Agriculture and Agri-Food Canada
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Rural Municipality of Pembina

Information Bulletin 97-10

Soils and Terrain

An introduction to the land resource

Land Resource Unit
Brandon Research Centre

Canada

Rural Municipality of Pembina

Information Bulletin 97-10

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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

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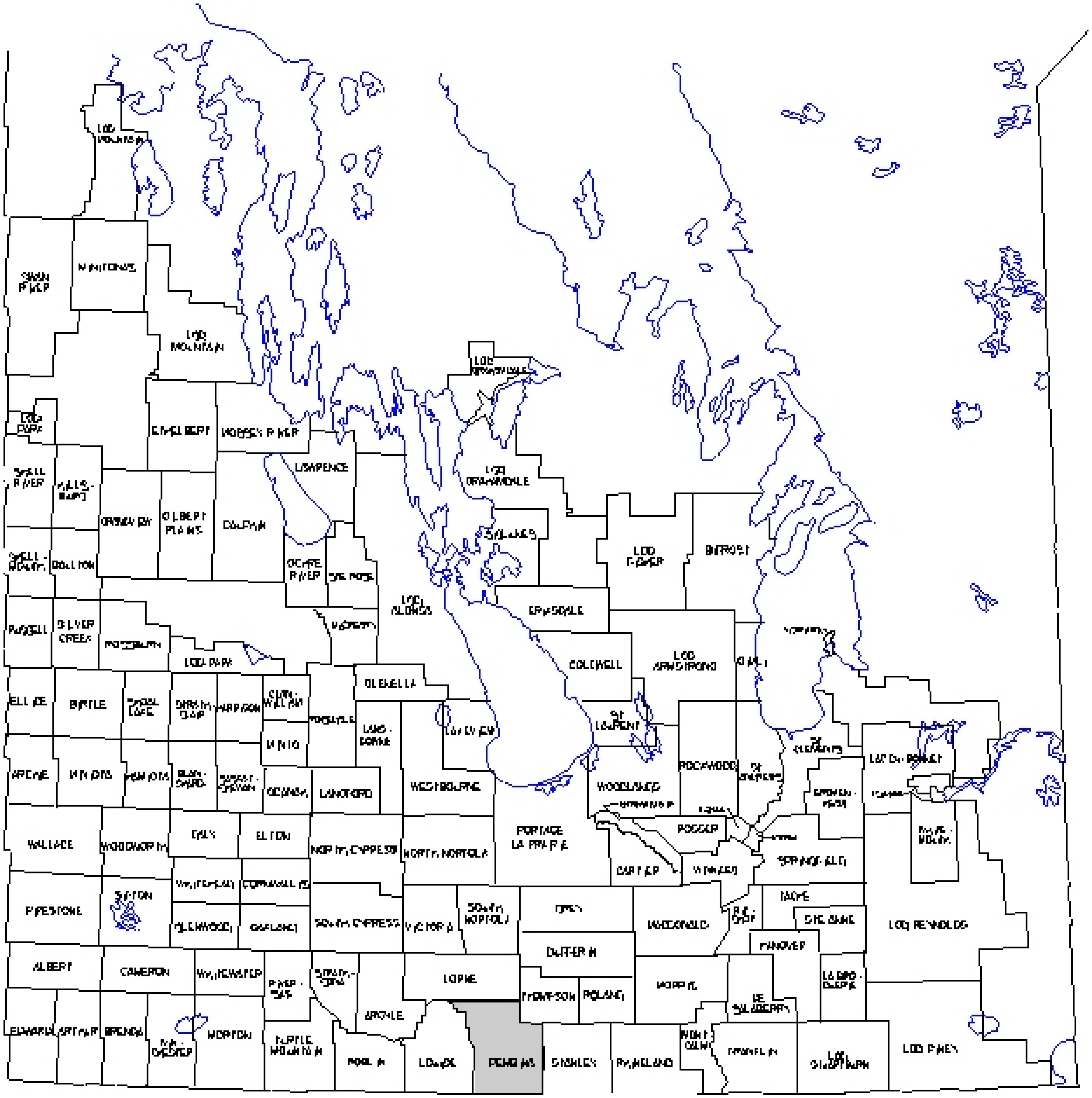


Figure 1. Rural municipalities of southern Manitoba.

INTRODUCTION

The location of the Rural Municipality of Pembina 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.

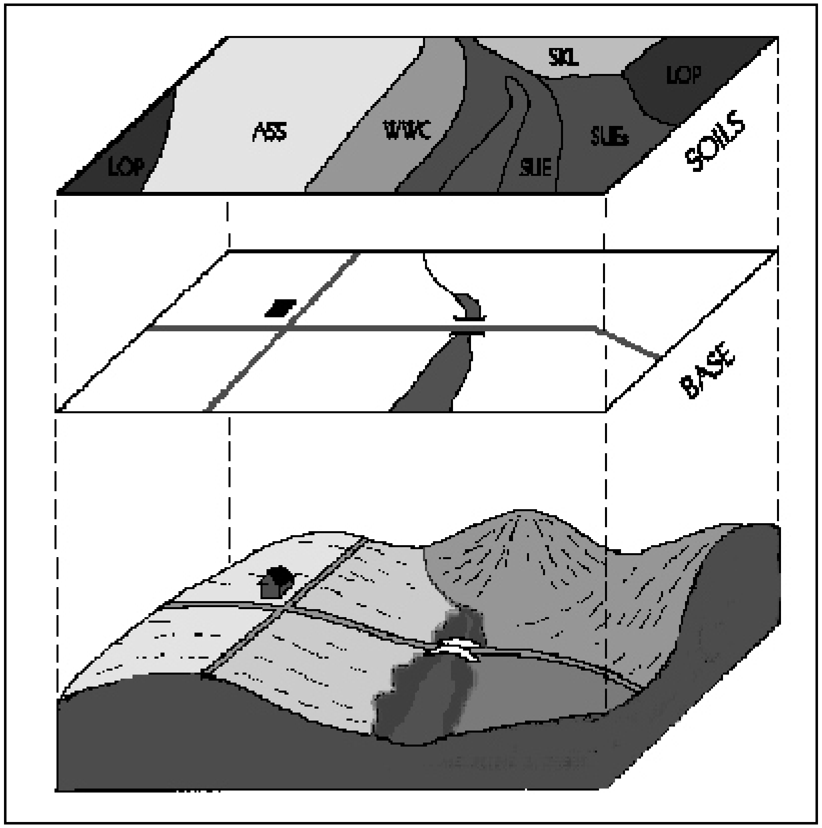


Figure 2. Soil and Base Map data.

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 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.

LAND RESOURCE OVERVIEW

The Rural Municipality (RM) of Pembina covers an area of 12.3 townships (approximately 113 300 hectares) of land in south-central Manitoba immediately north of the Canada-United States boundary (page 3). The towns of Darlingford, Manitou, La Riviere and Snowflake are the main population and agriculture service centres in the municipality.

The climate in the municipality can be described by weather data from Manitou. The mean annual temperature is 1.4˚C and the mean annual precipitation is 540 mm. The degree-days above 5˚C average 1636. The average frost-free period is 122 days (Environment Canada, 1982). The calculated seasonal moisture deficit for the period between May and September is 200 to 250 mm. The estimated effective growing degree days (EGDD) above 5˚C accumulated from May to September is between 1400 and 1500 (Agronomic Interpretations Working Group, 1995). These parameters provide an indication of moisture and heat energy available for crop growth.

Physiographically, the RM of Pembina is located in the Saskatchewan Plain (Canada-Manitoba Soil Survey, 1980). The majority of the RM occurs in the Manitou Plain while the northern and northeastern fringes of the municipality are in the Pembina Hills. The most prominent landscape feature is the broad meltwater channel of the Pembina Valley trending southeasterly across the municipality. Elevations range from a high of 488 m asl in the Pembina Hills to 375 m in the Pembina Valley at Windygates. The Manitou Plain has a level to gently undulating land surface, with local relief generally less than 3 m and slopes usually less than 5 percent. Local areas with relief up to 10 m and long slopes of 5 to 9 percent occur on rolling terrain near Manitou. The Pembina Hills area is characterized by an undulating to hummocky landscape with generally less than 3 m local relief. However, higher relief up to 9 m and slopes in excess of 9 percent occur on the Darlingford moraine which separates the Pembina Hills from the Manitou Plain. Greatest local relief is associated with the Pembina Valley, the depth of which varies from 60 m at La Riviere to about 120 m at Windygates. Steepest slopes in the RM occur along the side walls of this valley and in the eroded channels and gullies draining into the valley (page 9).

The soil materials in this RM are primarily loam textured glacial till deposits and thin lacustrine sediments underlain by loamy till. Stratified loamy alluvial deposits are associated with the floodplain of the Pembina River. Local areas of stratified glaciofluvial sand and gravel occur adjacent to the Pembina Valley and as small eskers scattered throughout the municipality. Higher ridges and knolls in the landscape may be underlain by shale materials or shale bedrock, often within half a metre the surface. Shale exposures commonly occur at lower levels of the valley sides along the Pembina Channel (page 11).

Soils in the municipality have been mapped at a semi-detailed level (1:50 000 scale) and published in the report, Soils of the Rural Municipality of Pembina, Soil Report No. D77, (Podolsky, 1993). According to the Canadian System of Soil Classification (Expert Committee on Soil Survey, 1987), the soils are classified as Black and Dark Gray Chernozems and Humic Gleysols, with a few minor areas of poorly structured Solonetzic soils. Regosolic soils occur on stratified stream deposits 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 soil report.

Surface drainage of the RM is mainly through the Pembina River and its tributary creeks and channels. Drainage of the area east of the Darlingford moraine is facilitated by an average gradient of about 7 m/km toward the Manitoba Plain. Surface drainage of hummocky terrain in the municipality is largely local in nature. Runoff collects in poorly drained depressions and potholes, many of which contain shallow water bodies in wet seasons. The majority of soils are well drained with significant areas of imperfect and rapidly drained soils, and local occurrences of poorly drained soils (page 13). Areas characterized by eroded channels and slopes adjacent to the Pembina Channel are well to rapidly drained. Imperfectly drained soils occur in larger areas of level to very gently sloping terrain throughout the municipality.

Minor areas of localized soil salinity (page 15) are usually associated with imperfectly drained soils in drainage channels and in larger level to depressional areas. In addition to salinity, other management considerations are primarily related to topography and wetness (page 17). There are no significant soil textural (sandy or clayey soils) or bedrock conditions within the municipality. Slightly stony soils are a minor concern, occupying less than 5 percent of the area (Podolsky, 1993).

The majority of the soils in the RM (77.5%) are rated **Class 1, 2** or **3** for agriculture capability (page 19). About three-quarters of the soils are classified as **Good** to **Fair** for irrigation suitability (page 21). Topography is the main limitation for agriculture. Well drained soils in gently sloping landscapes are generally rated **Class 1 and 2** for agriculture and **Good** for irrigation. Steeply sloping land and very poorly drained soils are rated in **Class 6** for agriculture and **Poor** for irrigation. Salinity affected soils in the municipality are rated in **Class 3 and 4** for agriculture capability, 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, the majority of the RM is at **Low** risk of degradation. However, areas with long slopes in excess of 5 percent present a **Moderate** risk of environmental impact and steeply sloping soils are rated as having a **High** potential for impact on the environment under irrigation. These conditions increase the risk or potential for rapid runoff from the soil surface and the transport of potential contaminants 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 risk map has been included to show where special practices should be adopted to mitigate this risk (page 25). Thirty percent of the land in the RM is at **High** to **Severe** risk to degradation from water erosion. Management practices focus primarily on maintaining adequate crop residues to provide sufficient surface cover. However, to provide adequate protection for the steeper sloping lands most at risk, a shift in land use away from annual cultivation to production of perennial forages and pasture may be required.

An assessment of land use in the RM of Pembina in 1994 was obtained through an analysis of satellite imagery. It showed that annual crops occupied about 66% of the land in the RM, while the remaining areas were in tree cover (15.1%), grassland (10.4%), and forage production (1.9%). Wetlands and small water bodies occupy 3% of the RM. Much of the area in woodland is used for native grazing and the grassland areas provide native and improved pasture for livestock. Various non-agricultural uses such as recreation and infrastructure for urban areas and transportation occupy about 2.8 % of the RM (page 27).

While most of the soils in the RM of Pembina have moderate to moderately severe limitations for arable agriculture, management of steeply sloping soils requires careful choice of crops and maintenance of adequate surface cover. Soils of all textures require special management to protect against the risk of wind erosion. This includes leaving adequate crop residues on the surface to provide sufficient trash cover during the early spring period. The provision of shelter belts, minimum tillage practices, and crop rotations including forage will help to reduce the risk of soil degradation, maintain productivity and 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:

<u>Derived Maps</u>
Slope
Surface Texture
Drainage
Salinity
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 Manitoba Land Resource Unit.

Slope Map.

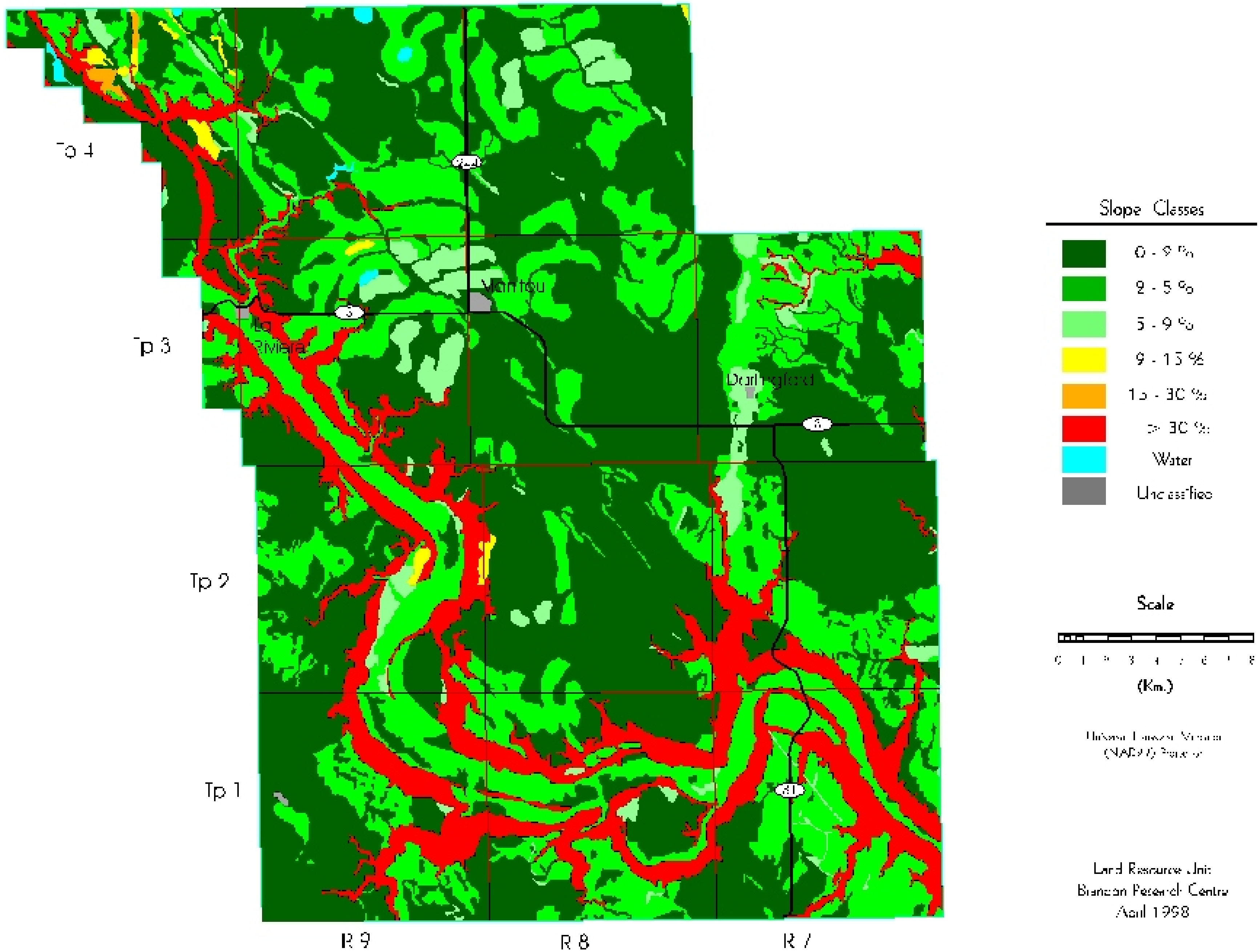
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil layer database. Specific colours are used to indicate the dominant slope class for each soil polygon in the RM. Additional slope classes may occur in each polygon area, but cannot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

Table 1. Slope Classes[1]

Slope Class	Area (ha)	Percent of RM
0 - 2 %	59459	52.5
2 - 5 %	33070	29.2
5 - 9 %	4249	3.7
9 - 15 %	535	0.5
15 - 30 %	156	0.1
> 30 %	15461	13.6
Unclassified	155	0.1
Water	242	0.2
Total	113327	100.0

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

Slope Map


Tp 4
Tp 3
Tp 2
Tp 1
Manitou
La Riviere
Darlingford
R 9
R 8
R 7
Slope Classes
0 - 2 %
2 - 5 %
5 - 9 %
9 - 15 %
15 - 30 %
> 30 %
Water
Unclassified
Scale
(Km.)
Land Resource Unit
Brandon Research Centre
April 1998

Surface Texture Map.

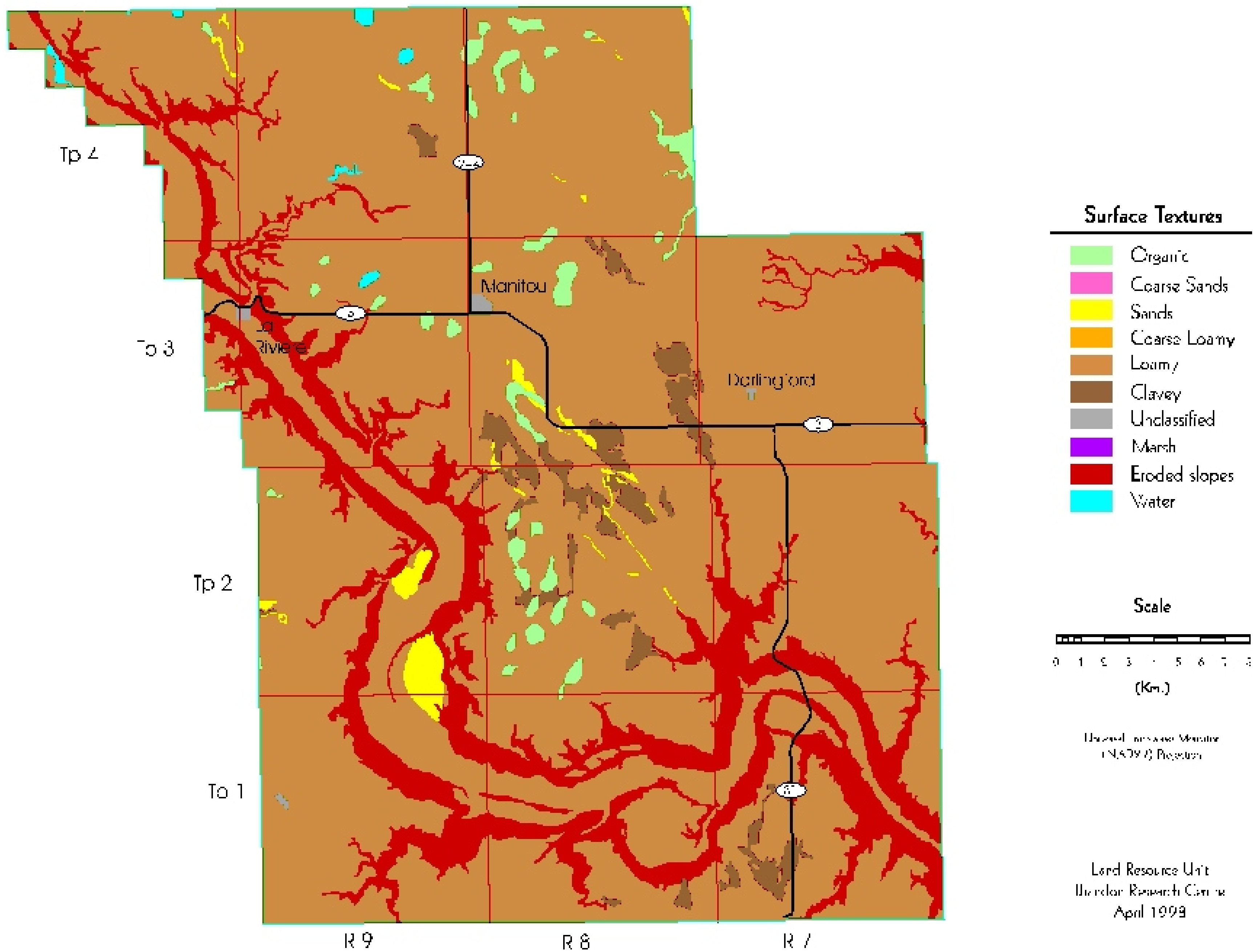
The soil textural class for the upper most soil horizon of the dominant soil series within a soil polygon was utilized for classification. Texture may vary from that shown with soil depth and location within the polygon.

Table 2. Surface Texture[1]

Surface Texture	Area (ha)	Percent of RM
Organics	1792	1.6
Coarse Sands	0	0.0
Sands	1117	1.0
Coarse Loamy	0	0.0
Loamy	91754	81.0
Clayey	2804	2.5
Eroded Slopes	15461	13.6
Marsh	0	0.0
Unclassified	155	0.1
Water	242	0.2
Total	113327	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.

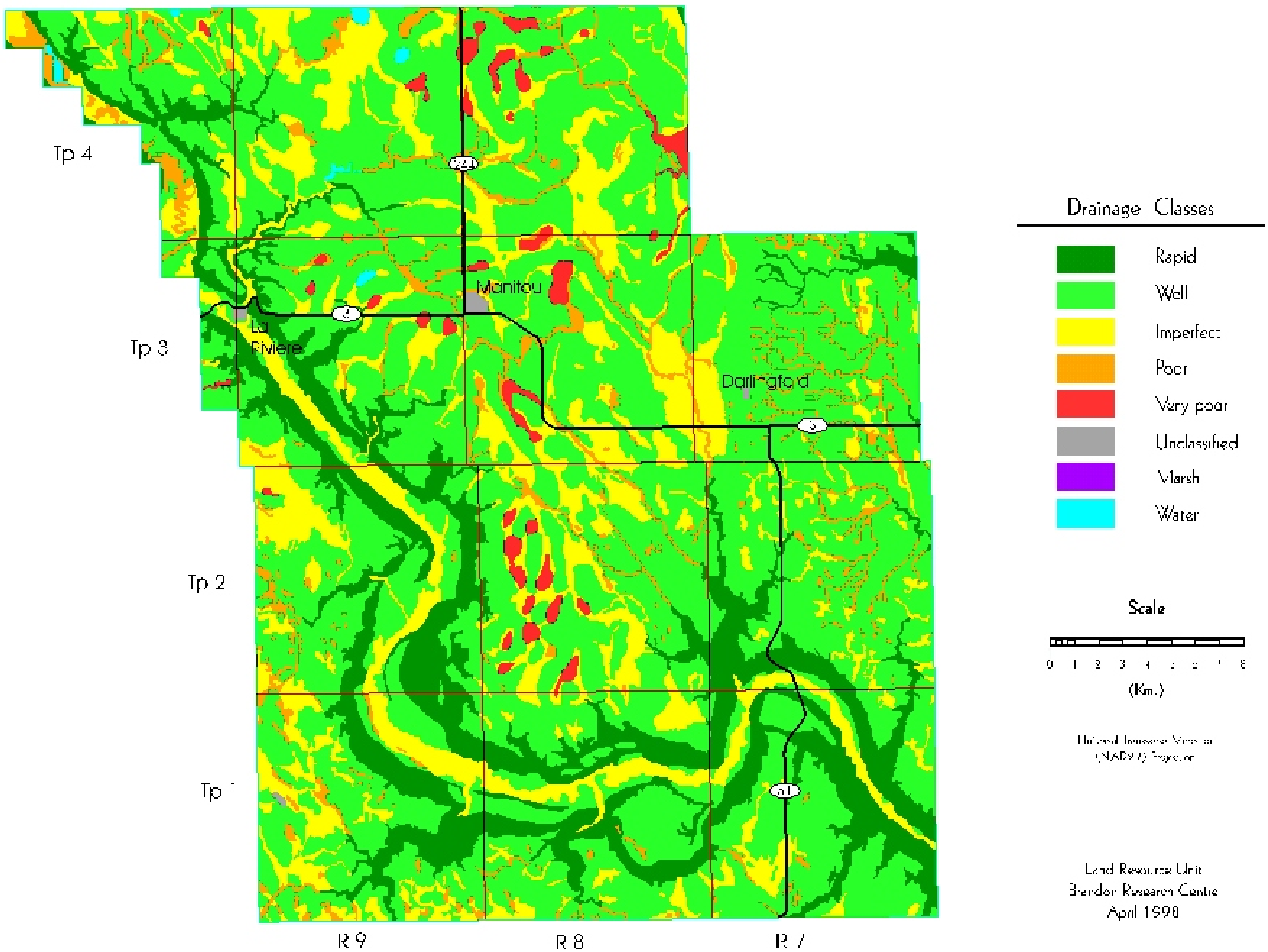
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes[1]

Drainage Class	Area (ha)	Percent of RM
Very Poor	1792	1.6
Poor	5604	4.9
Imperfect	21405	18.9
Well	68187	60.2
Rapid	15942	14.1
Marsh	0	0.0
Unclassified	155	0.1
Water	242	0.2
Total	113327	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.

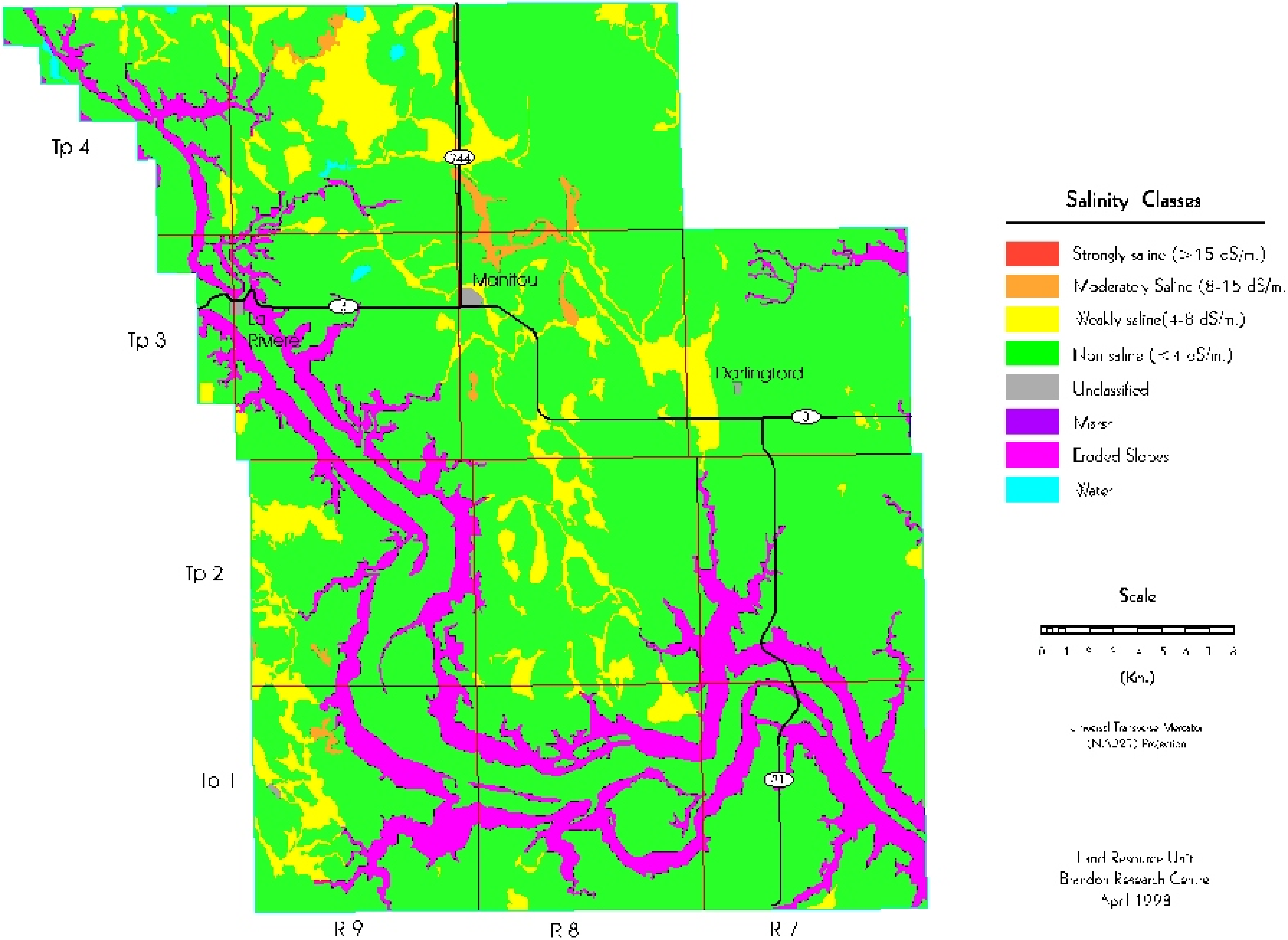
The salinity classification of each individual soil polygon was determined by the most severe salinity classification present within that polygon.

Table 4. Salinity Classes[1]

Salinity Class	Area (ha)	Percent of RM
Non Saline	86156	76.0
Weakly Saline	10447	9.2
Moderately Saline	866	0.8
Strongly Saline	0	0.0
Eroded Slopes	15461	13.6
Marsh	0	0.0
Unclassified	155	0.1
Water	242	0.2
Total	113327	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)**, have 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.

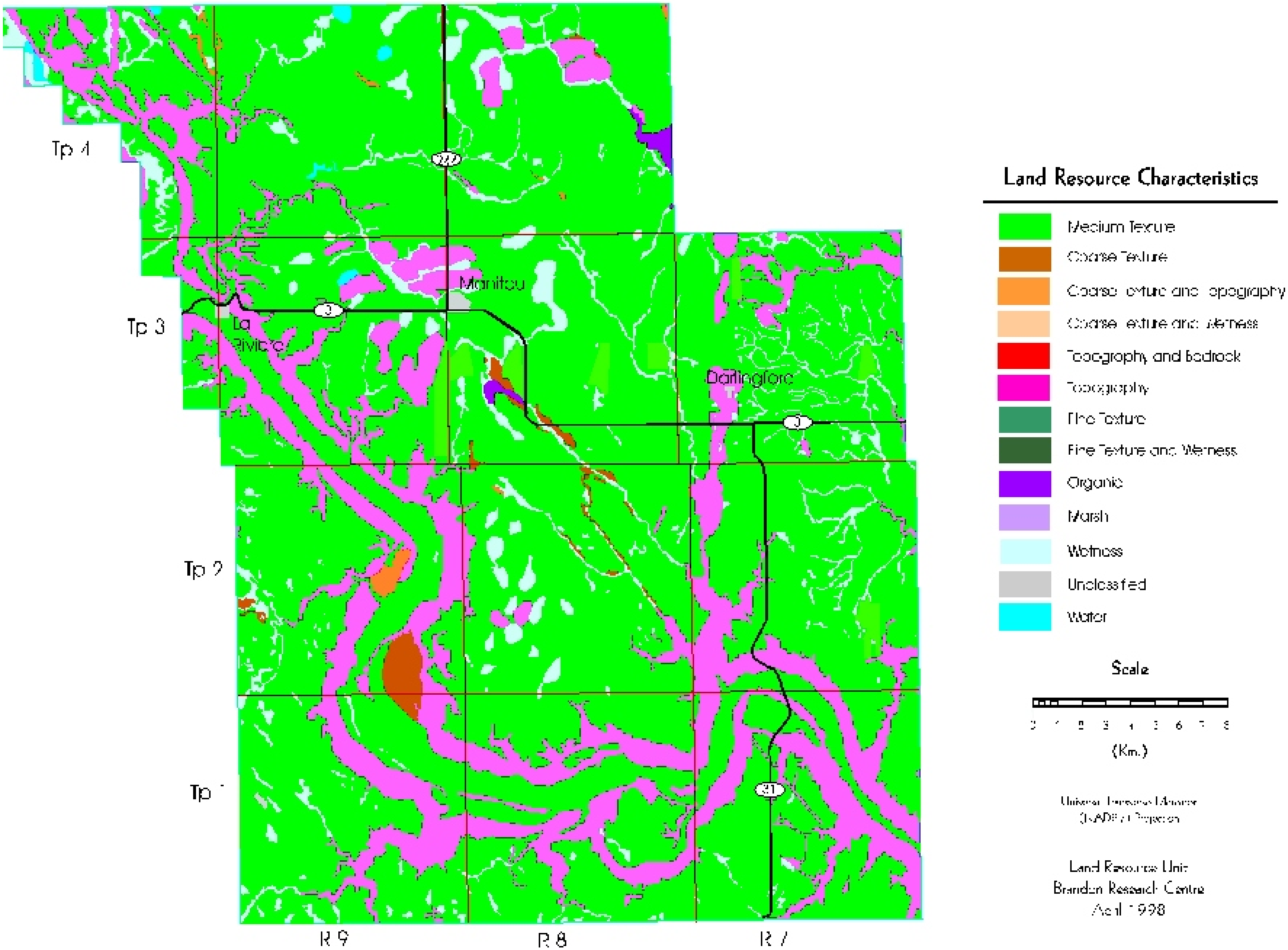
R = Bedrock - soil landscapes that have shallow depth to bedrock (< 50 cm) and/or exposed bedrock which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 5. Management Considerations[1]

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	0	0.0
Fine Texture and Wetness	0	0.0
Fine Texture and Topography	0	0.0
Medium Texture	84309	74.4
Coarse Texture	824	0.7
Coarse Texture and Wetness	0	0.0
Coarse Texture and Topography	294	0.3
Topography	20107	17.7
Topography and Bedrock	0	0.0
Wetness	7142	6.3
Wetness and Topography	0	0.0
Bedrock	0	0.0
Organic	254	0.2
Marsh	0	0.0
Unclassified	155	0.1
Water	242	0.2
Total	113327	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).

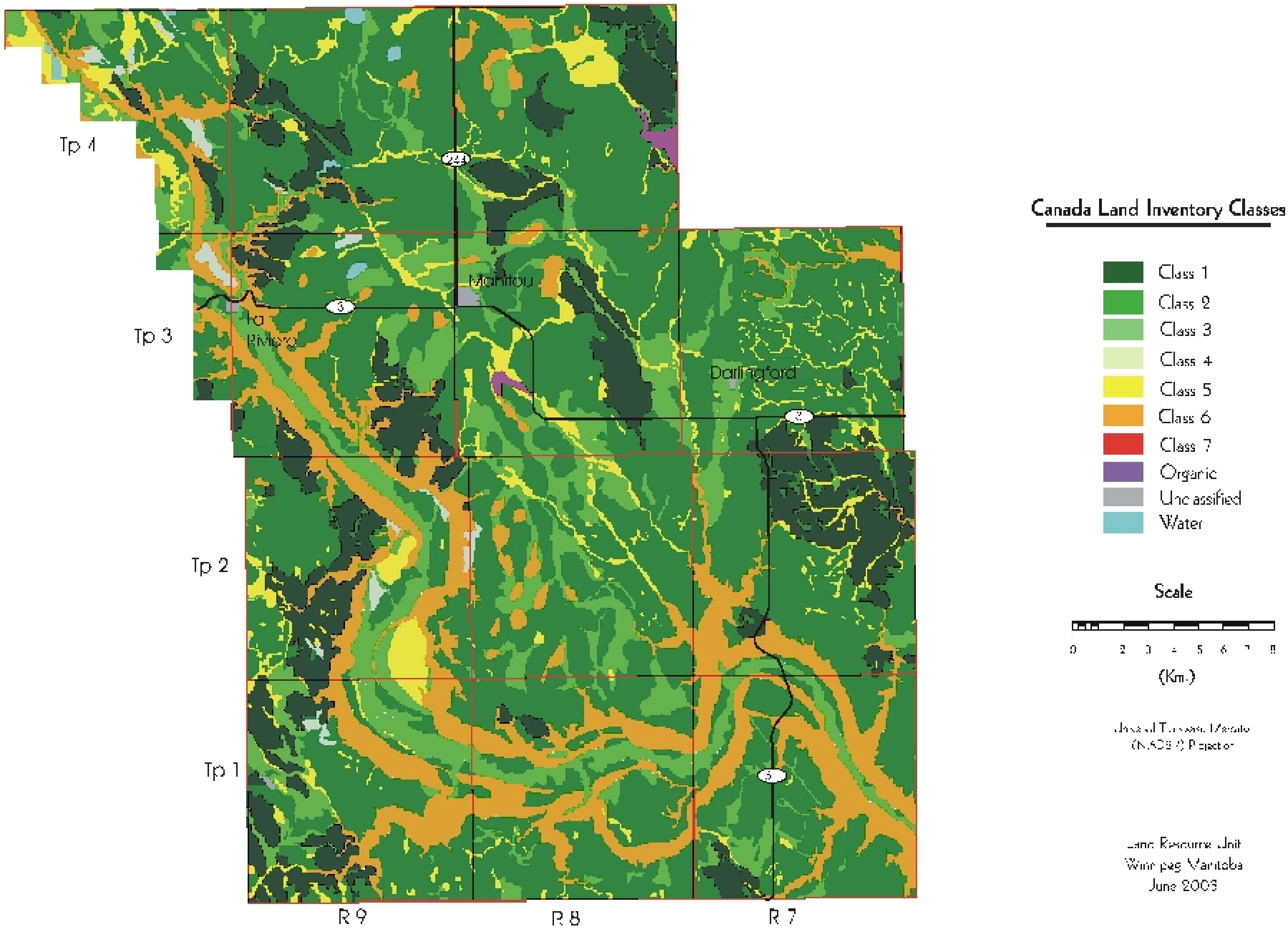
This generalized interpretive map is based on the dominant soil series and phases for each soil polygon. The CLI subclass limitations cannot be portrayed at this generalized map scale.

Table 6. Agricultural Capability[1]

Class Subclass	Area (ha)	Percent of RM
1	**13283**	**11.6**
2	**59640**	**52.1**
2I	1596	1.4
2M	90	0.1
2P	47	0.0
2T	26658	23.3
2TE	7	0.0
2TI	2251	2.0
2TW	48	0.0
2W	10145	8.9
2X	18799	16.4
3	**15796**	**13.8**
3D	2629	2.3
3DN	208	0.2
3I	4115	3.6
3M	92	0.1
3MP	72	0.1
3MT	18	0.0
3N	4246	3.7
3P	402	0.4
3T	3412	3.0
3TE	288	0.3
3TI	314	0.3
4	**808**	**0.7**
4ET	19	0.0
4N	122	0.1
4P	260	0.2
4T	387	0.3
4TE	20	0.0
5	**6943**	**6.1**
5M	1108	1.0
5MP	21	0.0
5T	158	0.1
5W	5044	4.4
5WI	612	0.5
6	**17254**	**15.1**
6P	156	0.1
6T	15542	13.6
6W	1555	1.4
Unclassified	**158**	**0.1**
Water	**243**	**0.2**
Organic	**254**	**0.2**
Total	**114378**	**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.

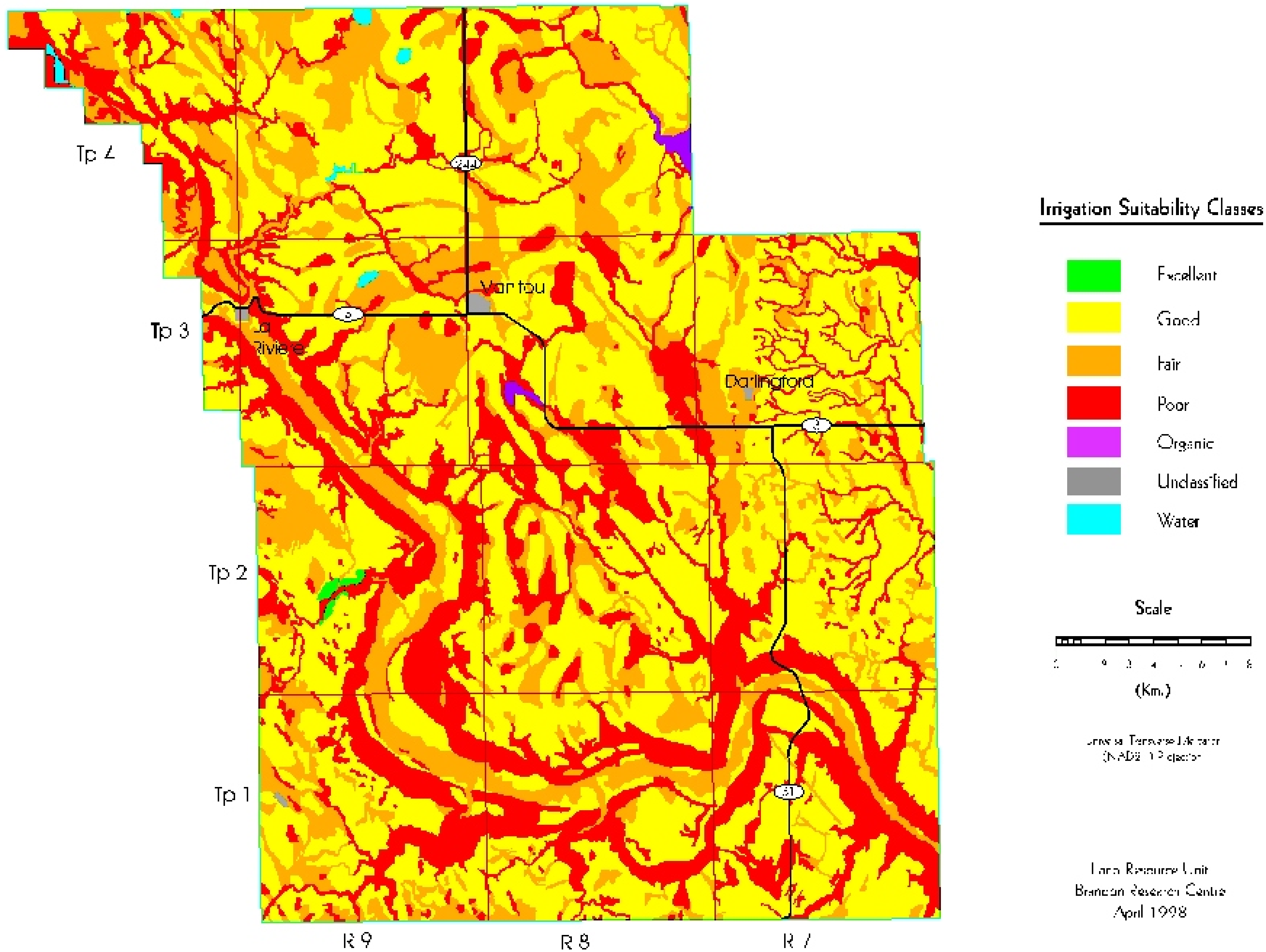
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Irrigation Suitability[1]

Class	Area (ha)	Percent of RM
Excellent	**127**	**0.1**
Good	**65733**	**58.0**
Fair	**19856**	**17.5**
Poor	**26960**	**23.8**
Organic	**254**	**0.2**
Unclassified	**155**	**0.1**
Water	**242**	**0.2**
Total	**113327**	**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 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.

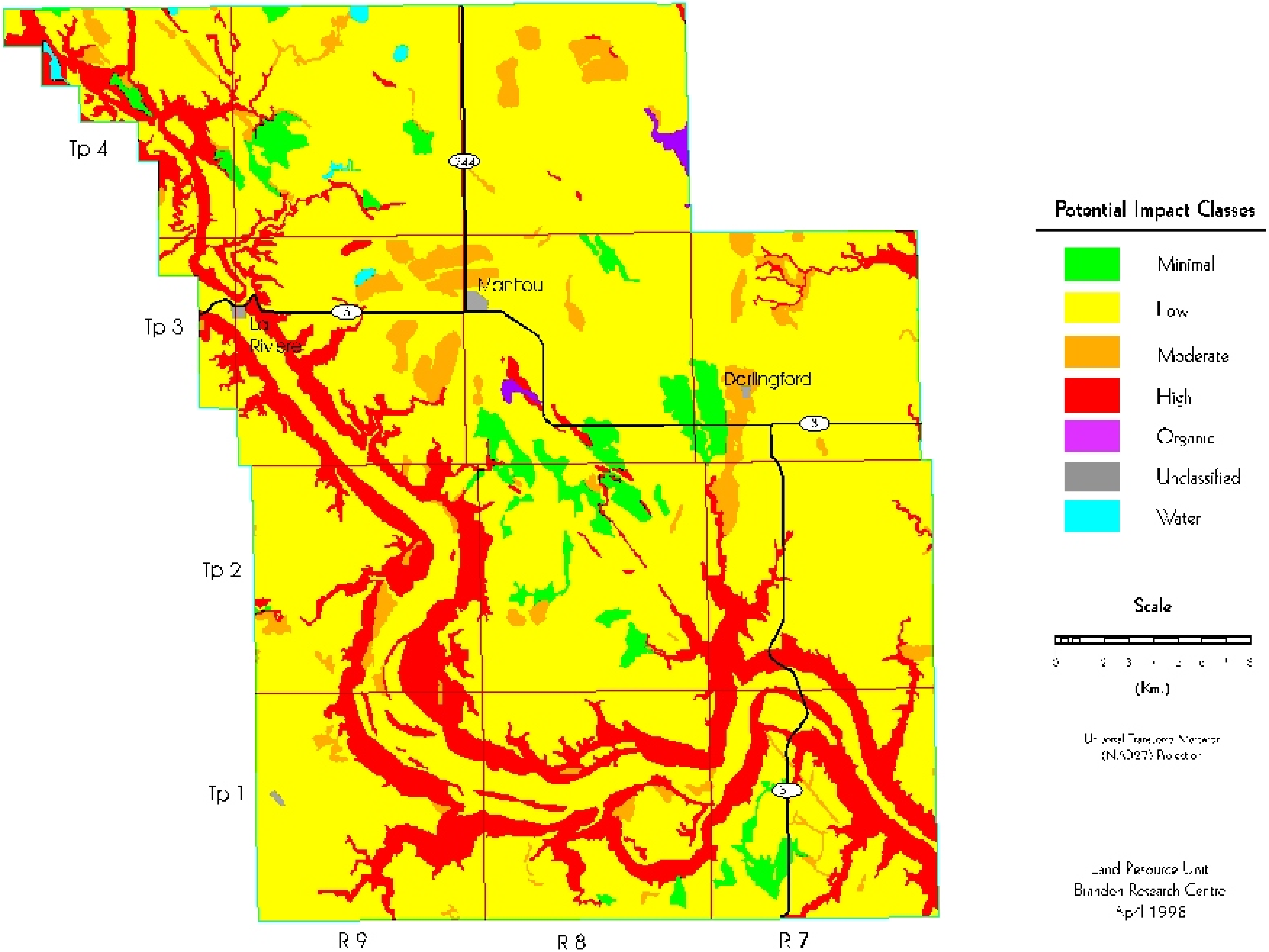
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 8. Potential Environmental Impact Under Irrigation[1]

Class	Area (ha)	Percent of RM
Minimal	**3727**	**3.3**
Low	**86460**	**76.3**
Moderate	**4750**	**4.2**
High	**17739**	**15.7**
Organic	**254**	**0.2**
Unclassified	**155**	**0.1**
Water	**242**	**0.2**
Total	**113327**	**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:

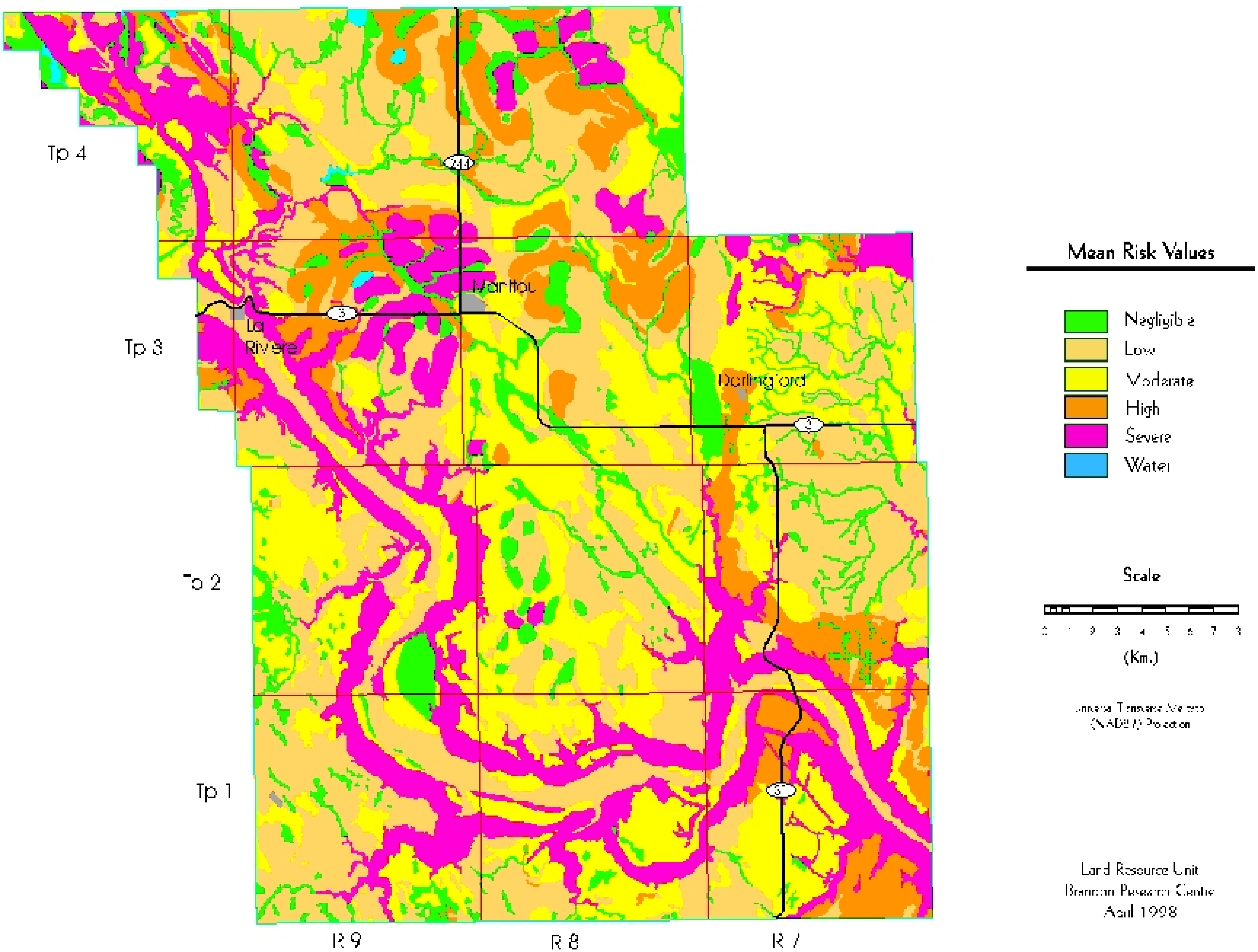
negligible
low
moderate
high
severe.

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

Class	Area (ha)	Percent of RM
Negligible	9837	8.7
Low	39739	35.1
Moderate	29415	26.0
High	12327	10.9
Severe	21612	19.1
Unclassified	155	0.1
Water	242	0.2
Total	113327	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.

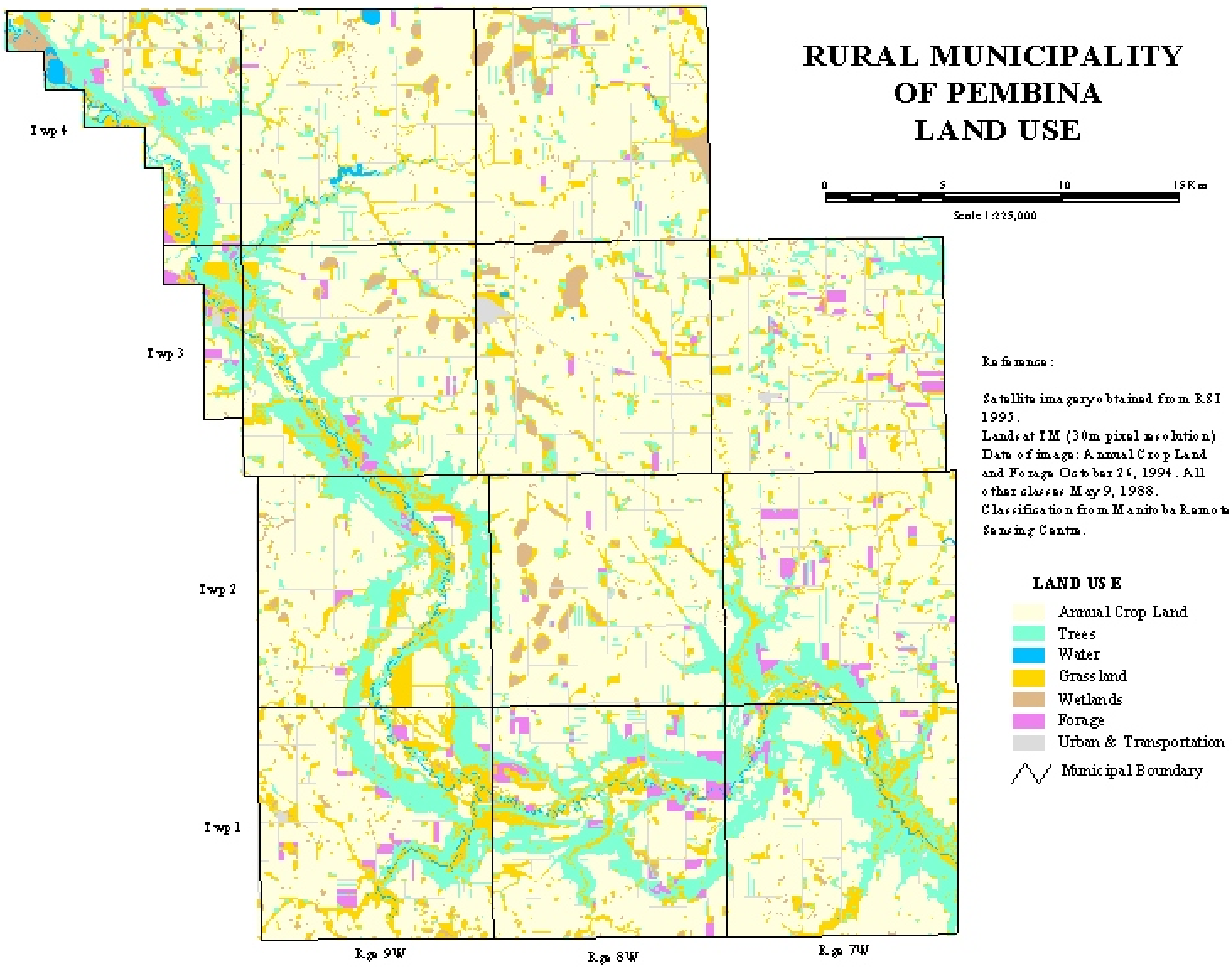
Water - open water - lakes, rivers streams, ponds, and lagoons.

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

Table 10. Land Use[1]

Class	Area (ha)	Percent of RM
Annual Crop Land	76619	66.6
Forage	2238	1.9
Grasslands	12020	10.4
Trees	17423	15.1
Wetlands	2756	2.4
Water	733	0.6
Urban and Transportation	3268	2.8
Total	115057	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 PEMBINA
LAND USE
0
5
10
15 Km
Scale 1:225,000
Twp 4
Twp 3
Twp 2
Twp 1
Rge 9W
Rge 8W
Rge 7W
Reference:
Satellite imagery obtained from RSI 1995.
Landsat TM (30m pixel resolution)
Date of image: Annual Crop Land and Forage October 26, 1994. All other classes May 9, 1988.
Classification from Manitoba Remote Sensing Centre.
LAND USE
Annual Crop Land
Trees
Water
Grassland
Wetlands
Forage
Urban & Transportation
Municipal Boundary

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