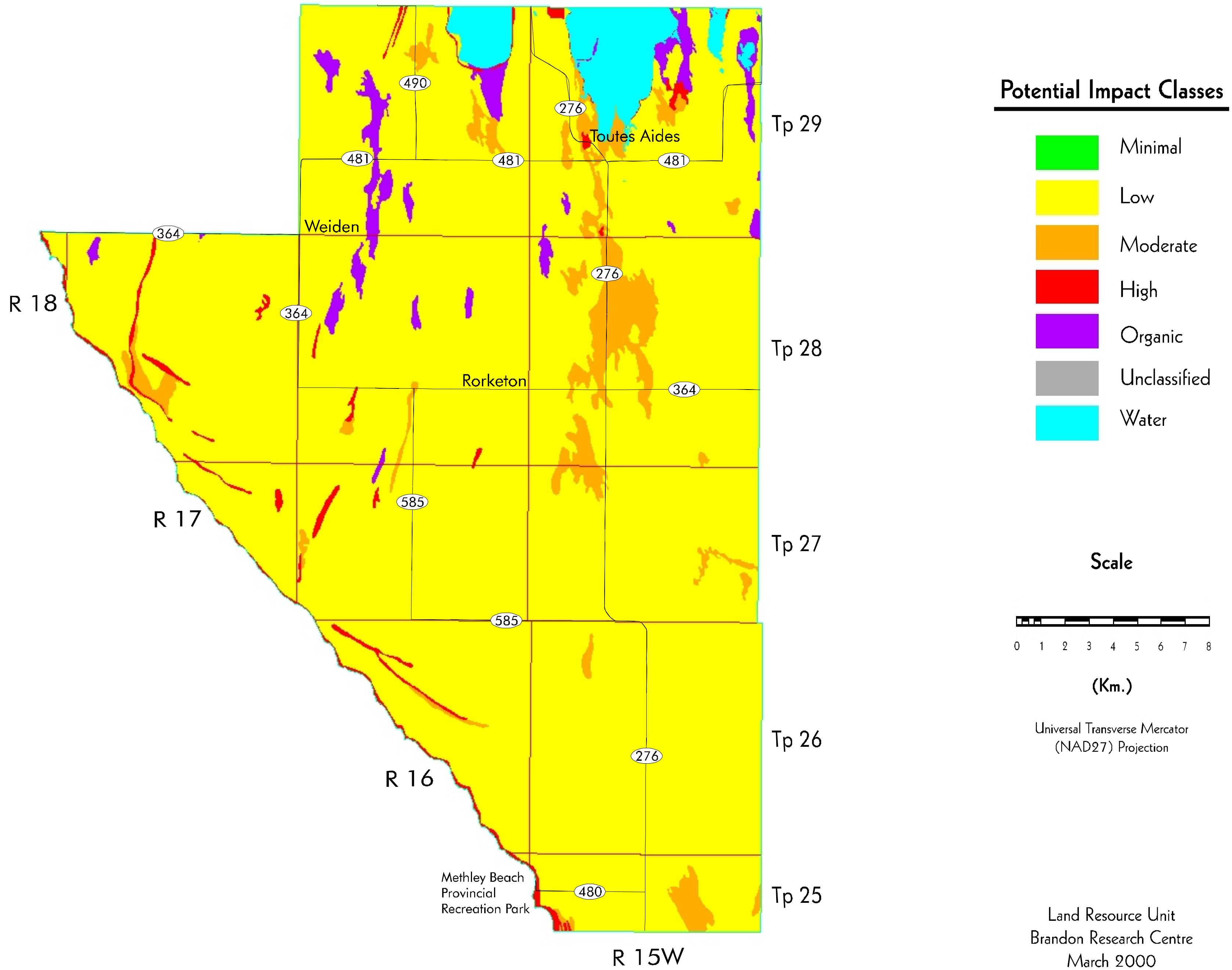
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Potential Environmental Impact Under Irrigation[1]

Class	Area (ha)	Percent of RM
Minimal	**0**	**0.0**
Low	**69640**	**89.0**
Moderate	**3578**	**4.6**
High	**1105**	**1.4**
Organic	**1654**	**2.1**
Unclassified	**0**	**0.0**
Water	**2307**	**2.9**
Total	**78284**	**100.0**

[1] Based on the **dominant** soil series and slope gradient within each polygon.

Potential Environmental Impact Under Irrigation



Water Erosion Risk Map.

The risk of water erosion was estimated using the universal soil loss equation (USLE) developed by Wischmeier and Smith (1965). The USLE predicted soil loss (tons/hectare/year) is calculated for each soil component in each soil map polygon. Erosion risk classes are assigned based on the weighted average soil loss for each map polygon. Water erosion risk factors include mean annual rainfall, average and maximum rainfall intensity, slope length, slope gradient, vegetation cover, management practices, and soil erodibility. The map shows 5 classes of soil erosion risk based on bare unprotected soil:

negligible
low
moderate
high
severe

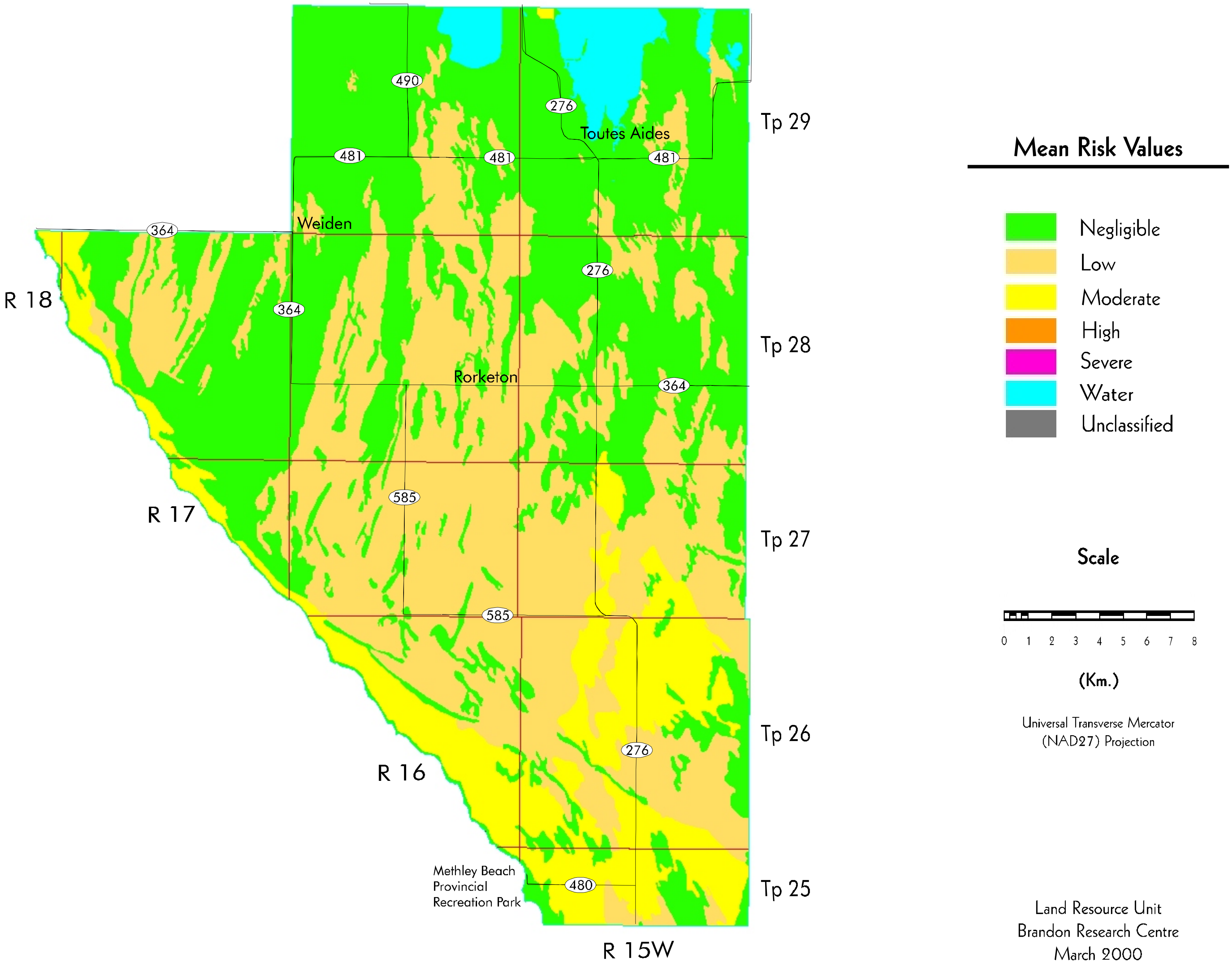
Cropping and residue management practices will significantly reduce this risk depending on crop rotation program, soil type, and landscape features.

Table 8. Water Erosion Risk[1]

Class	Area (ha)	Percent of RM
Negligible	**35149**	**44.9**
Low	**30621**	**39.1**
Moderate	**10207**	**13.0**
High	**0**	**0.0**
Severe	**0**	**0.0**
Unclassified	**0**	**0.0**
Water	**2307**	**2.9**
Total	**78284**	**100.0**

[1] Based on the **weighted average** USLE predicted soil loss within each polygon, assuming a bare unprotected soil.

Water Erosion Risk Map



Land Use Map.

The land use classification of the RM has been interpreted from LANDSAT satellite imagery, using supervised computer classification techniques. Many individual spectral signatures were classified and grouped into the seven general land use classes shown here. Although land use changes over time, and some land use practices on individual parcels may occasionally result in similar spectral signatures, this map provides a general representation of the current land use in the RM.

The following is a brief description of the land use classes:

Annual Crop Land - land that is normally cultivated on an annual basis.

Forage - perennial forages, generally alfalfa or clover with blends of tame grasses.

Grasslands - areas of native or tame grasses, may contain scattered stands of shrubs.

Trees - lands that are primarily in tree cover.

Wetlands - areas that are wet, often with sedges, cattails, and rushes.

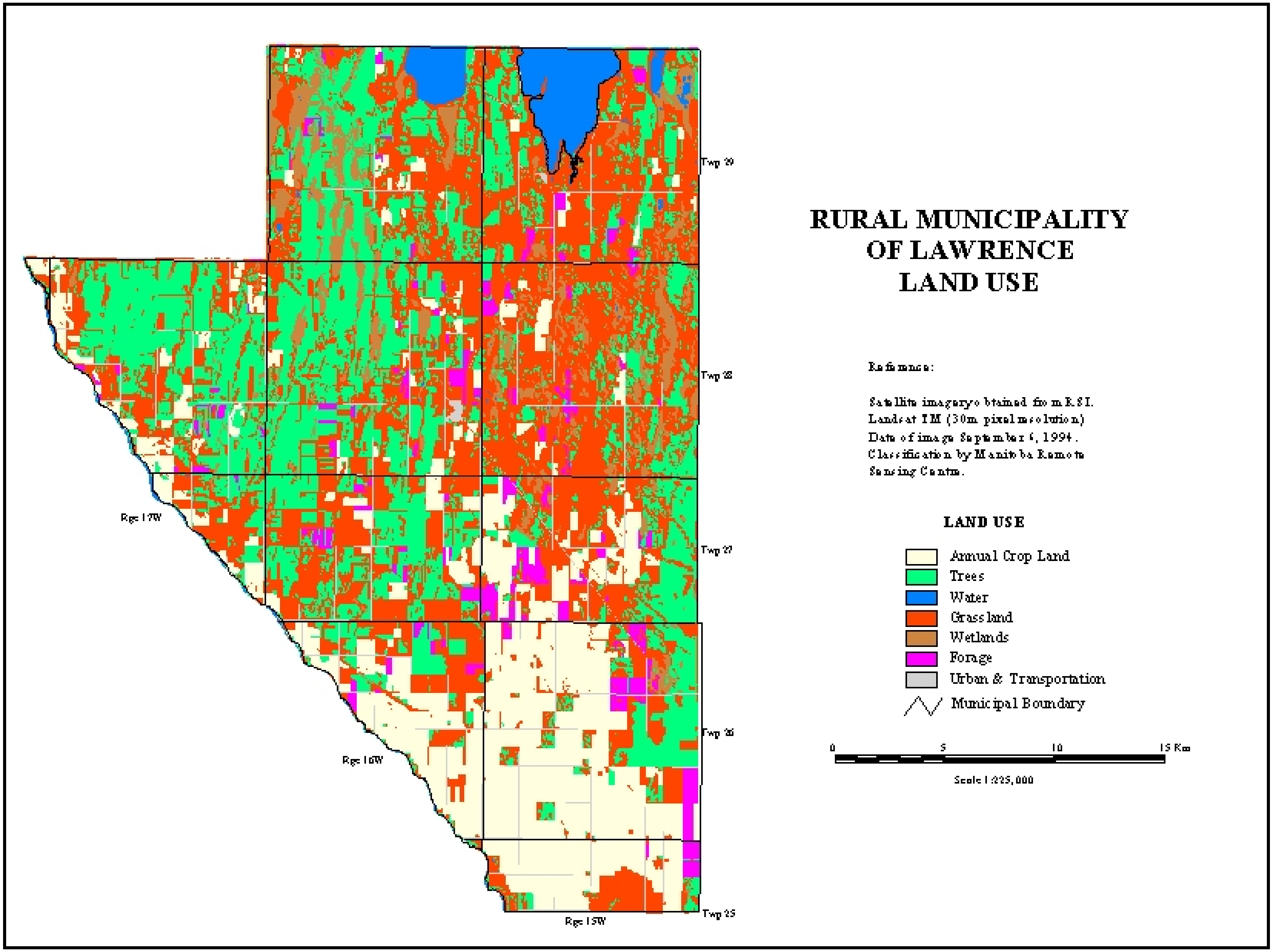
Water - open water - lakes, rivers streams, ponds, and lagoons.

Urban and Transportation - towns, roads, railways, quarries.

Table 9. Land Use[1]

Class	Area (ha)	Percent of RM
Annual Crop Land	14734	18.7
Forage	2508	3.2
Grasslands	29502	37.5
Trees	23439	29.8
Wetlands	4405	5.6
Water	2537	3.2
Urban and transportation	1611	2.0
Undifferentiated	0	0.0
Total	78736	100.0

[1] Land use information (1994) and map supplied by Prairie Farm Rehabilitation Administration. Areas may vary from previous maps due to differences in analytical procedures.


RURAL MUNICIPALITY
OF LAWRENCE
LAND USE
Reference:
Satellite imagery obtained from RSI.
Landsat TM (30m pixel resolution)
Date of image September 4, 1994.
Classification by Manitoba Remote
Sensing Centre.
LAND USE
Annual Crop Land
Trees
Water
Grassland
Wetlands
Forage
Urban & Transportation
Municipal Boundary
0
5
10
15 Km
Scale 1:225,000
Twp 29
Twp 28
Twp 27
Twp 26
Twp 25
Rge 17W
Rge 16W
Rge 15W

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