



Agriculture and  
Agri-Food Canada

Agriculture et  
Agroalimentaire Canada

**Rural Municipality of Rockwood**


**Information Bulletin 99-11**

## **Soils and Terrain**

An introduction  
to the land resource

Land Resource Unit  
Brandon Research Centre



Canada 

## **Rural Municipality of Rockwood**

### **Information Bulletin 99-11**

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.

Printed October, 1999

## 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

## CITATION

Land Resource Unit, 1999. Soils and Terrain. An Introduction to the Land Resource. Rural Municipality of Rockwood. Information Bulletin 99-11, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada

## ACKNOWLEDGMENTS

Continuing support for this project has been provided by Brandon Research Centre and PFRA Manitoba. The project was initiated by the Land Resource Unit under the Canada-Manitoba Agreement of Agricultural Sustainability.

The following individuals and agencies contributed significantly to the compilation, interpretation, and derivation of the information contained in this report.

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.  
R. Lewis, PFRA, Agriculture and Agri-Food Canada.

Professional expertise for data conversion, correlation, and interpretation was provided by:

W.R. Fraser and R.G. Eilers, Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada.  
P. Haluschak and G. Podolsky, Soil Resource Section, Soils and Crops Branch, Manitoba Agriculture.

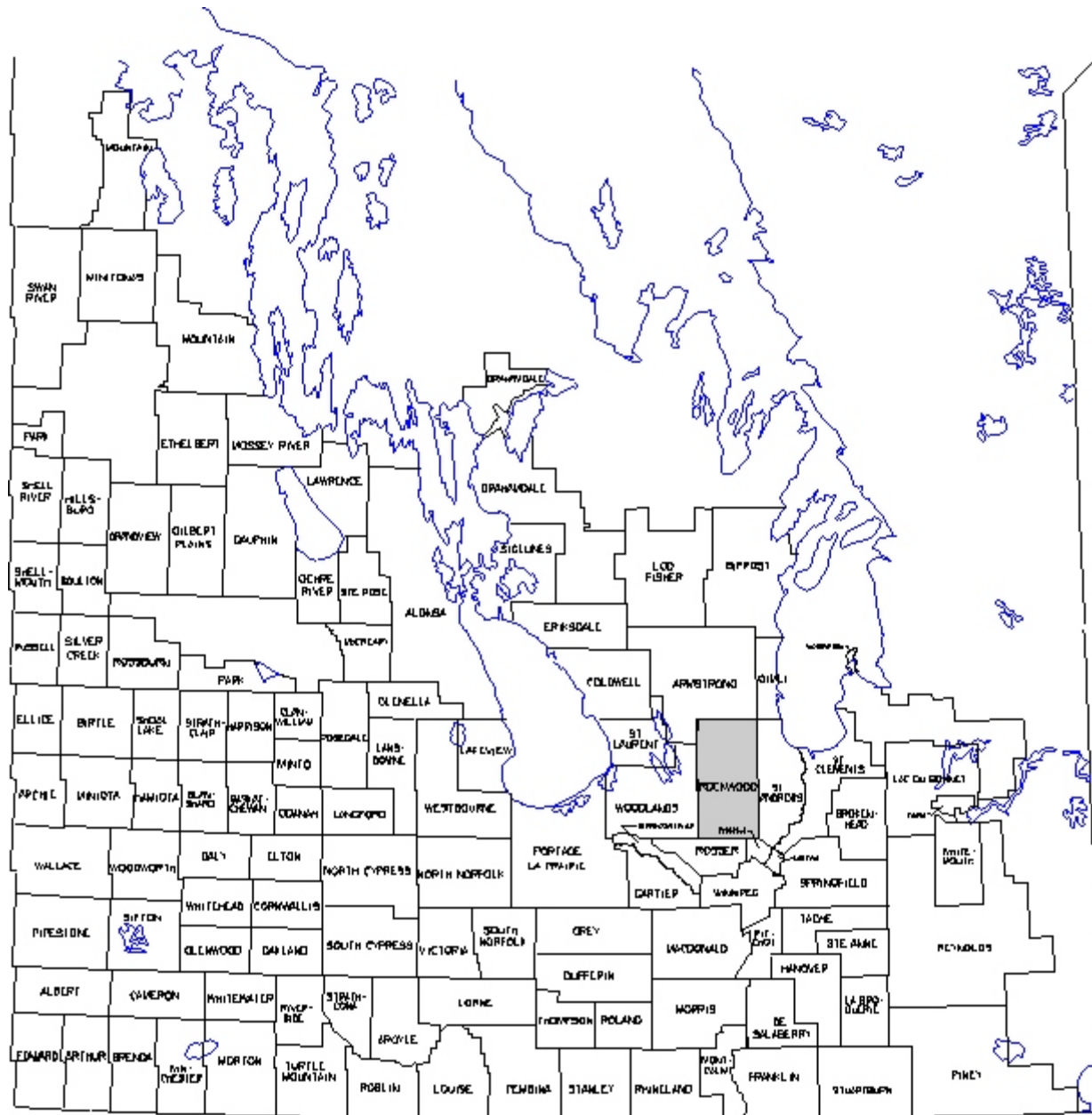


Figure 1. Rural municipalities of southern Manitoba.

## INTRODUCTION

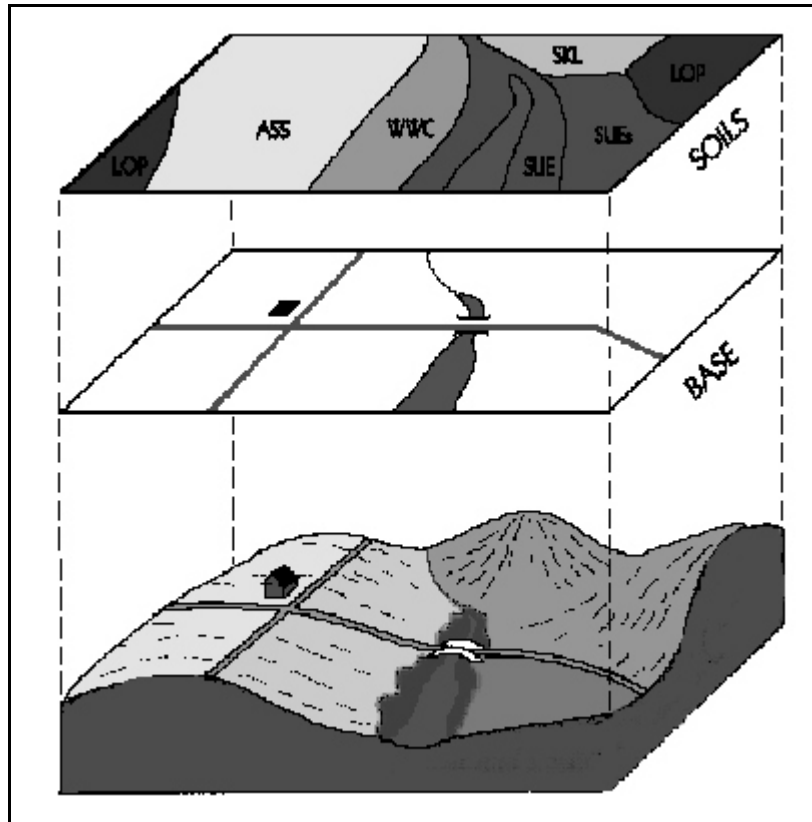
The location of the Rural Municipality of Rockwood is shown in Figure 1. A brief overview of the database information, and general environmental conditions for the municipality are presented. A set of maps derived from the data for typical agricultural land use and planning applications are also included.

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, based on photo-interpretation.

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, based on photo-interpretation.

## SOIL AND TERRAIN OVERVIEW

The Rural Municipality (RM) of Rockwood covers an area of 121 317 ha (approximately 13.2 townships) in the southern Interlake district of southern Manitoba. The municipality is located about 8 kilometres from the north perimeter of the City of Winnipeg (page 3). The Towns of Stonewall, Stony Mountain and Teulon are the largest population and service centres with smaller concentrations of people resident in Balmoral, Gunton, Komarno, Argyle and Grosse Isle.

The climate in the area can be related to weather data from Stonewall in the south and Gimli to the north. The mean annual temperature decreases from 2.0°C in the south to 1.1°C in the north while the mean annual precipitation ranges from 534 mm in the south to 528 mm in the north (Environment Canada, 1982, 1993). The average frost-free period is 119 days in the south and 122 days along Lake Winnipeg in the north. Degree-days above 5°C accumulated from May to September average 1623 in the south and 1543 in the north (Ash, 1991). 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 ranges between 250 mm and 200 mm. The estimated effective growing degree-days accumulated from May to September vary from 1600 in the south to 1400 in the north (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 northern part of the municipality is located in the Interlake Plain, the southern portion in the Woodlands Plain and the eastern part in the Red River Valley (Canada-Manitoba Soil Survey, 1980). Elevation of the land surface decreases gradually from 267 metres above sea level (m asl) in the northwest corner of the area to 228 m in the southwest. Although isolated areas exceed 270 m asl, elevation of the land surface generally slopes easterly at a rate of 0.5 to 1 m/km (2.6 to 6 ft/mi). Local relief is under 3 metres and slopes are generally less than 2 percent (page 9). Surface drainage throughout the municipality is poorly developed,

facilitated mainly by Netley and Wavey Creeks flowing to the southeast and east. Much of the area is characterized by high groundwater levels with artesian water pressure affecting soils in the Woodlands Plain. An extensive area of level to depressional, poorly drained soils on the eastern boundary of the municipality is managed as a wetland known as the Oak Hammock Marsh. Surface drainage for agricultural purposes has been improved in the southern and eastern parts of the area by a network of man-made drains.

Soil materials in the municipality were deposited during the last glaciation and during the time of glacial Lake Agassiz. The Interlake Plain is characterized by extremely calcareous, waterworked loamy glacial till and the Woodlands Plain consists of thin clayey lacustrine and till materials underlain by loam textured, stony glacial till. In contrast, the Red River Valley is characterized by deep, clayey to silty and loamy lacustrine sediments (page 11). The flat topography throughout the municipality results 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 and 1:100 000 scales) and published in the soil survey reports for the Winnipeg and Morris map sheet areas (Ehrlich et al., 1953) and the Fisher-Teulon map sheet areas (Pratt et al., 1961). Detailed 1:20 000 scale map information is available for selected areas in the municipality (Michalyna et al., 1975 and Hopkins, 1981). According to the Canadian System of Soil Classification (Expert Committee on Soil Survey, 1998), the Interlake Plain area is characterized by weakly developed Brunisolic and Dark Gray Chernozem soils (Garson, Fairford and Inwood series) in association with Humic Gleysol soils (Meleb series), often with thin peaty surface layers in poorly drained sites. The Woodlands Plain and the Red River Valley consist mainly of Chernozemic Black soils (Woodlands complex and Marquette, Semple, Red River and Lakeland associations) occurring in association with Humic Gleysol soils (Kline, Glenfields and Balmoral series) in depressional sites.

Major management considerations are related to fine texture (clayey soils) and wetness (page 15). Seasonal high water tables (at 1 to 2 metres) and saturated soils are common as surface water ponds in

poorly drained depressions throughout the area. Well drained sandy and gravelly soils are subject to potential wind erosion and droughtiness. Moderately to excessively stony conditions are associated with the till soils and beach deposits throughout the area. Limestone bedrock occurs near the surface in the vicinity of Stonewall and Stony Mountain. Poorly drained depressional areas in the Woodlands Plain and Red River Valley are affected by a variable distribution of weak salinity.

Twenty-nine percent of the soils are rated in **Class 2** for agricultural capability and 31 percent in **Class 3** due to stoniness, wetness and adverse soil structure. Local areas of sandy soils affected by droughtiness and thin soils underlain by limestone bedrock are placed in **Class 4**. Soils affected by either excess wetness or droughtiness occupy 6 percent of the area and are rated as **Class 5**. Very poorly drained soils occupying 6 percent of the area are rated as **Class 6**. Organic soils with very limited capability for agriculture in their native state cover 3.4 percent of the area (page 17). The irrigation suitability of soils in this municipality is dominantly **Fair** (44 percent) and **Poor** (42 percent). Most of the area rated **Poor** consists of clayey to loamy textured soils in the Red River Valley. Areas rated as **Good** (11 percent of the area) consist dominantly of imperfectly drained, stone-free loam textured soils (page 19).

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, an assessment of potential environmental impact (EI) under irrigation is shown on page 21. The risk of impact is **Minimal** on the clayey textured soils and **Low, Moderate** or **High** on the remaining soils in the municipality. Areas at **High** potential risk consist of highly permeable sandy soils and thin clayey soils with high watertables underlain by permeable silty deposits. 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. Although 57 percent of the land in the municipality is at a **Negligible** risk of degradation due to water

erosion, this risk increases to **Low** to **Moderate** as the slope increases in gently undulating landscapes. Sandy and loamy soils in the municipality are also at a risk of erosion by wind. Current management practices focus on maintaining adequate crop residues and sufficient surface cover to adequately protect the soils from both wind and water erosion.

The dominant land use in the RM of Rockwood is agriculture. An assessment of the status of land use in 1994 obtained through an analysis of satellite imagery, showed annual crops occupying 50 percent and forage crops 5 percent of the area. The vegetative cover in the Interlake Plain remains as a mix of native grassland and treed areas due to the stony nature and poor drainage associated with the glacial till soils. This area provides forage and grazing capacity as well as wildlife habitat. Wetlands cover 5 percent of the area and provide habitat for waterfowl. Various non-agricultural uses such as infrastructure for urban areas, transportation and recreation occupy nearly 4 percent of the municipality (page 25).

The majority of soils in the RM of Rockwood have moderate to moderately severe limitations for arable agriculture. Clayey textured soils require management practices which maintain adequate surface drainage, soil structure and tilth and lighter textured soils require protection against wind erosion. The stony and bouldery conditions on the glacial till soils require clearing to permit annual cultivation and the choice of crops is reduced on saline affected soils.

A major portion of the municipality has low relief and a dominance of imperfectly to poorly drained soils. These soils are frequently saturated and subject to surface ponding and slow runoff, particularly during spring runoff or following heavy rains. 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:

### Derived Maps

Slope

Generalized Soil

Drainage

Management Considerations

### Interpretative Maps

Agricultural Capability

Irrigation Suitability

Potential Environmental Impact

Water Erosion Risk

Land Use

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.

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.



**Slope Map.**

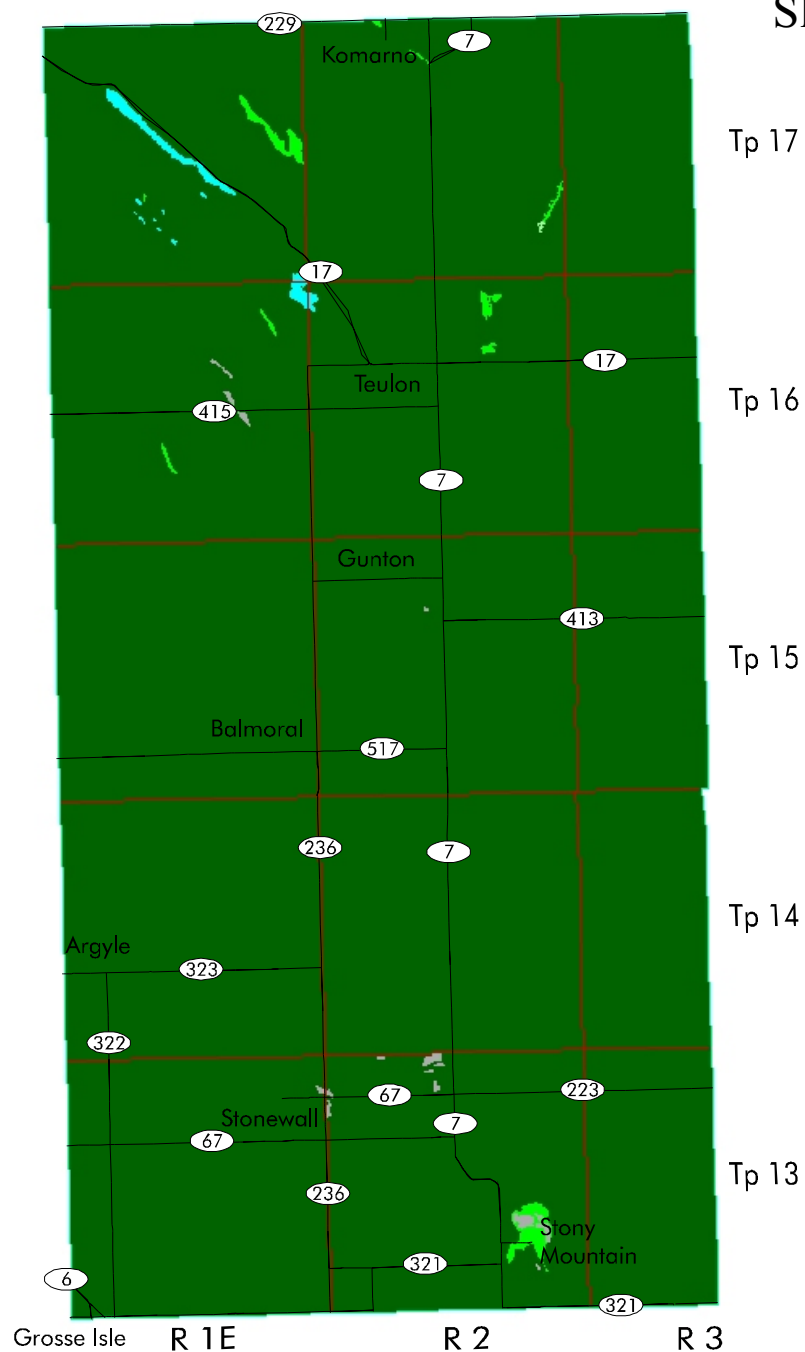
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area,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

**Table 1. Slope Classes<sup>1</sup>**

<b>Slope Class</b>	<b>Area (ha)</b>	<b>Percent of RM</b>
<b>0 - 2 %</b>	<b>120527</b>	<b>99.3</b>
<b>2 - 5 %</b>	<b>408</b>	<b>0.3</b>
<b>5 - 9 %</b>	<b>6</b>	<b>0.0</b>
<b>9 - 15 %</b>	<b>0</b>	<b>0.0</b>
<b>15 - 30 %</b>	<b>0</b>	<b>0.0</b>
<b>&gt; 30 %</b>	<b>0</b>	<b>0.0</b>
<b>Unclassified</b>	<b>162</b>	<b>0.1</b>
<b>Water</b>	<b>215</b>	<b>0.2</b>
<b>Total</b>	<b>121317</b>	<b>100.0</b>

<sup>1</sup> Area has been assigned to the dominant slope in each soil polygon.

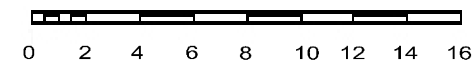
## Slope Map



## Slope Classes



## Scale



(Km.)

Universal Transverse Mercator  
(NAD27) ProjectionLand Resource Unit  
Brandon Research Centre  
June 1999

### 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.

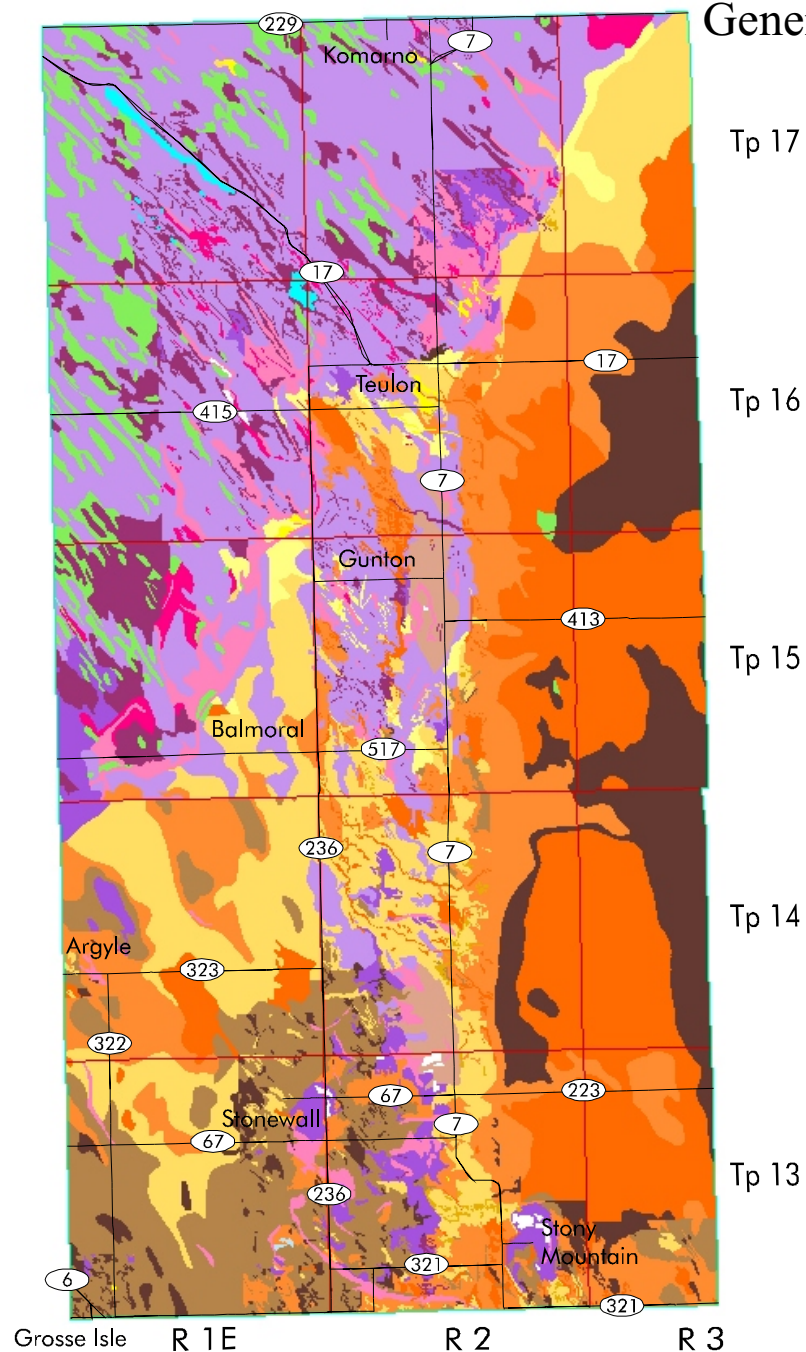
**Table 2. Generalized Soil Groups<sup>1</sup>**

<b>Soil Groups</b>	<b>Area (ha)</b>	<b>Percent of RM</b>
<b>Clayey Lacustrine (Luvisols and Dark Gray Chernozems)</b>	<b>140</b>	<b>0.1</b>
<b>Highly Calcareous Loamy Till (Gleysols)</b>	<b>5793</b>	<b>4.8</b>
<b>Extremely Calcareous Loamy Till (Black Chernozems)</b>	<b>3569</b>	<b>2.9</b>
<b>Extremely Calcareous Loamy Till (Brunisols and Dark Gray Chernozems)</b>	<b>27871</b>	<b>23.0</b>
<b>Highly Calcareous Loamy Till (Black Chernozems)</b>	<b>1376</b>	<b>1.1</b>
<b>Marsh</b>	<b>5</b>	<b>0.0</b>
<b>Clayey Lacustrine (Gleysols)</b>	<b>10250</b>	<b>8.4</b>
<b>Loamy Lacustrine (Gleysols)</b>	<b>17596</b>	<b>14.5</b>
<b>Sandy Loam Lacustrine (Gleysols)</b>	<b>247</b>	<b>0.2</b>
<b>Shallow Organic Fen Peat</b>	<b>4111</b>	<b>3.4</b>
<b>Sandy Lacustrine (Gleysols)</b>	<b>221</b>	<b>0.2</b>
<b>Clayey Lacustrine (Black Chernozems)</b>	<b>10198</b>	<b>8.4</b>
<b>Loamy Lacustrine</b>	<b>16827</b>	<b>13.9</b>
<b>Sandy Loam Lacustrine</b>	<b>15143</b>	<b>12.5</b>
<b>Variable Textured Alluvium (Regosols)</b>	<b>16</b>	<b>0.0</b>
<b>Sandy Lacustrine</b>	<b>1468</b>	<b>1.2</b>
<b>Sand and Gravel (Gleysols)</b>	<b>1366</b>	<b>1.1</b>
<b>Sand and Gravel</b>	<b>4743</b>	<b>3.9</b>
<b>Water</b>	<b>215</b>	<b>0.2</b>
<b>Unclassified</b>	<b>162</b>	<b>0.1</b>
<b>Total</b>	<b>121317</b>	<b>100.0</b>

<sup>1</sup> Based on the **dominant** soil series for each soil polygon.

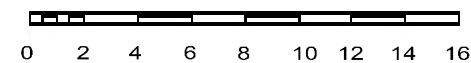
## Generalized Soil Map

## Soil Associations



- |  |  |
|--|--|
|  | Clayey Lacustrine (Luvisols and Dark Gray Chernozems)              |
|  | Highly Calcareous Loamy Till (Gleysols)                            |
|  | Extremely Calcareous Loamy Till (Black Chernozems)                 |
|  | Extremely Calcareous Loamy Till (Brunisols & Dark Gray Chernozems) |
|  | Highly Calcareous Loamy Till (Black Chernozems)                    |
|  | Marsh  |
|  | Clayey Lacustrine (Gleysols)                                       |
|  | Loamy Lacustrine (Gleysols)  |
|  | Sandy Loam Lacustrine (Gleysols)                                   |
|  | Shallow Organic Fen Peat   |
|  | Sandy Lacustrine (Gleysols)  |
|  | Clayey Lacustrine (Black Chernozems)                               |
|  | Loamy Lacustrine   |
|  | Sandy Loam Lacustrine  |
|  | Variable Textured Alluvium (Regosols)                              |
|  | Sandy Lacustrine   |
|  | Sand & Gravel (Gleysols)   |
|  | Sand & Gravel  |
|  | Water  |
|  | Unclassified   |

## Scale



(Km.)

Land Resource Unit  
Brandon Research Centre  
August 1999

Universal Transverse Mercator  
(NAD27) Projection

**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.

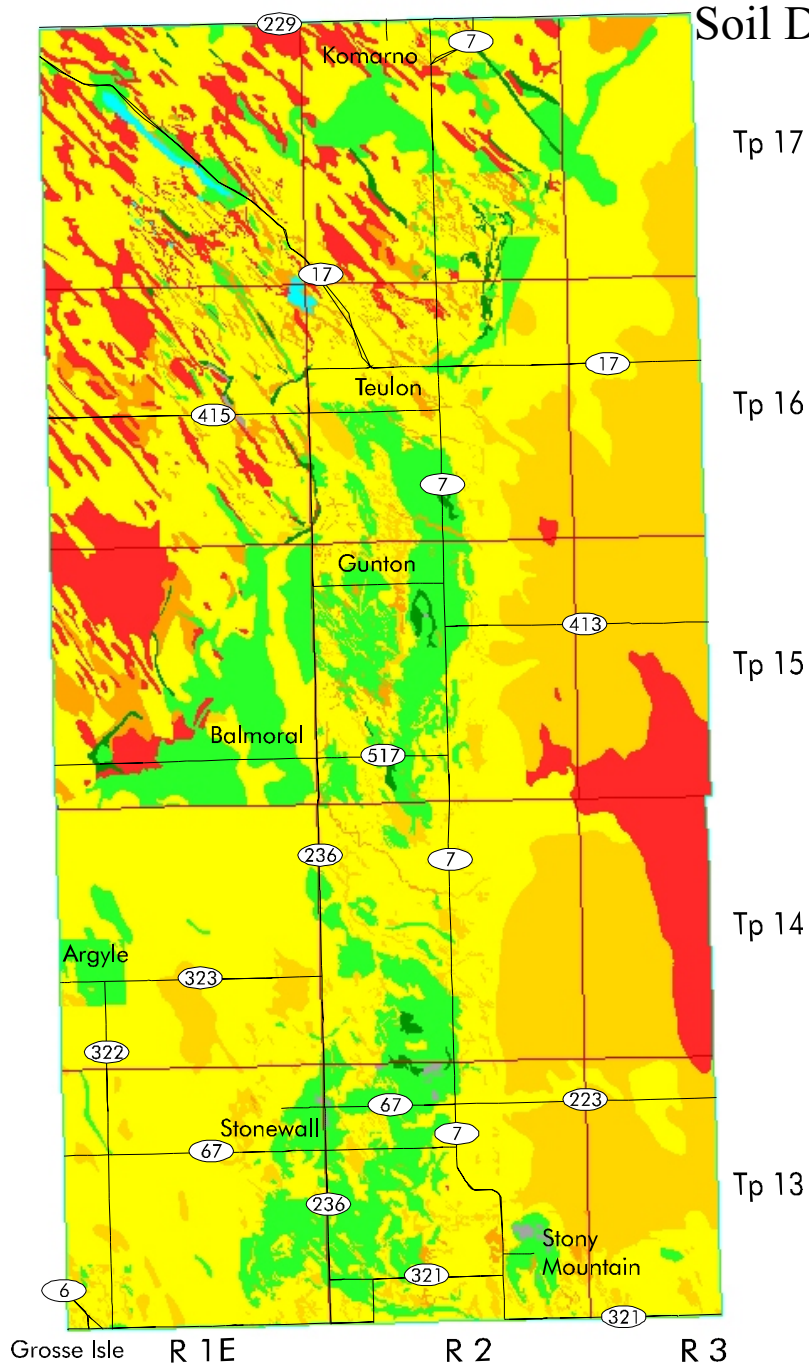
Drainage classification is based on the dominant soil series within each individual soil polygon.

**Table 3. Drainage Classes<sup>1</sup>**

<b>Drainage Class</b>	<b>Area (ha)</b>	<b>Percent of RM</b>
<b>Very Poor</b>	<b>11570</b>	<b>9.5</b>
<b>Poor</b>	<b>3894</b>	<b>3.2</b>
<b>Poor, drained</b>	<b>24120</b>	<b>19.9</b>
<b>Imperfect</b>	<b>63162</b>	<b>52.1</b>
<b>Well</b>	<b>17262</b>	<b>14.2</b>
<b>Rapid</b>	<b>927</b>	<b>0.8</b>
<b>Rock</b>	<b>0</b>	<b>0.0</b>
<b>Marsh</b>	<b>5</b>	<b>0.0</b>
<b>Unclassified</b>	<b>162</b>	<b>0.1</b>
<b>Water</b>	<b>215</b>	<b>0.2</b>
<b>Total</b>	<b>121317</b>	<b>100.0</b>

<sup>1</sup> Area has been assigned to the dominant drainage class for each soil polygon.

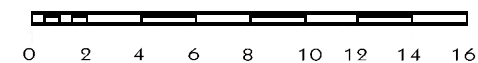
## Soil Drainage Map



## Drainage Classes



## Scale



(Km.)

Universal Transverse Mercator  
(NAD27) Projection

Land Resource Unit  
Brandon Research Centre  
September 1999

### 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.

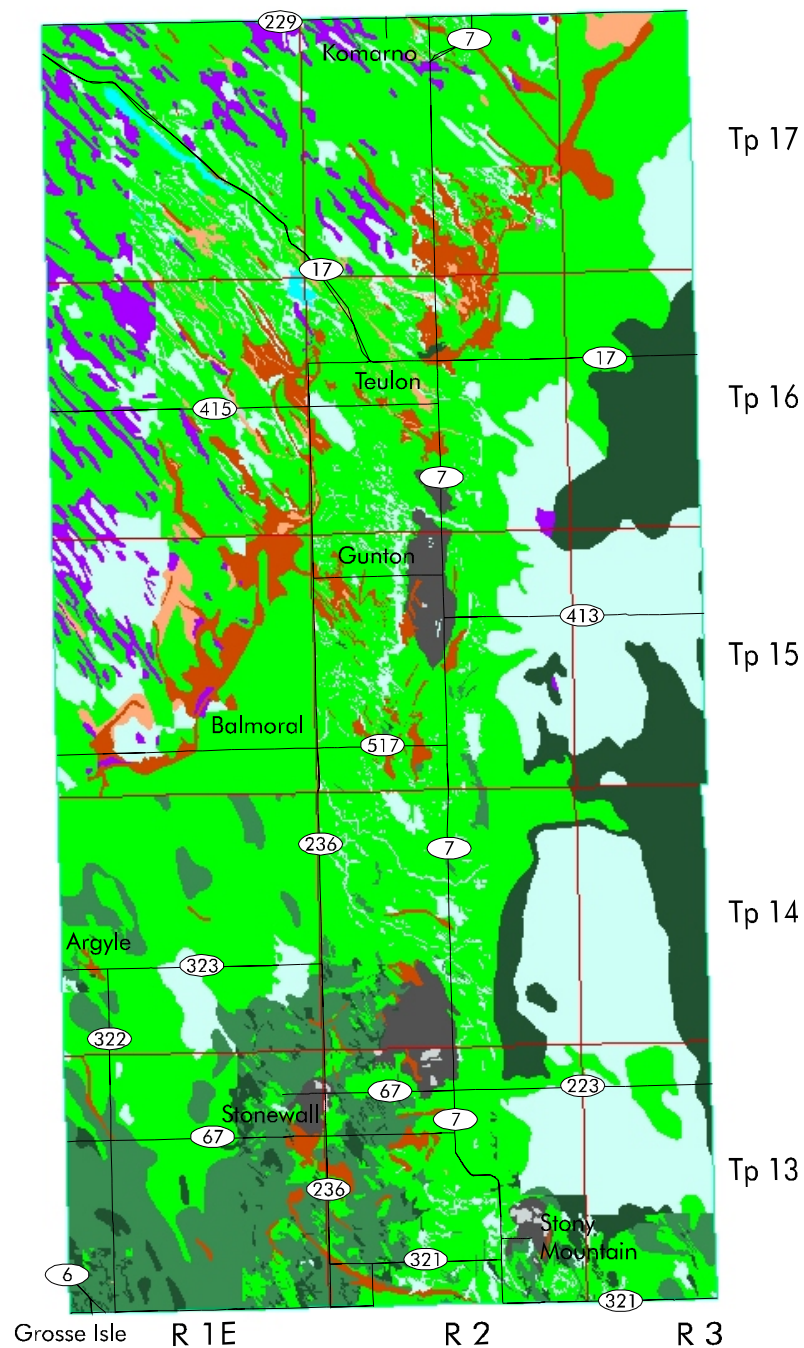
**Table 4. Management Considerations<sup>1</sup>**

Land Resource Characteristics	Area (ha)	Percent of RM
<b>Fine Texture</b>	<b>10354</b>	<b>8.5</b>
<b>Fine Texture and Wetness</b>	<b>10250</b>	<b>8.4</b>
<b>Fine Texture and Topography</b>	<b>0</b>	<b>0.0</b>
<b>Medium Texture</b>	<b>62730</b>	<b>51.7</b>
<b>Coarse Texture</b>	<b>6011</b>	<b>5.0</b>
<b>Coarse Texture and Wetness</b>	<b>1587</b>	<b>1.3</b>
<b>Coarse Texture and Topography</b>	<b>0</b>	<b>0.0</b>
<b>Topography</b>	<b>6</b>	<b>0.0</b>
<b>Bedrock</b>	<b>2250</b>	<b>1.9</b>
<b>Wetness</b>	<b>23636</b>	<b>19.5</b>
<b>Organic</b>	<b>4111</b>	<b>3.4</b>
<b>Marsh</b>	<b>5</b>	<b>0.0</b>
<b>Unclassified</b>	<b>162</b>	<b>0.1</b>
<b>Water</b>	<b>215</b>	<b>0.2</b>
<b>Total</b>	<b>121317</b>	<b>100.0</b>

<sup>1</sup> Based on the **dominant** soil series and slope gradient within each polygon.



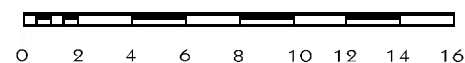
## Management Considerations Map



### Land Resource Characteristics



### Scale



(Km.)

Universal Transverse Mercator  
(NAD27) Projection

Land Resource Unit  
Brandon Research Centre  
September 1999



### 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 modifiers 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<sup>1</sup>**

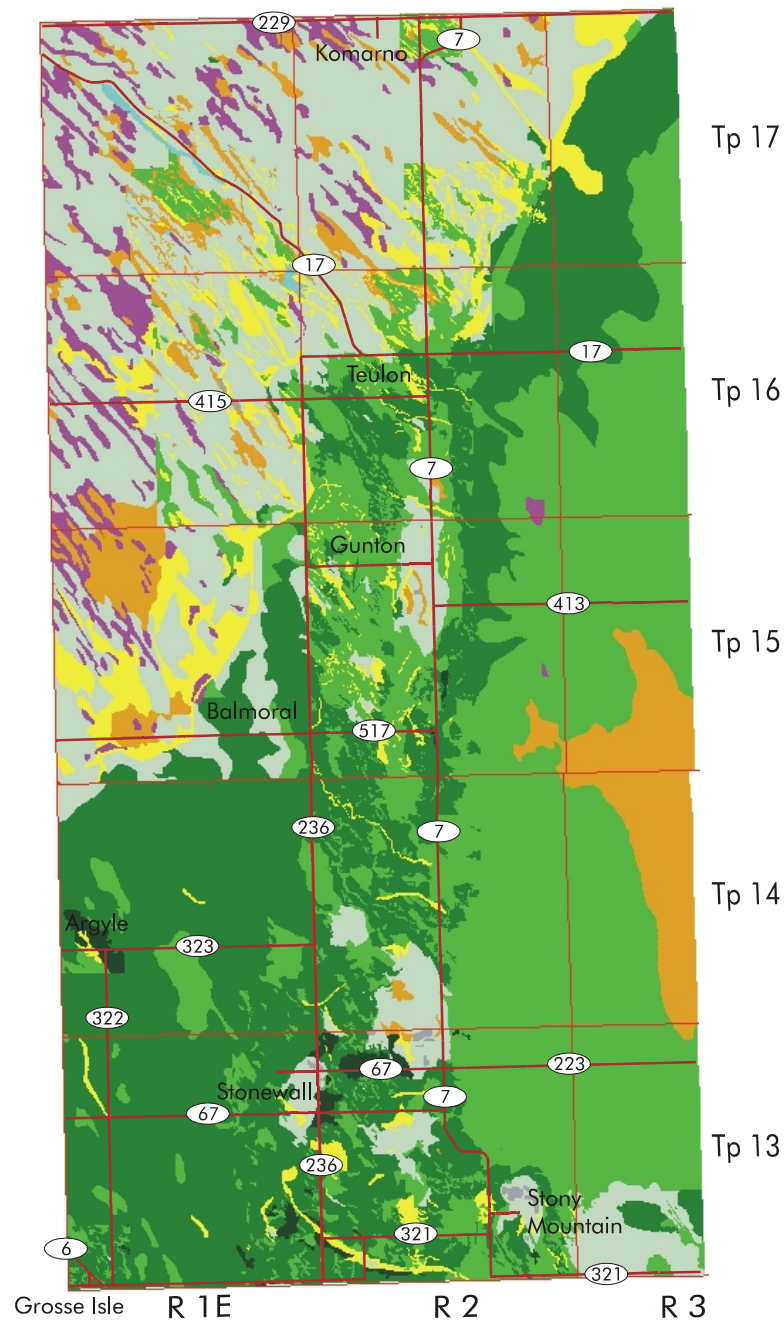
<b>Class</b>	<b>Area</b>	
<b>Percent</b>		
<b>Subclass</b>	<b>(ha)</b>	
<b>of RM</b>		
<b>1</b>	<b>871</b>	<b>0.7</b>
<b>2</b>	<b>35186</b>	<b>29.0</b>
2D	1747	1.4
2M	12218	10.1
2MP	27	0.0
2MT	19	0.0
2P	156	0.1
2W	19354	16.0
2WP	6	0.0
2X	1669	1.4
<b>3</b>	<b>37908</b>	<b>31.3</b>
3D	7753	6.4
3I	16	0.0

**Table 5. Agricultural Capability<sup>1</sup>**

<b>Class</b>	<b>Area</b>	<b>Percent</b>
<b>Subclass</b>	<b>(ha)</b>	<b>of RM</b>
3M	921	0.8
3N	5362	4.4
3NW	8020	6.6
3P	67	0.1
3T	4	0.0
3TE	2	0.0
3W	15763	13.0
<b>4</b>	<b>27835</b>	<b>23.0</b>
4DP	22810	18.8
4M	1689	1.4
4N	1248	1.0
4R	1829	1.5
4RP	220	0.2
4W	39	0.0
<b>5</b>	<b>7392</b>	<b>6.1</b>
5M	3307	2.7
5P	173	0.1
5W	3913	3.2
<b>6</b>	<b>7604</b>	<b>6.3</b>
6RM	200	0.2
6W	7404	6.1
<b>7</b>	<b>5</b>	<b>0.0</b>
7W	5	0.0
<b>Unclassified</b>	<b>160</b>	<b>0.1</b>
<b>Water</b>	<b>214</b>	<b>0.2</b>
<b>Organic</b>	<b>4103</b>	<b>3.4</b>
<b>Total</b>	<b>121279</b>	<b>100.0</b>

<sup>1</sup> Based on the **dominant** soil series and slope gradient within each polygon.

## Agriculture Capability Map



### Canada Land Inventory Classes



### Scale



(Km.)

Universal Transverse Mercator  
(NAD27) Projection

Land Resource Unit  
Winnipeg Manitoba  
June 2003

### 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.

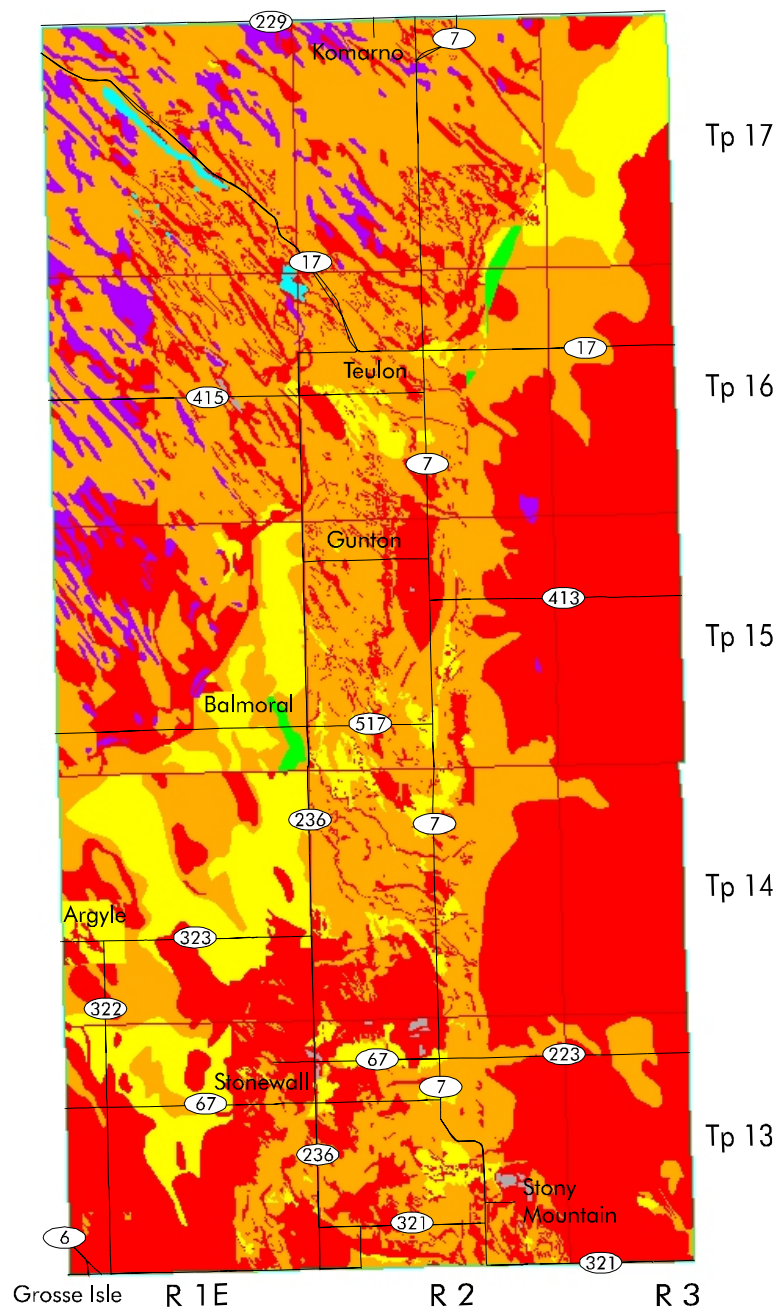
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

**Table 6. Irrigation Suitability<sup>1</sup>**

<b>Class Percent of RM</b>	<b>Area (ha)</b>	
<b>Excellent</b>	<b>346</b>	<b>0.3</b>
<b>Good</b>	<b>13292</b>	<b>11.0</b>
<b>Fair</b>	<b>52744</b>	<b>43.5</b>
<b>Poor</b>	<b>50447</b>	<b>41.6</b>
<b>Organic</b>	<b>4111</b>	<b>3.4</b>
<b>Unclassified</b>	<b>162</b>	<b>0.1</b>
<b>Water</b>	<b>215</b>	<b>0.2</b>
<b>Total</b>	<b>121317</b>	<b>100.0</b>

<sup>1</sup> Based on the **dominant** soil series and slope gradient within each polygon.

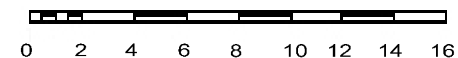
## Irrigation Suitability Map



### Irrigation Suitability Classes



### Scale



(Km.)

Universal Transverse Mercator  
(NAD27) Projection

Land Resource Unit  
Brandon Research Centre  
June 1999

### 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.

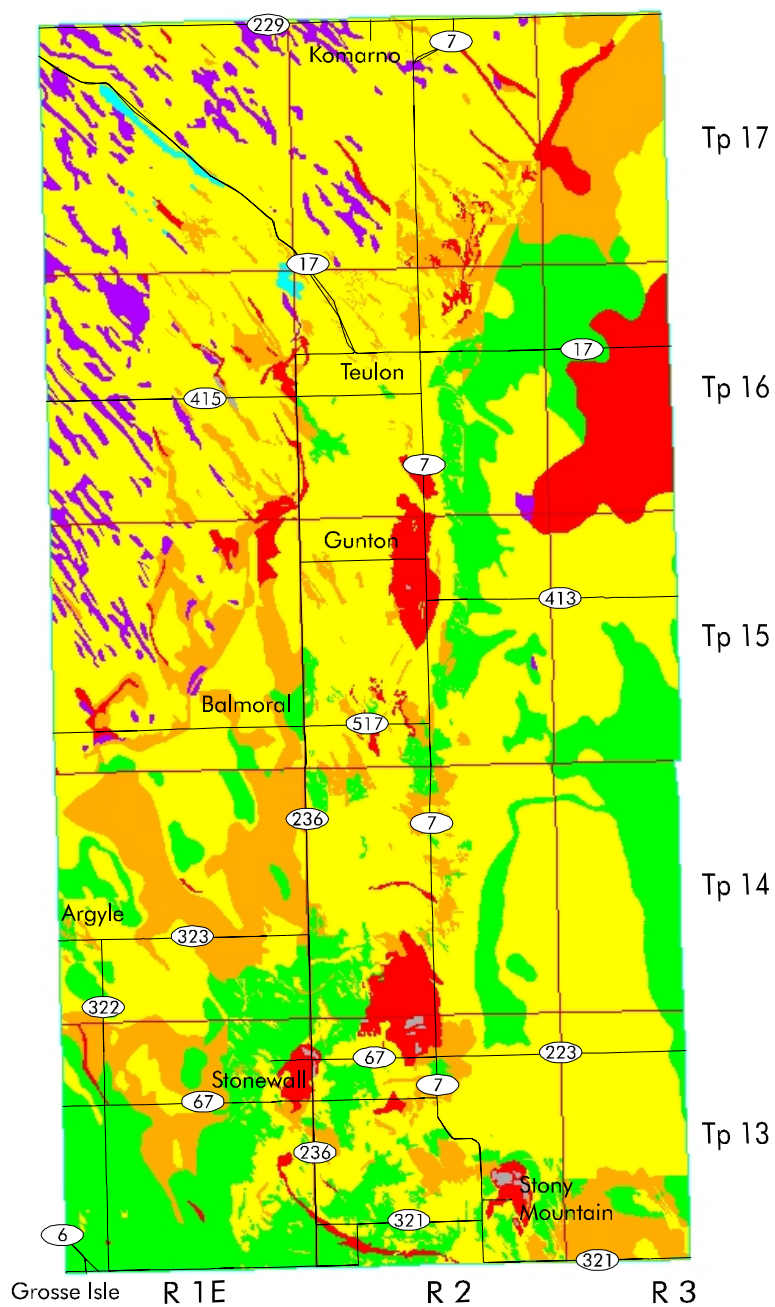
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

**Table 7. Potential Environmental Impact Under Irrigation<sup>1</sup>**

<b>Class Percent of RM</b>	<b>Area (ha)</b>	
<b>Minimal</b>	<b>29643</b>	<b>24.4</b>
<b>Low</b>	<b>62618</b>	<b>51.6</b>
<b>Moderate</b>	<b>16803</b>	<b>13.9</b>
<b>High</b>	<b>7764</b>	<b>6.4</b>
<b>Organic</b>	<b>4111</b>	<b>3.4</b>
<b>Unclassified</b>	<b>162</b>	<b>0.1</b>
<b>Water</b>	<b>215</b>	<b>0.2</b>
<b>Total</b>	<b>121317</b>	<b>100.0</b>

<sup>1</sup> Based on the **dominant** soil series and slope gradient within each polygon.

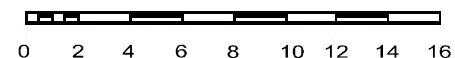
## Potential Environmental Impact Under Irrigation



### Potential Impact Classes



### Scale



(Km.)

Universal Transverse Mercator  
(NAD27) Projection

Land Resource Unit  
Brandon Research Centre  
June 1999

**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.

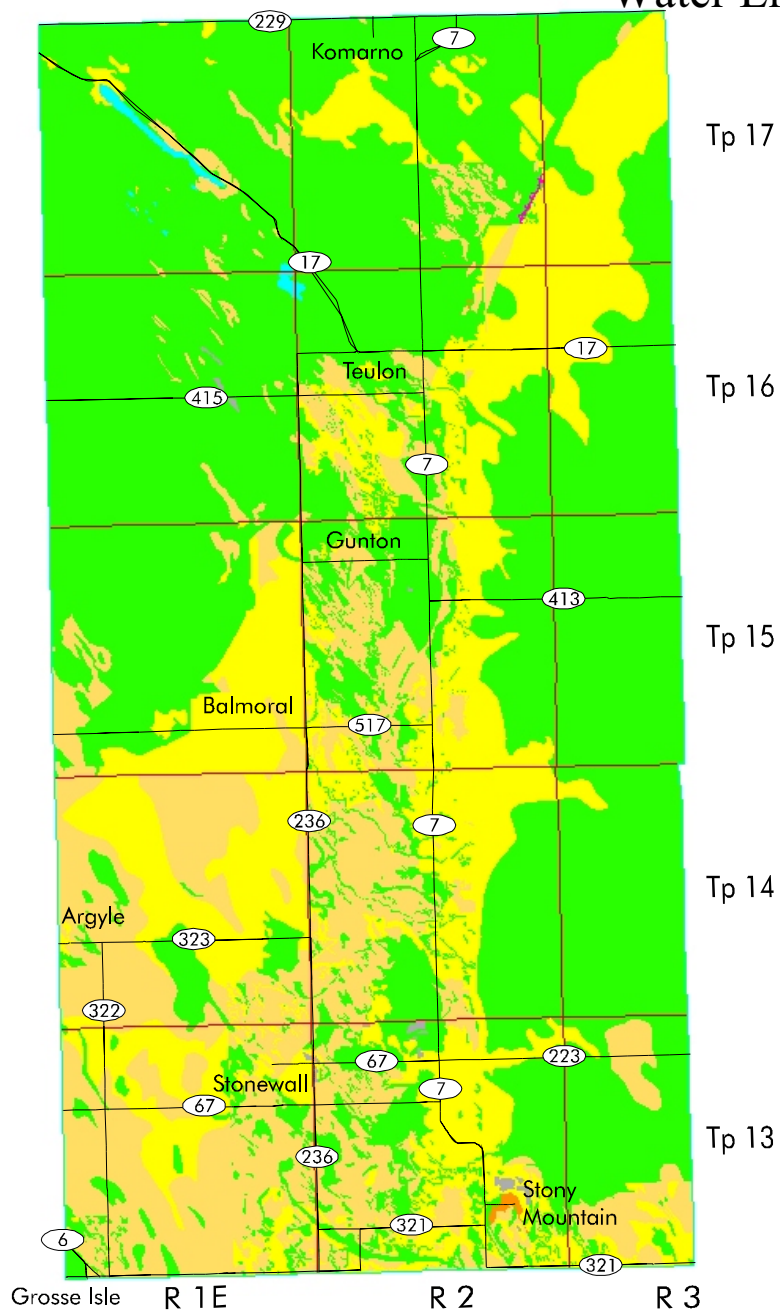
**Table 8. Water Erosion Risk<sup>1</sup>**

<b>Class Percent of RM</b>	<b>Area (ha)</b>	
<b>Negligible</b>	<b>69157</b>	<b>57.0</b>
<b>Low</b>	<b>23317</b>	<b>19.2</b>
<b>Moderate</b>	<b>28368</b>	<b>23.4</b>
<b>High</b>	<b>73</b>	<b>0.1</b>
<b>Severe</b>	<b>25</b>	<b>0.0</b>
<b>Unclassified</b>	<b>162</b>	<b>0.1</b>
<b>Water</b>	<b>215</b>	<b>0.2</b>
<b>Total</b>	<b>121317</b>	<b>100.0</b>

<sup>1</sup> Based on the **weighted average** USLE predicted soil loss within each polygon, assuming a bare unprotected soil.



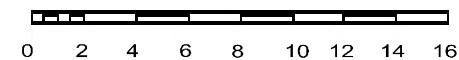
## Water Erosion Risk Map



### Mean Risk Values



### Scale



(Km.)

Universal Transverse Mercator  
(NAD27) Projection

Land Resource Unit  
Brandon Research Centre  
June 1999



**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.

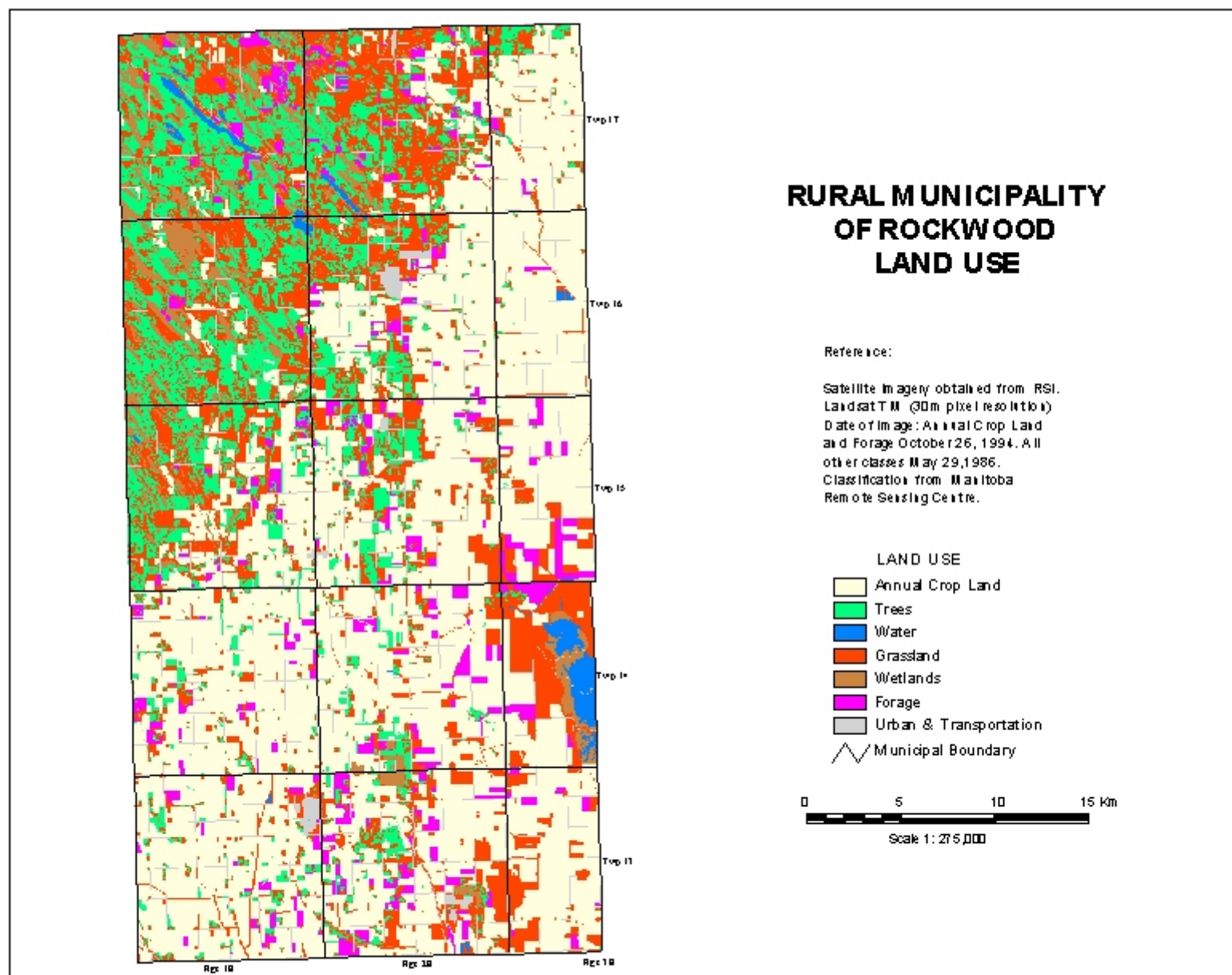
**Water** - open water - lakes, rivers streams, ponds, and lagoons.

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

**Table 9. Land Use<sup>1</sup>**

<b>Class Percent of RM</b>	<b>Area (ha)</b>	
<b>Annual Crop Land</b>	<b>60950</b>	<b>50.2</b>
<b>Forage</b>	<b>5625</b>	<b>4.6</b>
<b>Grasslands</b>	<b>24837</b>	<b>20.4</b>
<b>Trees</b>	<b>17967</b>	<b>14.8</b>
<b>Wetlands</b>	<b>6380</b>	<b>5.3</b>
<b>Water</b>	<b>1229</b>	<b>1.0</b>
<b>Urban and transportation</b>	<b>4493</b>	<b>3.7</b>
<b>Total</b>	<b>121481</b>	<b>100.0</b>

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



## REFERENCES

Agronomic Interpretations Working Group. 1995. Land Suitability Rating System for Agricultural Crops: 1. Spring-seeded Small Grains. Edited by W.W. Pettapiece. Tech. Bull. 1995-6E. Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada, Ottawa. 90 pages, 2 maps.

Ash, G.H.B. 1991. An Agroclimatic Risk Assessment of Southern Manitoba and Southeastern Saskatchewan. M.A. Thesis. Department of Geography, University of Manitoba, Winnipeg.

Canada Land Inventory. 1965. Soil Capability Classification for Agriculture. Canada Land Inventory Report No. 2. ARDA, Dept. of Forestry, Canada, Ottawa.

Canada-Manitoba Soil Survey. 1980. Physiographic Regions of Manitoba. Ellis Bldg., University of Manitoba, Winnipeg. Revised. Unpublished Report.

Canada-Manitoba Soil Survey. 1979. Ecological Regions and Subregions in Manitoba. Ellis Bldg., University of Manitoba, Winnipeg. Revised. Unpublished Report.

Ehrlich, W.A., Poyser, E.A. Pratt, L.E. and Ellis, J. H. 1953 Report of Reconnaissance Soil Survey of Winnipeg and Morris Map Sheet Areas. Soils Report No. 5. Manitoba Soil Survey. Published by Manitoba Dept. of Agriculture. 111pp and 2 maps.

Environment Canada. 1982. Canadian Climatic Normals 1951-1980. Frost, Vol. 6; Atmospheric Environment, Downsview, Ontario.

Environment Canada. 1993. Canadian Climatic Normals 1961-1990. Prairie Provinces. Atmospheric Environment, Downsview, Ontario.

Hopkins, L.A. 1980. Soils of the Rockwood Area. Report D27. Canada-Manitoba Soil Survey. Winnipeg.

Irrigation Suitability Classification Working Group. 1987. An Irrigation Suitability Classification System for the Canadian Prairies. LRRC contribution no. 87-83, Land Resource Research Centre, Research Branch, Agriculture Canada, Ottawa

Land Resource Unit. 1999. Soil and Terrain Classification System Manual. In preparation. Ellis Bldg. University of Manitoba. Winnipeg.

MacDonald, K.B., and Valentine, K.W.G. 1992. CanSIS Manual 1 CanSIS/NSDB: A General Description. Land Resource Division, Centre for Land and Biological Resources Research, Research Branch, Agriculture Canada, Ottawa.

Michalyna, W., Gardiner, Wm. and Podolsky, G. 1975. Soils of the Winnipeg Region Study Area. Report D14. Canada-Manitoba Soil Survey. Winnipeg.

Podolsky, G. 1986. Soils of the Towns of Fraserwood, Inwood, Komarno and a strip of the Lake Manitoba Shoreline. Report D57. Canada-Manitoba Soil Survey. Winnipeg.

Pratt, L.E. Ehrlich, W.A., LeClaire, F.P., Barr, J.A. 1961 Report of Detailed-Reconnaissance Soil Survey of Fisher and Teulon Map Sheet Areas. Soils Report No. 12. Manitoba Soil Survey. Winnipeg, 80 pp and 2 maps.

Soil Classification Working Group. 1998. The Canadian System of Soil Classification. Third Edition. Publ. No. 1646. Research Branch, Agriculture and Agri-Food Canada.

Wischmeier, W.H. and Smith, D.D. 1965. Predicting Rainfall-erosion Loss from Cropland East of the Rocky Mountains. U.S. Department of Agriculture, Agriculture Handbook No. 282, U.S. Government Printing Office, Washington, D.C.