Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

**Rural Municipality of Morton**

**Information Bulletin 97-5**

# Soils and Terrain

## An introduction to the land resource

Land Resource Unit
Brandon Research Centre

Canada

# Rural Municipality of Morton

# Information Bulletin 97-5

Prepared by:

Manitoba 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 March, 1998

## 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

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

## CITATION

Manitoba Land Resource Unit, 1997. Soils and Terrain. An Introduction to the Land Resource. Rural Municipality of Morton. Information Bulletin 97-5, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada.

## ACKNOWLEDGEMENTS

This project was financially supported in part by the Canada-Manitoba Agreement on Agricultural Sustainability, Prairie Farm Rehabilitation Administration (PFRA), and Agriculture and Agri-Food Canada.

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, Manitoba Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada.
G.J. Racz, Head, Dept. of Soil Science, University of Manitoba.
F. Wilson, Manager, Manitoba Land and Soil Programs, PFRA, Agriculture and Agri-Food Canada
K.S. McGill, Manager, Soil Resource Section, Soil and Crops Branch, Manitoba Agriculture.

Technical support was provided by:

G.W. Lelyk, Manitoba Land Resource Unit, Brandon Research Centre, Research Branch, Agriculture and Agri-Food Canada.
J. Fitzmaurice, N. Lindberg, A. Waddell, M. Fitzgerald and S. Grift, Dept. of Soil Science, University of Manitoba.
J. Griffiths, C. Aglugub, Soil Resource Section, Soils and Crops Branch, Manitoba Agriculture.
R. Lewis, PFRA, Agriculture and Agri-Food Canada.
G.F. Mills, P.Ag, Winnipeg, Manitoba

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

W.R. Fraser and W. Michalyna, Manitoba 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.

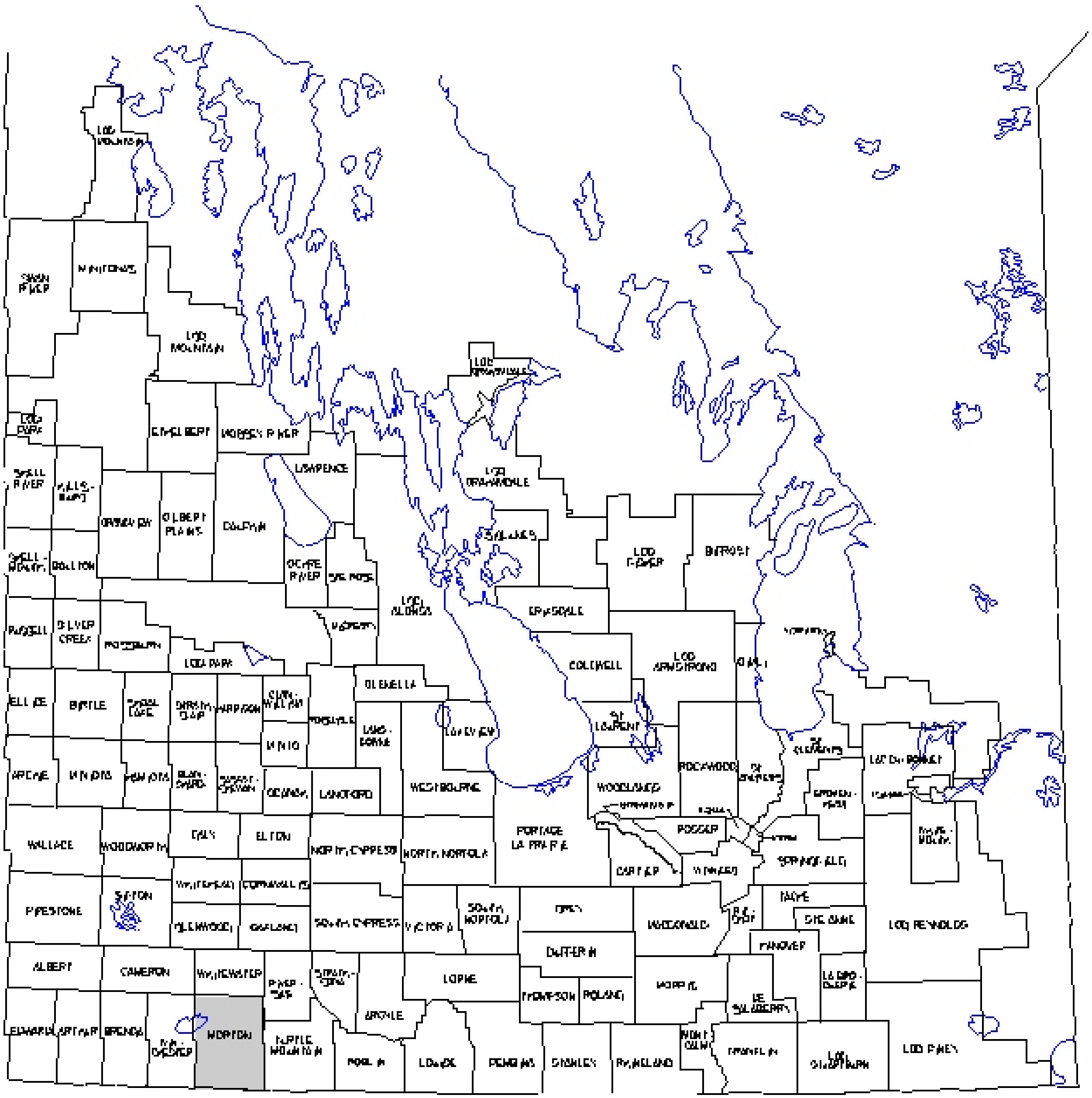



**Figure 1.** Rural municipalities of southern Manitoba.

## INTRODUCTION

The location of the Rural Municipality of Morton 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 Manitoba 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.

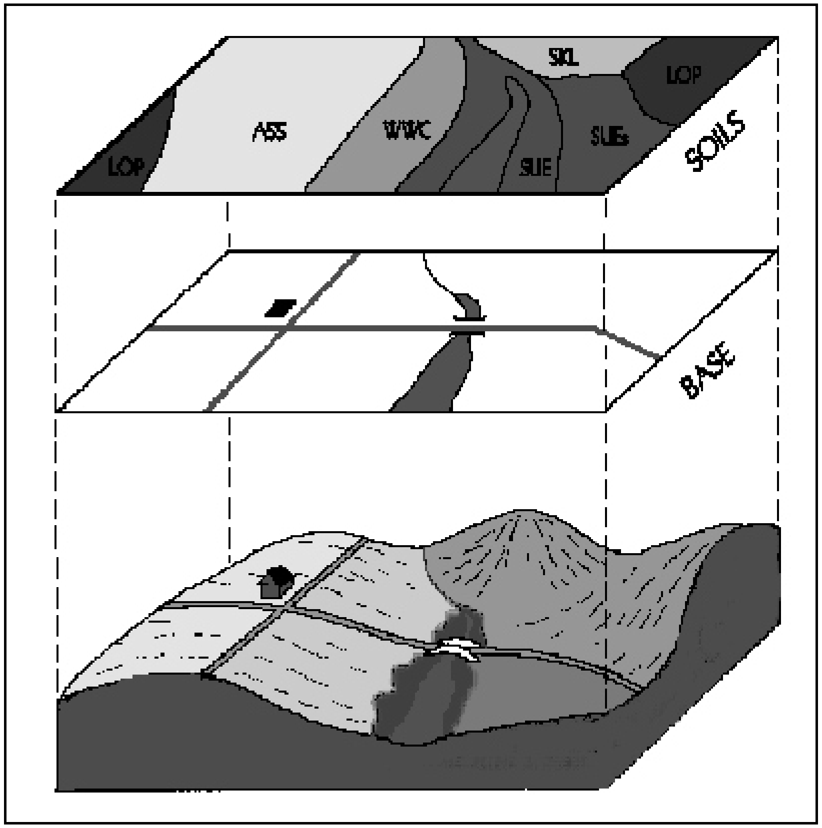



**Figure 2.** Soil and Base Map data.

**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 air 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. Slope gradient and length classes were also added, based on air photo-interpretation. 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.

## LAND RESOURCE OVERVIEW

The Rural Municipality (RM) of Morton covers an area of 12 townships (approximately 117 000 hectares) of land immediately north of the Canada-United States boundary in southwestern Manitoba (page 3). Boissevain is the main population and agriculture service centre in the municipality although the population of the municipality is predominantly rural and farm-based.

The climate in the municipality can be described by weather data from Boissevain. The mean annual temperature is 2.7˚C and the mean annual precipitation is 502 mm (Environment Canada, 1982). The degree-days above 5˚C average 1602 and the average frost-free period is 121 days (Ash, 1991). The calculated seasonal moisture deficit for the period between May and September ranges from 250 to slightly less than 200 mm. The estimated effective growing degree days (EGDD) above 5˚C, accumulated from date of seeding to date of the first fall frost, decreases from slightly in excess of 1500 to less than 1400 at higher elevations in the Turtle Mountain uplands (Agronomic Interpretations Working Group, 1995). These parameters provide an indication of moisture and heat energy available for crop growth.

Physiographically, the RM of Morton is located in the Saskatchewan Plain. The largest part of the municipality is in the Boissevain Plain while Turtle Mountain occupies the high elevations to the south along the Canada-United States boundary (Canada-Manitoba Soil Survey, 1980). Turtle Mountain is a hummocky upland rising to around 683 metres above sea level (m asl). Local relief is typically between 3 and 8 m, with slopes of 9 to 15 percent. Areas in the central part of the upland have lower relief with irregular slopes ranging from 5 to 9 percent. The Mountainside Escarpment surrounding this upland slopes to the north and east at rates approaching 23 metres per km as the elevation decreases to about 560 m asl at the toe of the escarpment. Greatest local relief with slopes often exceeding 30 percent occurs within the numerous gullies and channels dissecting the escarpment area. The Boissevain Plain surrounding Turtle Mountain slopes northward from the escarpment initially at a rate of 10 m per km and then more gradually as the elevation falls to about 488 m asl along the northern boundary of the municipality. The Boissevain Plain has generally low relief and level terrain with slopes less than 2 percent around Whitewater Lake and gently undulating terrain and slopes of 2 to 9 percent below the Mountainside Escarpment and along the northern boundary of the municipality (page 9).

The soil materials in this municipality are dominantly loam textured comprised of slightly to moderately stony glacial till and thin lacustrine sediments overlying glacial till. Loam textured lacustrine sediments and minor areas of clayey soils and sand and gravel glaciofluvial outwash deposits occur in the vicinity of Whitewater Lake (page 11).

Soils in the municipality have been mapped at a detailed 1:20 000 scale and a semi-detailed 1:40 000 scale and published in Soils of the Boissevain-Melita Area, Soil Report No. 20, (Eilers et al., 1978). Soils along the eastern edge of the municipality have been mapped in the Reconnaissance Soil Survey of South-Western Manitoba (Ellis and Shafer, 1940). According to the Canadian System of Soil Classification (Expert Committee on Soil Survey, 1987), the soils are dominantly Black Chernozems, with Humic Gleysols in the depressional areas. Dark Gray Chernozem soils and Gray Luvisol soils occur at higher elevations in the Turtle Mountain. Thin Black soils and Regosolic soils are common on the knolls and ridges in undulating topography and on steeply sloping areas of eroded slopes. A more detailed and complete description of the type, distribution and textural variability of soils in the municipality is provided in the published soil reports.

The majority of the soils in the RM are well drained with imperfect drainage being most common in level areas of the Whitewater Lake basin and on lower slopes of undulating terrain. The Turtle Mountain upland is characterized by well drained soils and numerous small to moderate size lakes and wetlands. Runoff from this upland drains toward the Boissevain Plain and into Whitewater

Lake. Extensive areas surrounding Whitewater Lake are affected by poor drainage, high water tables and surface ponding during wet years. Lower lying areas are characterized by marsh vegetation. Drainage of undulating portions of the Boissevain Plain is largely local in nature, as runoff from snowmelt or heavy rainfall accumulates in numerous poorly drained depressions, many of which contain shallow ponds and small lakes in wet seasons.(page 13).

Although the majority of soils are non-saline, salinity (page 15) is widespread around Whitewater Lake and is common in lower slopes, depressions and shallow drainage channels in till landscapes. Other management considerations primarily relate to topography, texture and wetness (page 17). Poorly drained clay soils occur around Whitewater Lake and slightly to moderately stony soil conditions are common in the till soils throughout the municipality.

The majority of the soils in the RM (70%) are rated in **Class 2** and **3** for agriculture capability (page 19). About 78 percent of the soils are classified as **Good** to **Fair** for irrigation suitability (page 21). Topography (steep slopes), wetness and salinity are the main limitations for agriculture. Well and imperfectly drained soils in gently sloping landscapes are generally rated **Class 2** for agriculture and **Good** for irrigation. More steeply sloping hummocky areas are rated in **Class 4** and **5** for agriculture and **Fair** for irrigation. Poorly drained soils and saline soils are rated in **Class 5 and 6** for agriculture and **Poor** for irrigation.

A major issue 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 has been included in this bulletin (page 23). As shown, nearly 75 percent of the soils in the RM are at **Low** to **Moderate** risk of degradation. Steeply sloping soils are rated as having a **High** risk for environmental impact under irrigation as there is greater potential for rapid runoff from the soil surface into adjacent wetlands or water bodies. This EI map is intended to be used in association with the irrigation suitability map.

Another issue of concern to producers and soil conservation and land use specialists is soil erosion caused by agricultural cropping and tillage practices. To highlight areas with potential for water erosion, a map has been included to show where special practices should be adopted to mitigate this risk (page 25). The risk of water erosion is **Negligible** for18 percent of the soils in the RM and an additional 52 percent of the area is at a **Low** to **Moderate** risk. Areas of undulating loamy soils are at **High** risk of water erosion and low knolls in these areas are also susceptible to erosion by wind. Steeper sloping areas in the Turtle Mountain and the Mountainside Escarpment area, particularly adjacent to stream channels have a **Severe** risk of water erosion. Management practices focus primarily on maintaining adequate crop residues to provide sufficient surface cover during the early spring period. To protect those soils most at risk to water erosion may require a shift in land use away from annual cultivation to production of perennial forages and pasture.

Land use in the RM of Morton is primarily agriculture. An assessment of land use in 1995 was obtained through analysis of satellite imagery. It showed that annual crops occupied about 46 percent of the land, while the remaining areas were in grassland (17%), forage production (3%) and tree cover (20%). Although most of the wooded area occurs in the Turtle Mountain upland, many steeper sloping soils in the agricultural area are also tree covered. Wetlands, including Whitewater Lake cover 7 percent of the area and small water bodies occupy 3.4 percent. The grassland areas located primarily on poorly drained and saline soils, provide native and improved pasture and forage for livestock. Various non-agricultural uses such as recreation and infrastructure for urban areas and transportation occupy about 2.4 percent of the RM (page 27).

While most of the soils in the RM of Morton have moderate to moderately severe limitations for arable agriculture, management of lands with severe to very severe limitations requires careful choice of crops and maintenance of adequate surface cover to reduce the risk of degradation and maintain productivity. Implementation of conservation practices on all soils on a site-by-site basis will help to insure that agriculture land use is sustainable over the long term.

## 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, soil salinity, 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
Surface Texture
Drainage
Salinity
Management Considerations

Interpretative Maps
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 Manitoba Land Resource Unit.

**Slope Map.**

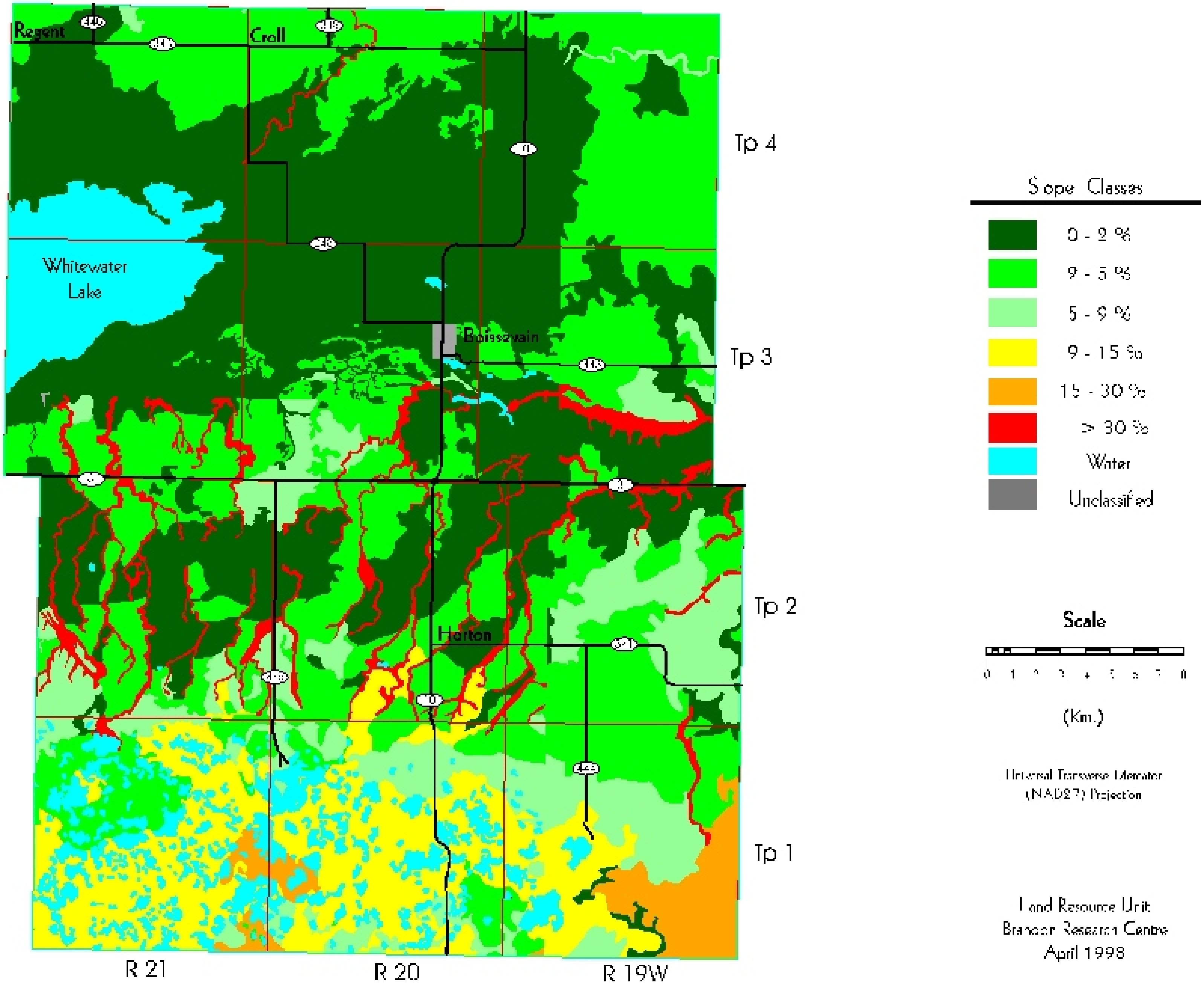
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil layer database. Specific colours are used to indicate the dominant slope class for each soil polygon in the RM. Additional slope classes may occur in each polygon area, but cannot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

**Table 1. Slope Classes[1]**

| Slope Class | Area (ha) | Percent of RM |
|---|---|---|
| 0 - 2 % | 41586 | 35.7 |
| 2 - 5 % | 34870 | 29.9 |
| 5 - 9 % | 11894 | 10.2 |
| 9 - 15 % | 11817 | 10.1 |
| 15 - 30 % | 2684 | 2.3 |
| > 30 % | 4758 | 4.1 |
| Unclassified | 148 | 0.1 |
| Water | 8725 | 7.5 |
| Total | 116483 | 100.0 |

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

# Slope Map


Regent
Croll
Whitewater Lake
Boissevain
Morton
Tp 4
Tp 3
Tp 2
Tp 1
R 21
R 20
R 19W
Slope Classes
0 - 2 %
2 - 5 %
5 - 9 %
9 - 15 %
15 - 30 %
> 30 %
Water
Unclassified
Scale
(Km.)
Universal Transverse Mercator
(NAD27) Projection
Land Resource Unit
Brandon Research Centre
April 1998

**Surface Texture Map.**

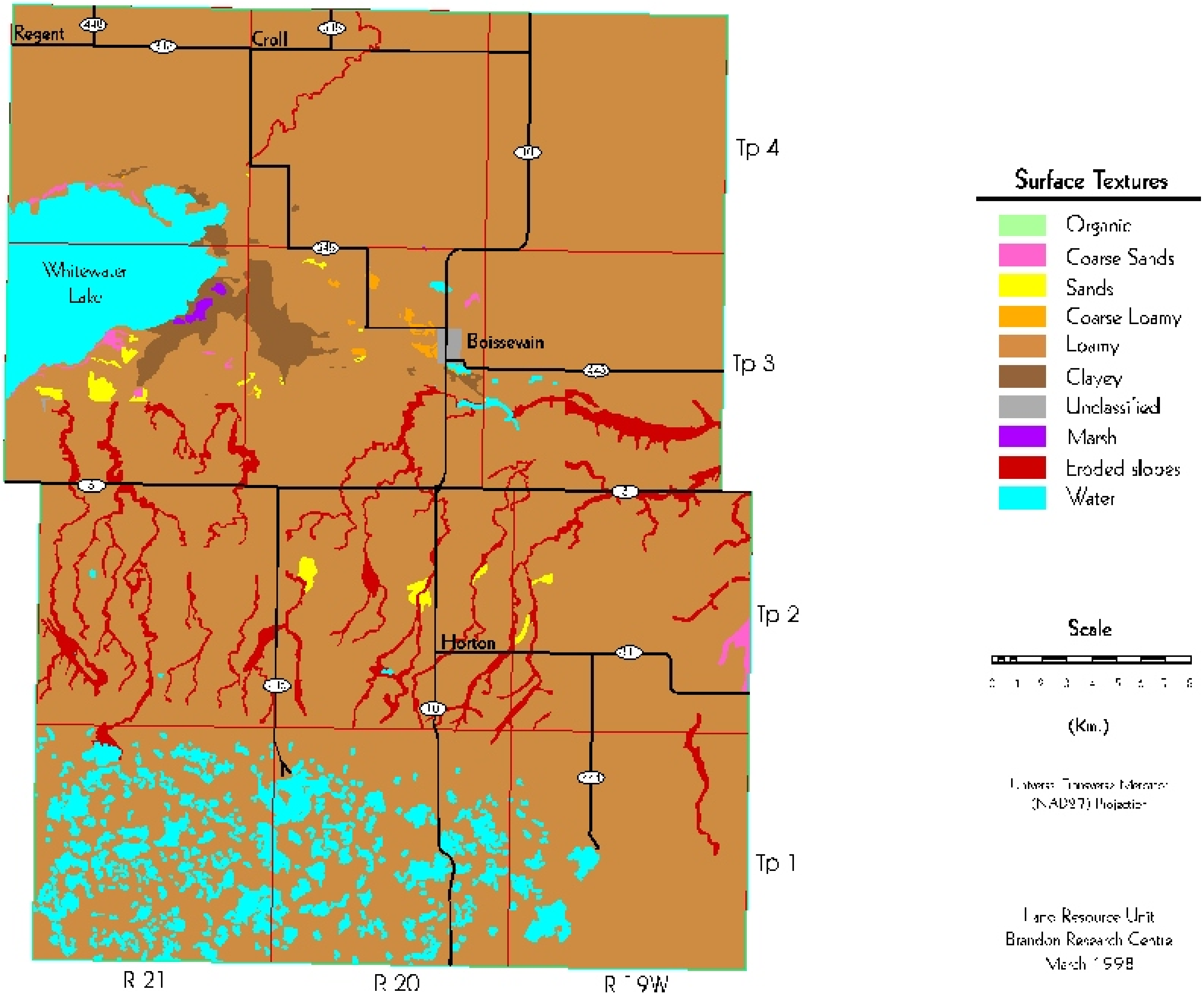
The soil textural class for the upper most soil horizon of the dominant soil series within a soil polygon was utilized for classification. Texture may vary from that shown with soil depth and location within the polygon.

**Table 2. Surface Texture[1]**

| Surface Texture | Area (ha) | Percent of RM |
|---|---|---|
| Organics | 0 | 0.0 |
| Coarse Sands | 293 | 0.3 |
| Sands | 457 | 0.4 |
| Coarse Loamy | 162 | 0.1 |
| Loamy | 100216 | 86.0 |
| Clayey | 1636 | 1.4 |
| Eroded Slopes | 4758 | 4.1 |
| Marsh | 88 | 0.1 |
| Unclassified | 148 | 0.1 |
| Water | 8725 | 7.5 |
| Total | 116483 | 100.0 |

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

# Surface Texture Map



**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. Six drainage classes plus four 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.

**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.

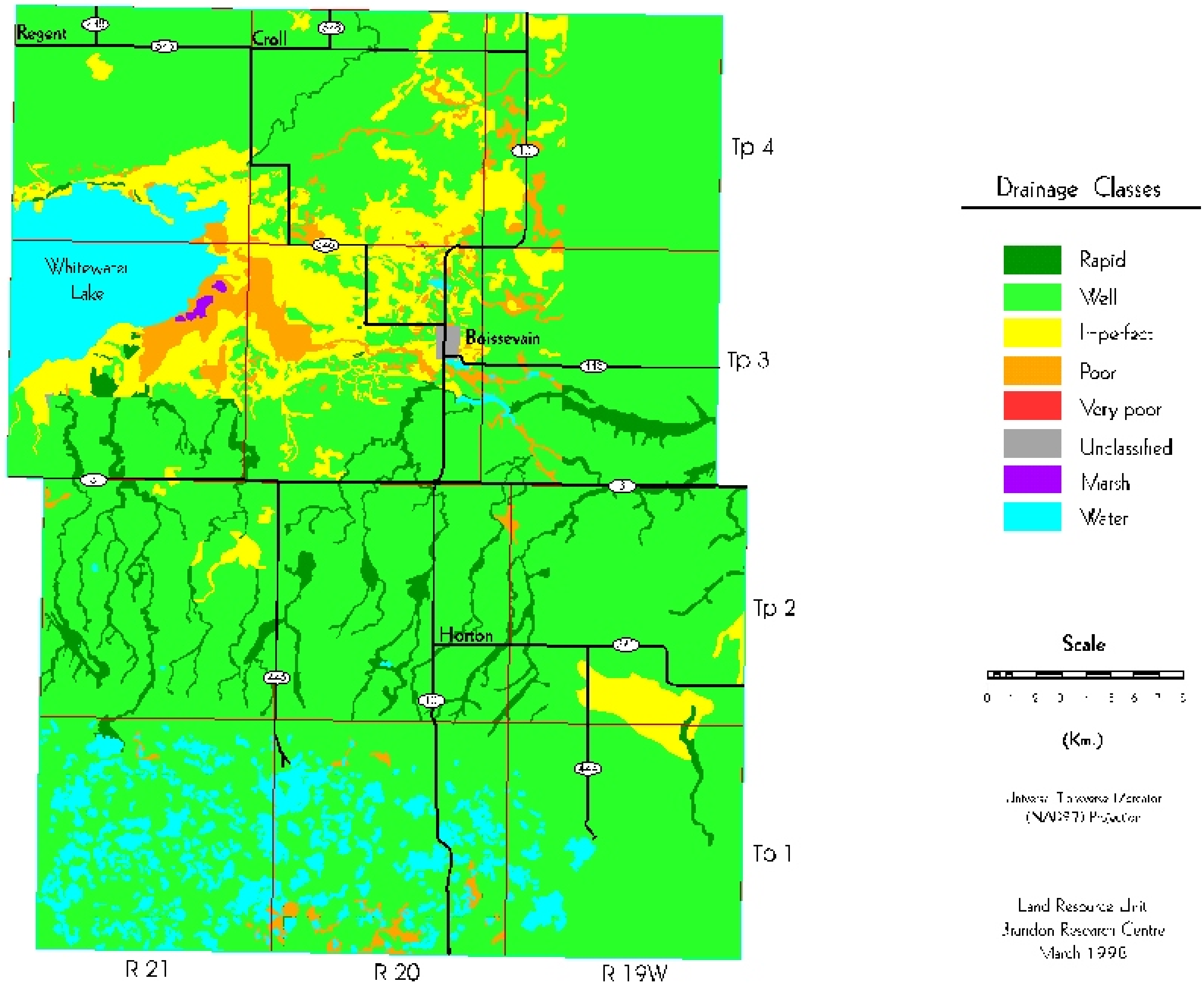
Drainage classification is based on the dominant soil series within each individual soil polygon.

**Table 3. Drainage Classes[1]**

| Drainage Class | Area (ha) | Percent of RM |
|---|---|---|
| Very Poor | 0 | 0.0 |
| Poor | 3727 | 3.2 |
| Imperfect | 11135 | 9.6 |
| Well | 87475 | 75.1 |
| Rapid | 5184 | 4.5 |
| Marsh | 88 | 0.1 |
| Unclassified | 148 | 0.1 |
| Water | 8725 | 7.5 |
| Total | 116483 | 100.0 |

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

# Soil Drainage Map



**Soil Salinity Map.**

A saline soil contains soluble salts in such quantities that they interfere with the growth of most crops. Soil salinity is determined by the electrical conductivity of the saturation extract in decisiemens per metre (dS/m). Approximate limits of salinity classes are:

| | |
|---|---|
| **non-saline** | < 4 dS/m |
| **weakly saline** | 4 to 8 dS/m |
| **moderately saline** | 8 to 15 dS/m |
| **strongly saline** | > 15 dS/m. |

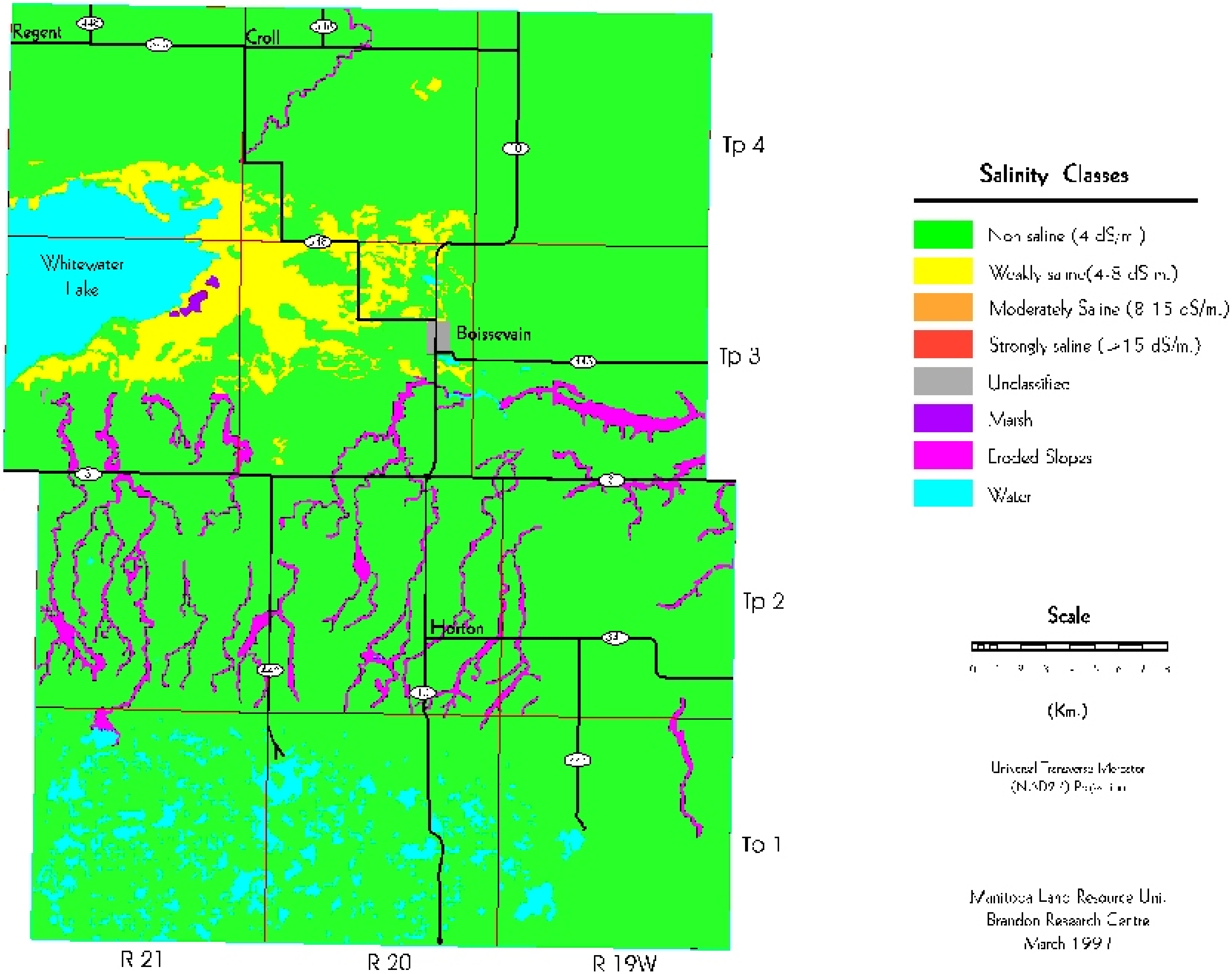
The salinity classification of each individual soil polygon was determined by the most severe salinity classification present within that polygon.

**Table 4. Salinity Classes[1]**

| Salinity Class | Area (ha) | Percent of RM |
|---|---|---|
| **Non Saline** | **96675** | **83.0** |
| **Weakly Saline** | **6089** | **5.2** |
| **Moderately Saline** | **0** | **0.0** |
| **Strongly Saline** | **0** | **0.0** |
| **Eroded Slopes** | **4758** | **4.1** |
| **Marsh** | **88** | **0.1** |
| **Unclassified** | **148** | **0.1** |
| **Water** | **8725** | **7.5** |
| **Total** | **116483** | **100.0** |

[1] Area has been assigned to the most severe salinity class for each soil polygon.

# Soil Salinity Map



**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.

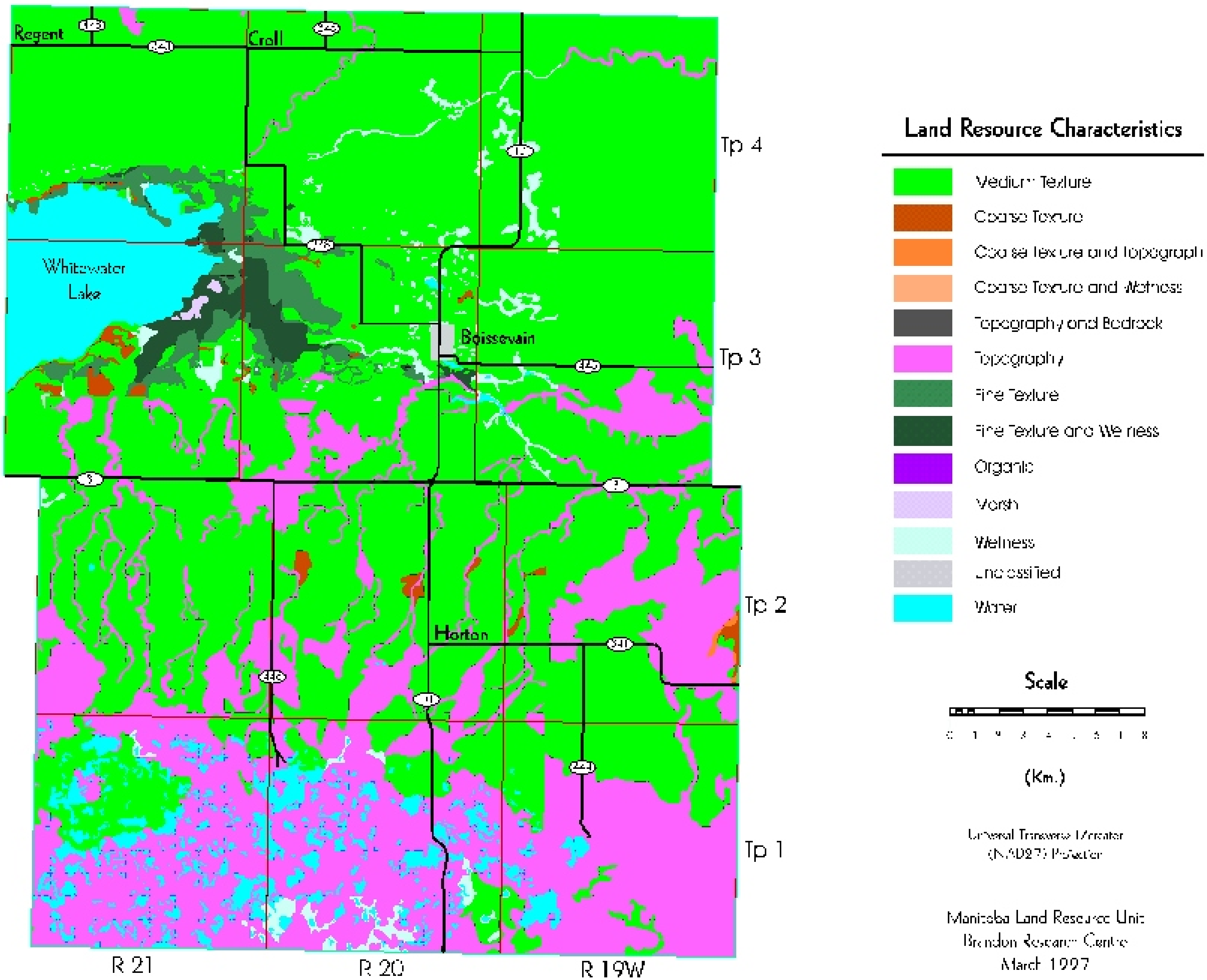
**R = Bedrock** - soil landscapes that have shallow depth to bedrock (< 50 cm) and/or exposed bedrock which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

**Table 5. Management Considerations**[1]

| Land Resource Characteristics | Area (ha) | Percent of RM |
|---|---|---|
| Fine Texture | 2630 | 2.3 |
| Fine Texture and Wetness | 1461 | 1.3 |
| Fine Texture and Topography | 0 | 0.0 |
| Medium Texture | 70804 | 60.8 |
| Coarse Texture | 699 | 0.6 |
| Coarse Texture and Wetness | 0 | 0.0 |
| Coarse Texture and Topography | 51 | 0.0 |
| Topography | 29672 | 25.5 |
| Topography and Bedrock | 0 | 0.0 |
| Wetness | 2205 | 1.9 |
| Wetness and Topography | 0 | 0.0 |
| Bedrock | 0 | 0.0 |
| Organic | 0 | 0.0 |
| Marsh | 88 | 0.1 |
| Unclassified | 148 | 0.1 |
| Water | 8725 | 7.5 |
| Total | 116483 | 100.0 |

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

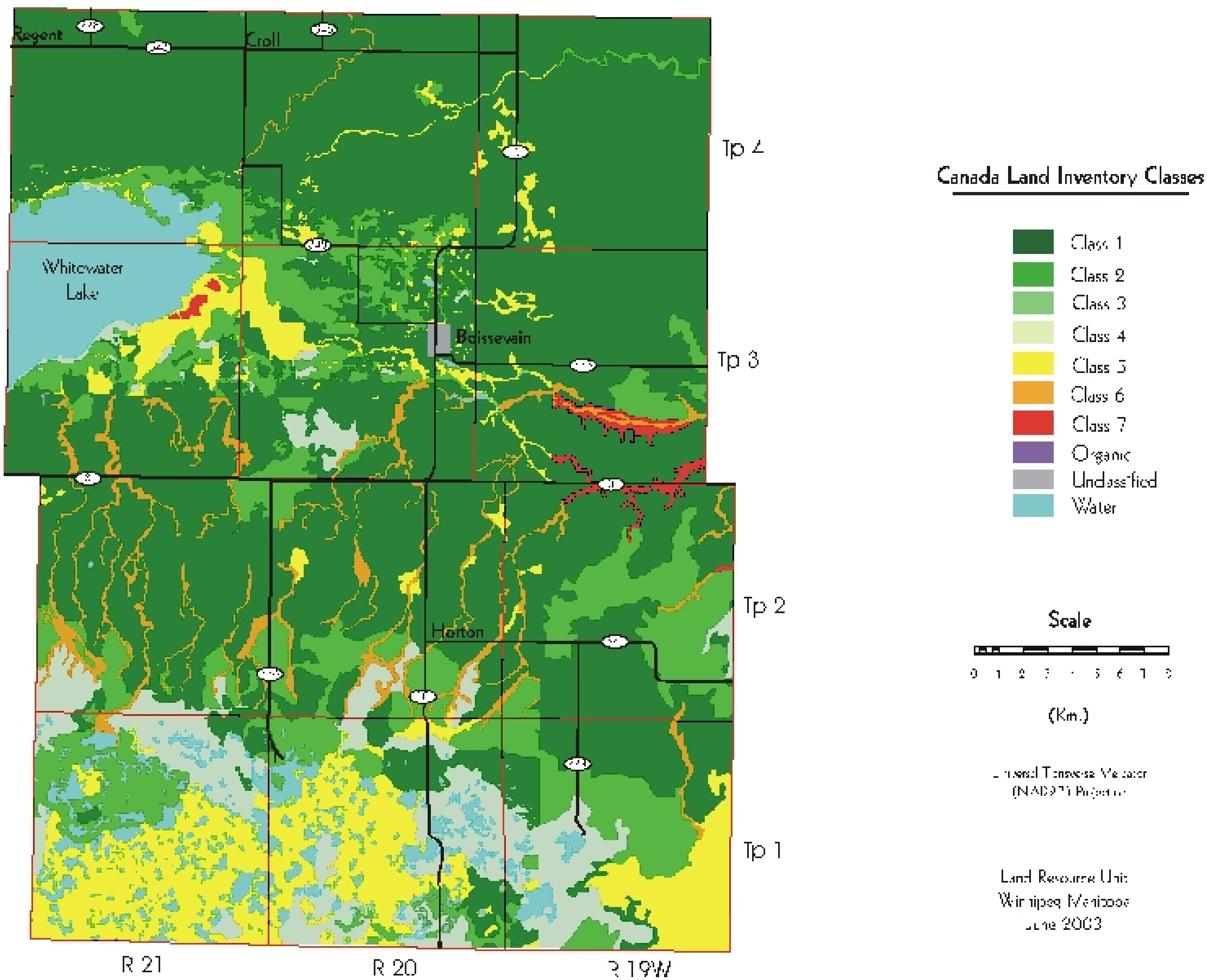
This generalized interpretive map is based on the dominant soil series and phases for each soil polygon. The CLI subclass limitations cannot be portrayed at this generalized map scale.

**Table 6. Agricultural Capability[1]**

| Class Subclass | Area (ha) | Percent of RM |
|---|---|---|
| **2** | **64456** | **55.4** |
| 2E | 3526 | 3.0 |
| 2IW | 183 | 0.2 |
| 2M | 77 | 0.1 |
| 2P | 139 | 0.1 |
| 2T | 24882 | 21.4 |
| 2TE | 4987 | 4.3 |
| 2TP | 141 | 0.1 |
| 2TW | 1749 | 1.5 |
| 2W | 4080 | 3.5 |
| 2X | 24691 | 21.5 |
| **3** | **17341** | **14.9** |
| 3 | 35 | 0.0 |
| 3ET | 210 | 0.2 |
| 3M | 124 | 0.1 |
| 3N | 4442 | 3.8 |
| 3P | 18 | 0.0 |
| 3T | 11623 | 10.0 |
| 3TE | 890 | 0.8 |
| **4** | **8127** | **7.0** |
| 4DN | 172 | 0.1 |
| 4ET | 403 | 0.3 |
| 4I | 79 | 0.1 |
| 4M | 288 | 0.2 |
| 4T | 7187 | 6.2 |
| **5** | **12713** | **10.9** |
| 5M | 427 | 0.4 |
| 5T | 8559 | 7.4 |
| 5W | 3627 | 3.1 |
| 5WI | 100 | 0.1 |
| **6** | **4170** | **3.6** |
| 6T | 4170 | 3.6 |
| **7** | **669** | **0.6** |
| 7T | 581 | 0.5 |
| 7W | 88 | 0.1 |
| **Unclassified** | **148** | **0.1** |
| **Water** | **8699** | **7.5** |
| **Total** | **116323** | **100.0** |

[1] Based on **dominant** soil, slope gradient, and slope length of each soil 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.

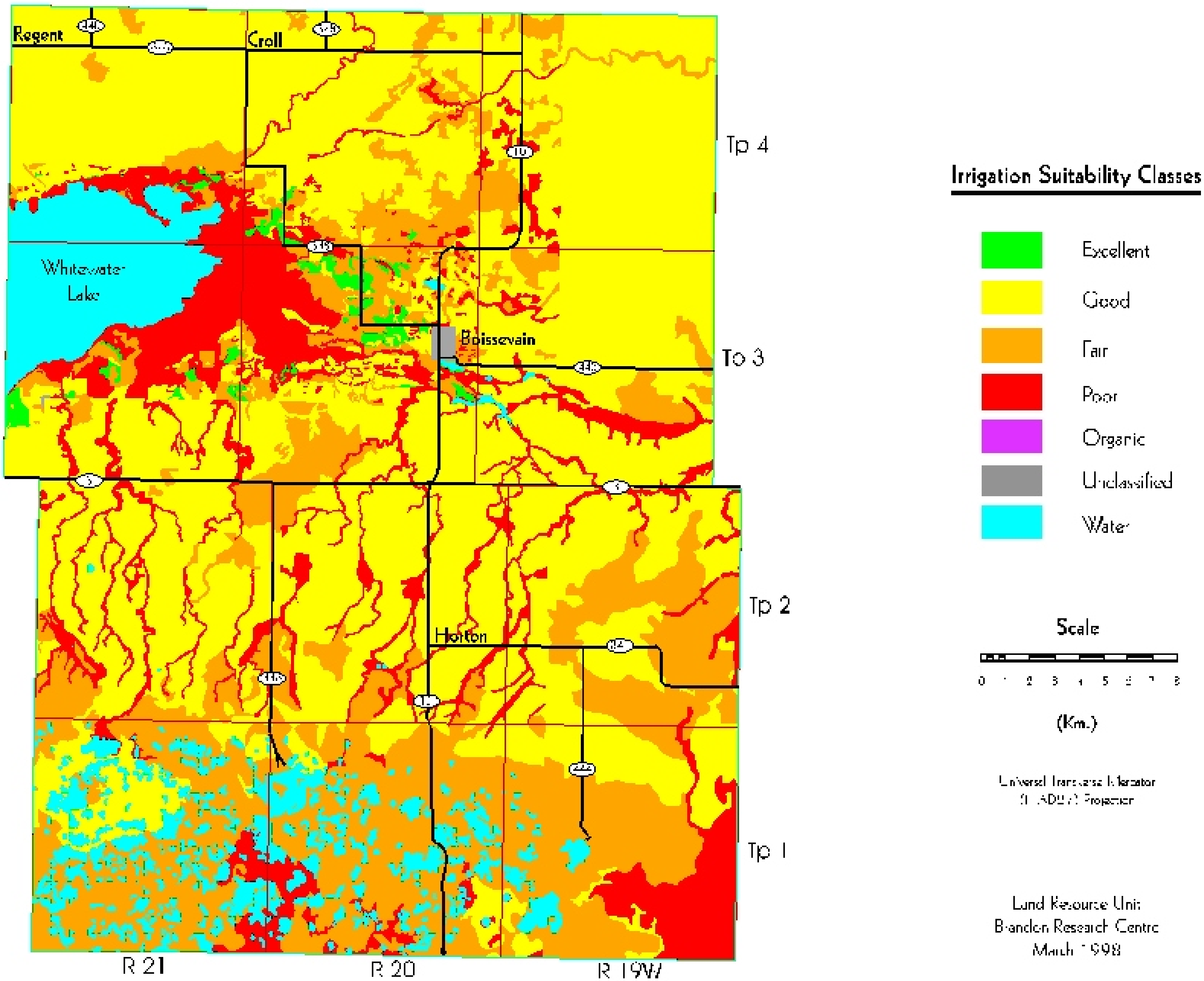
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

**Table 7. Irrigation Suitability**[1]

| **Class** | **Area (ha)** | **Percent of RM** |
|---|---|---|
| **Excellent** | **971** | **0.8** |
| **Good** | **61317** | **52.6** |
| **Fair** | **30514** | **26.2** |
| **Poor** | **14807** | **12.7** |
| **Organic** | **0** | **0.0** |
| **Unclassified** | **148** | **0.1** |
| **Water** | **8725** | **7.5** |
| **Total** | **116483** | **100.0** |

[1] Based on **dominant** soil, slope gradient, and slope length of each soil polygon.

# Irrigation Suitability Map



**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.

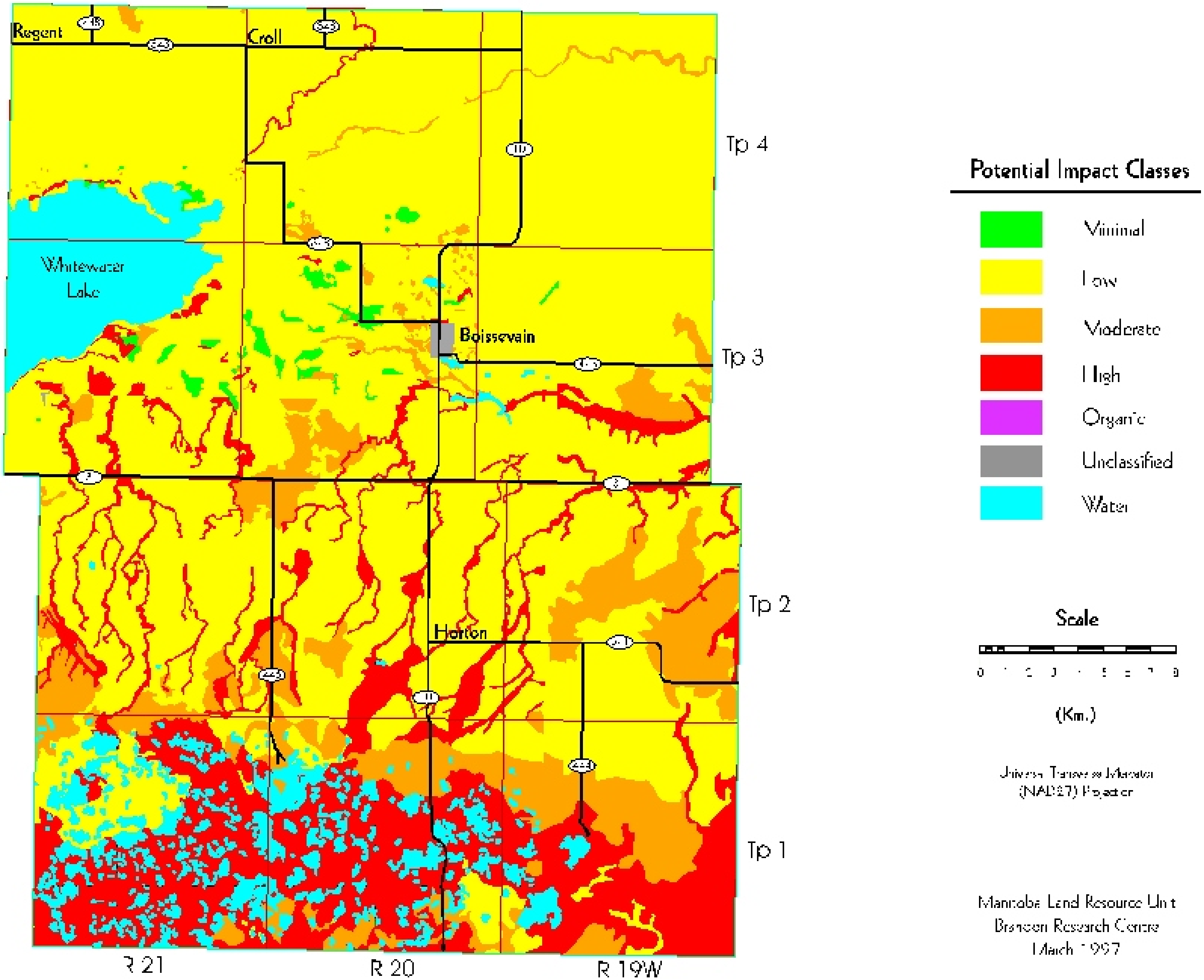
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

**Table 8. Potential Environmental Impact Under Irrigation[1]**

| Class | Area (ha) | Percent of RM |
|---|---|---|
| **Minimal** | **815** | **0.7** |
| **Low** | **74108** | **63.6** |
| **Moderate** | **12580** | **10.8** |
| **High** | **20107** | **17.3** |
| **Organic** | **0** | **0.0** |
| **Unclassified** | **148** | **0.1** |
| **Water** | **8725** | **7.5** |
| **Total** | **116483** | **100.0** |

[1] Based on **dominant** soil, slope gradient, and slope length of each soil 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. The map shows 5 classes of soil erosion risk based on bare unprotected soil:

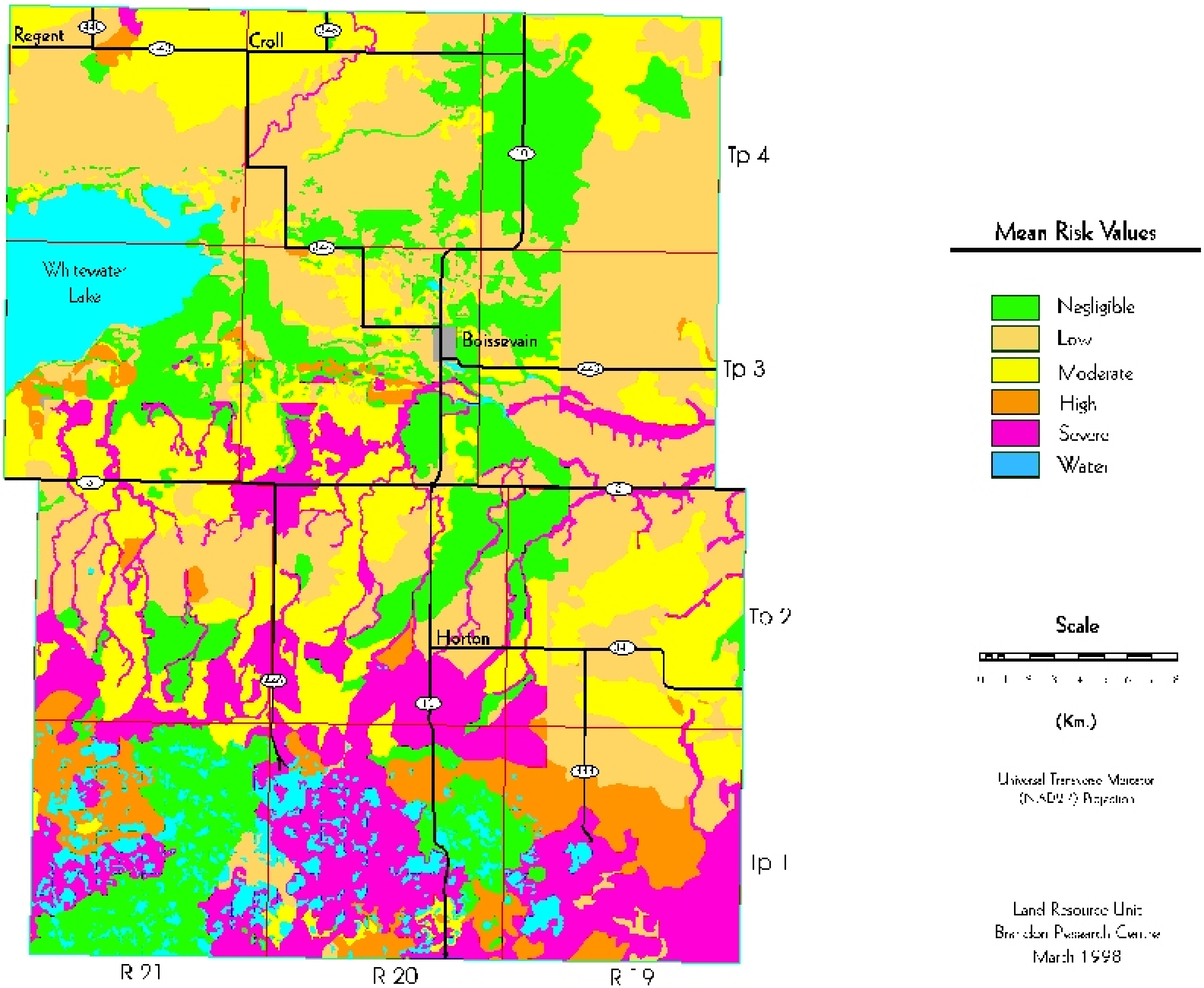
**negligible**
**low**
**moderate**
**high**
**severe.**

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

**Table 9. Water Erosion Risk[1]**

| Class | Area (ha) | Percent of RM |
|---|---|---|
| Negligible | 20593 | 17.7 |
| Low | 35725 | 30.7 |
| Moderate | 24790 | 21.3 |
| High | 7002 | 6.0 |
| Severe | 19500 | 16.7 |
| Unclassified | 148 | 0.1 |
| Water | 8725 | 7.5 |
| Total | 116483 | 100.0 |

# 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.

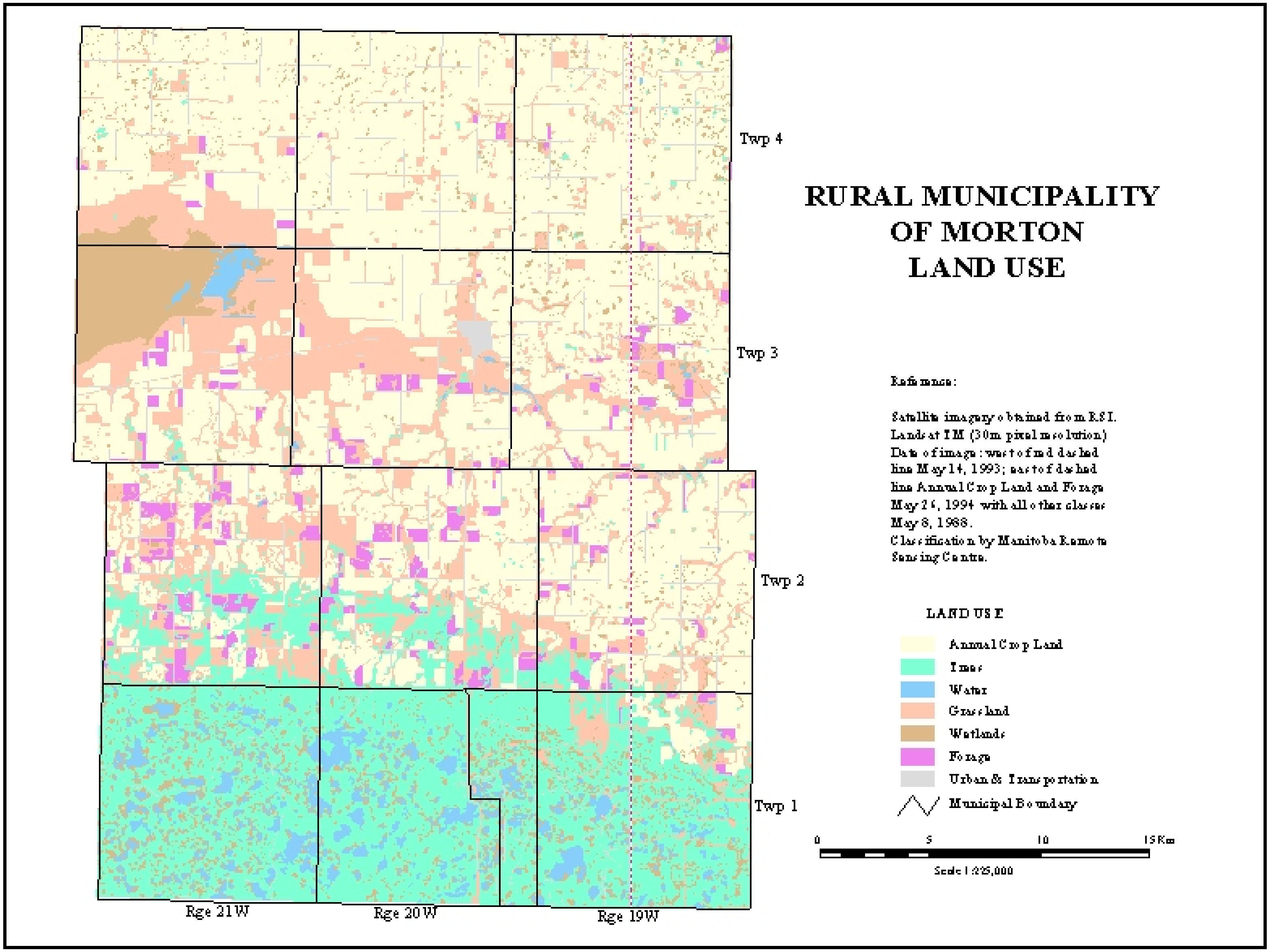
**Water** - open water - lakes, rivers streams, ponds, and lagoons.

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

**Table 10. Land Use[1]**

| Class | Area (ha) | Percent of RM |
|---|---|---|
| Annual Crop Land | 54076 | 46.2 |
| Forage | 3545 | 3.0 |
| Grasslands | 20545 | 17.6 |
| Trees | 24026 | 20.5 |
| Wetlands | 8027 | 6.9 |
| Water | 3963 | 3.4 |
| Urban and Transportation | 2820 | 2.4 |
| Total | 117002 | 100.0 |

[1] Land use information (1995) and map supplied by Prairie Farm Rehabilitation Administration. Areas may vary from previous maps due to differences in analytical procedures.


RURAL MUNICIPALITY
OF MORTON
LAND USE
Twp 4
Twp 3
Twp 2
Twp 1
Rge 21W
Rge 20W
Rge 19W
Reference:
Satellite imagery obtained from RSI.
Landsat TM (30m pixel resolution)
Date of image: west of red dashed
line May 14, 1993; east of dashed
line Annual Crop Land and Forage
May 26, 1994 with all other classes
May 8, 1988.
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

**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.

Eilers, R.G., Hopkins, L.A., and Smith, R.E., 1978. Soils of the Boissevain - Melita Area. Report No. 20. Canada-Manitoba Soil Survey. Winnipeg.

Ellis, J.H., and Shafer, W.H. 1940. Reconnaissance Soil Survey of South-Western Manitoba. Soils Report No. 8. Manitoba Soil Survey. Published by the Manitoba Dept. Of Agriculture. 104pp and map.

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.

Expert Committee on Soil Survey. 1987. The Canadian System of Soil Classification. Second Edition. Publ. No. 1646. Research Branch, Agriculture Canada, Ottawa.

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

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.

Manitoba Land Resource Unit. 1998. Soil and Terrain Classification System Manual. In preparation. Ellis Bldg. University of Manitoba. Winnipeg.

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.