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Rural Municipality of Bifrost


Information Bulletin 99-17

Soils and Terrain

An introduction
to the land resource

Land Resource Unit
Brandon Research Centre



Canada 

Rural Municipality of Bifrost

Information Bulletin 99-17

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 Bifrost. Information Bulletin 99-17, 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.

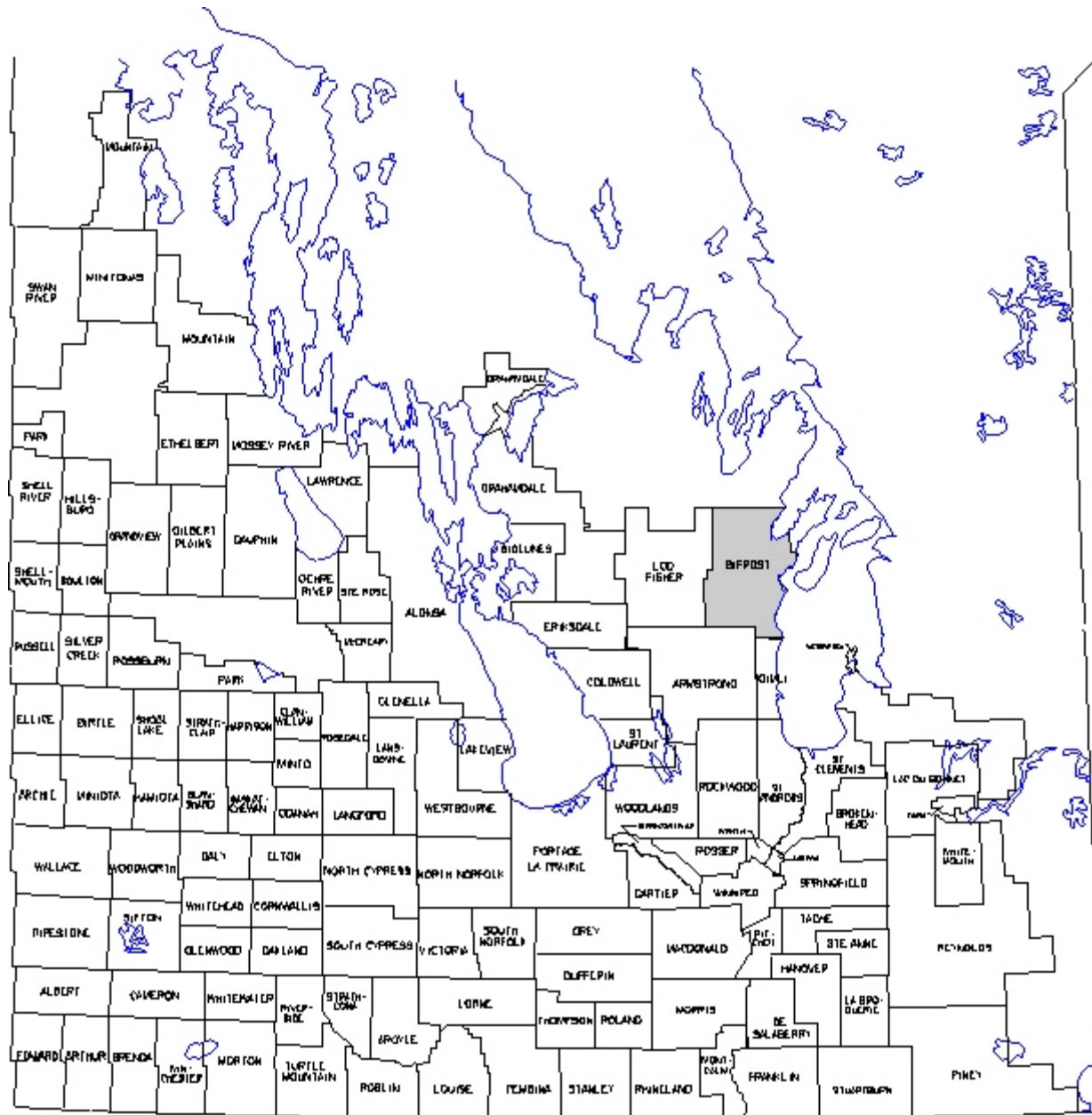


Figure 1. Rural municipalities of southern Manitoba.

INTRODUCTION

The location of the Rural Municipality of Bifrost 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.

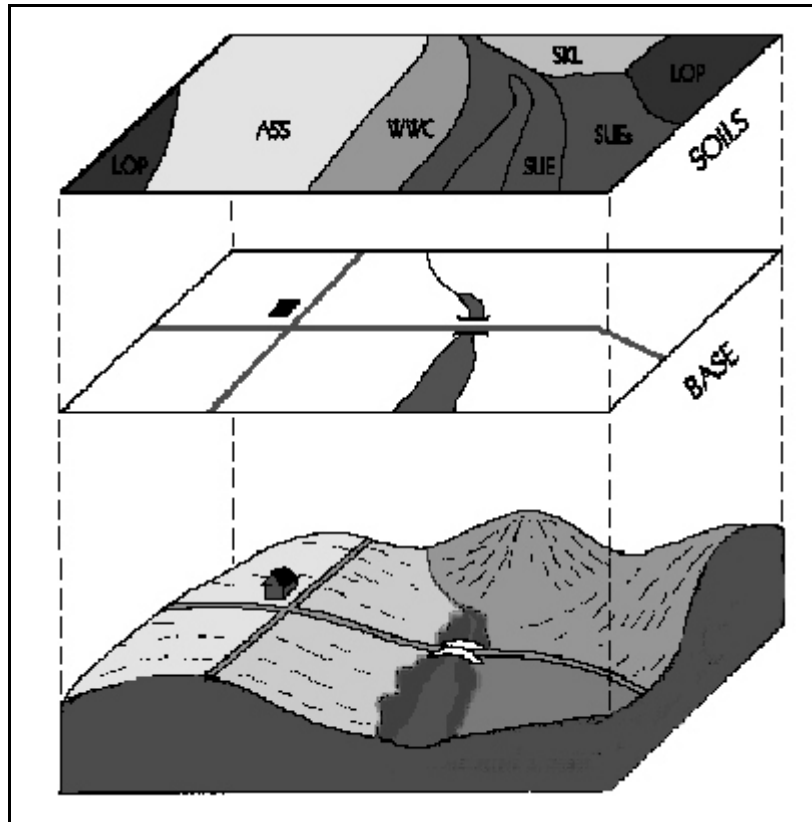


Figure 2. Soil and Base Map data.

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 Bifrost covers an area of 165 486 ha (approximately 18 townships) located on the west shore of Lake Winnipeg in the central Interlake District (page 3). Arborg and Riverton are the largest population and service centres. Part of the Moose Creek Provincial Forest is situated along the northern boundary of the municipality.

The climate in the southern part of the area can be related to weather data from Arborg. The mean annual temperature is 0.9°C and the mean annual precipitation is 491 mm (Environment Canada, 1993). The average frost-free period is 103 days and degree-days above 5°C accumulated from May to September average 1495 (Ash, 1991). The growing season is expected to be slightly cooler and shorter in the northern portion of the area. An evaluation of growing conditions in this region of Manitoba can be related to estimates of seasonal moisture deficit and effective growing degree-days (EGDD) above 5°C. The seasonal moisture deficit calculated between May and September is close to 200 mm and the estimated effective growing degree-days accumulated from May to September range from 1350 in the south to 1300 to 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 eastern portion of the municipality is in the Icelandic River Lowland while the northwestern area is in the Fisher River Plain. A small part of the Lake Winnipeg Terrace touches the southeast corner and part of the Interlake Plain occurs in the southwest corner of the municipality (Canada-Manitoba Soil Survey, 1980). Elevations in the municipality vary from 248 metres above sea level (m asl) in the southwest corner to 214 m asl on Lake Winnipeg. The land surface slopes gradually to the east at a rate of about 1 m/km (5 ft/mi). Relief is generally under 3 metres and slopes are less than 2 percent although local areas with slopes of 2

to 5 percent are common in the Fisher River Plain (page 9). Natural drainage toward Lake Winnipeg is provided by the Icelandic River and its tributaries although surface drainage in much of the area is poorly developed. Low-lying terrain adjacent to Lake Winnipeg is very poorly drained and subject to flooding when lake levels are high. Portions of this shoreline are protected from flooding by a system of dikes. Drainage of the level clayey soils around Arborg and Riverton and near Lake Winnipeg has been enhanced by ditches to assist in removal of surface waters for agriculture.

Soil materials in the municipality were deposited during the last glaciation and during the time of glacial Lake Agassiz. The Icelandic River Lowland is a level to depressional area of clayey to loamy lacustrine deposits whereas the Fisher River Plain consists of shallow lacustrine materials underlain by glacial till. The Interlake Plain is a gently undulating and ridged area of extremely calcareous, very stony, waterworked, loamy glacial till. Local outcrops of this till occur throughout the municipality (page 11). The generally flat topography throughout the area results in the majority of soils being classified as imperfectly to poorly and very poorly drained (page 13).

Soils in the municipality have been mapped at a reconnaissance level and published at a 1:100 000 scale in the soil survey report for the Fisher-Teulon map sheet areas (Pratt et al., 1961) and at a 1:126 720 scale for the Red Rose-Washow Bay area (Smith et al., 1975). Detailed 1:20 000 scale map information is available for small areas around Arborg and Riverton (Podolsky, 1982). According to the Canadian System of Soil Classification (Expert Committee on Soil Survey, 1998), Dark Gray Chernozem soils develop on well to imperfectly drained clayey materials and thin Brunisolic soils and Dark Gray Chernozems develop on calcareous glacial till are dominant. Humic Gleysol soils, many with a thin surface layer of peat, occupy poorly drained areas in the landscape. Very poorly drained organic soils occur in larger depressional areas near Lake Winnipeg (page 11).

Major management considerations are related to clayey soil texture, wetness and organic soils (page 15). Seasonal high water tables (at 1 to 2 metres) and saturated soils are common. Surface water ponds in poorly drained depressional areas and organic terrain. Moderately to excessively stony conditions are associated with the till soils and beach deposits throughout the area. Soils in the area are generally non-saline although weak salinity occurs in lower-lying clayey soils in the Icelandic River Lowland.

Imperfectly drained clayey soils rated in **Class 2** for agricultural capability occupy 14 percent of the municipality while 33 percent of the soils are rated as **Class 3** due to adverse soil structure, stoniness and wetness. Four percent of the area is rated in **Class 5** due to droughtiness, stoniness and excess wetness. **Class 6** soils affected by excessive wetness occupy 3 percent of the area and **Class 7** soils characterized by a shallow depth to bedrock or very poor drainage occupy 2.6 percent of the area. Organic soils with very limited capability for agriculture in their native state cover 27 percent of the area (page 17). The irrigation suitability of soils in this municipality varies from **Fair** (20 percent) to **Poor** (53 percent). The organic soils are not rated for irrigation (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 potential for adverse impact is mainly **Minimal** and **Low**. Local areas of poorly drained clayey soils underlain by permeable silty subsoil, areas of bedrock close to the surface and marsh areas which may receive runoff from adjacent uplands are rated as a **High** potential risk. 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. About 79 percent of the land in the municipality is at a **Negligible** risk of degradation due to water erosion and 18 percent of the area consisting of very gently undulating imperfectly drained clay is considered to have a **Low** potential risk. Current management practices focus on maintaining sufficient crop residues and surface cover to adequately protect the soils from both wind and water erosion.

Although agriculture is a major land use in the RM of Bifrost extensive areas are utilized for forestry and wildlife. An assessment of the status of land use in 1994 obtained through an analysis of satellite imagery showed that cultivated land for production of annual crops (36 percent of the area) and forage crops (0.6 percent of the area) is concentrated mainly in the southern half of the municipality. Grassland areas occupying 23 percent of the land area and treed areas covering 21 percent provide forage and grazing capacity as well as wildlife habitat and opportunity for recreation activities. Wetlands and organic soils covering 16 percent of the area provide wildlife habitat and recreation potential. Various non-agricultural uses such as infrastructure for urban areas, transportation and recreation occupy nearly 2 percent of the municipality (page 25).

The majority of soils utilized for agriculture in the RM of Bifrost have moderate to moderately severe limitations for arable agriculture. The extensive area of clay textured soils require management practices which maintain adequate surface drainage, soil structure and tilth. This includes incorporation of crop residues into the soil and use of minimum tillage practices and crop rotations which include forages. A major portion of the municipality has low relief and a dominance of imperfectly to poorly and very poorly drained soils which are frequently saturated and subject to surface ponding, particularly during spring runoff or following heavy rains. Consequently, improvement and maintenance of water management infrastructure 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.

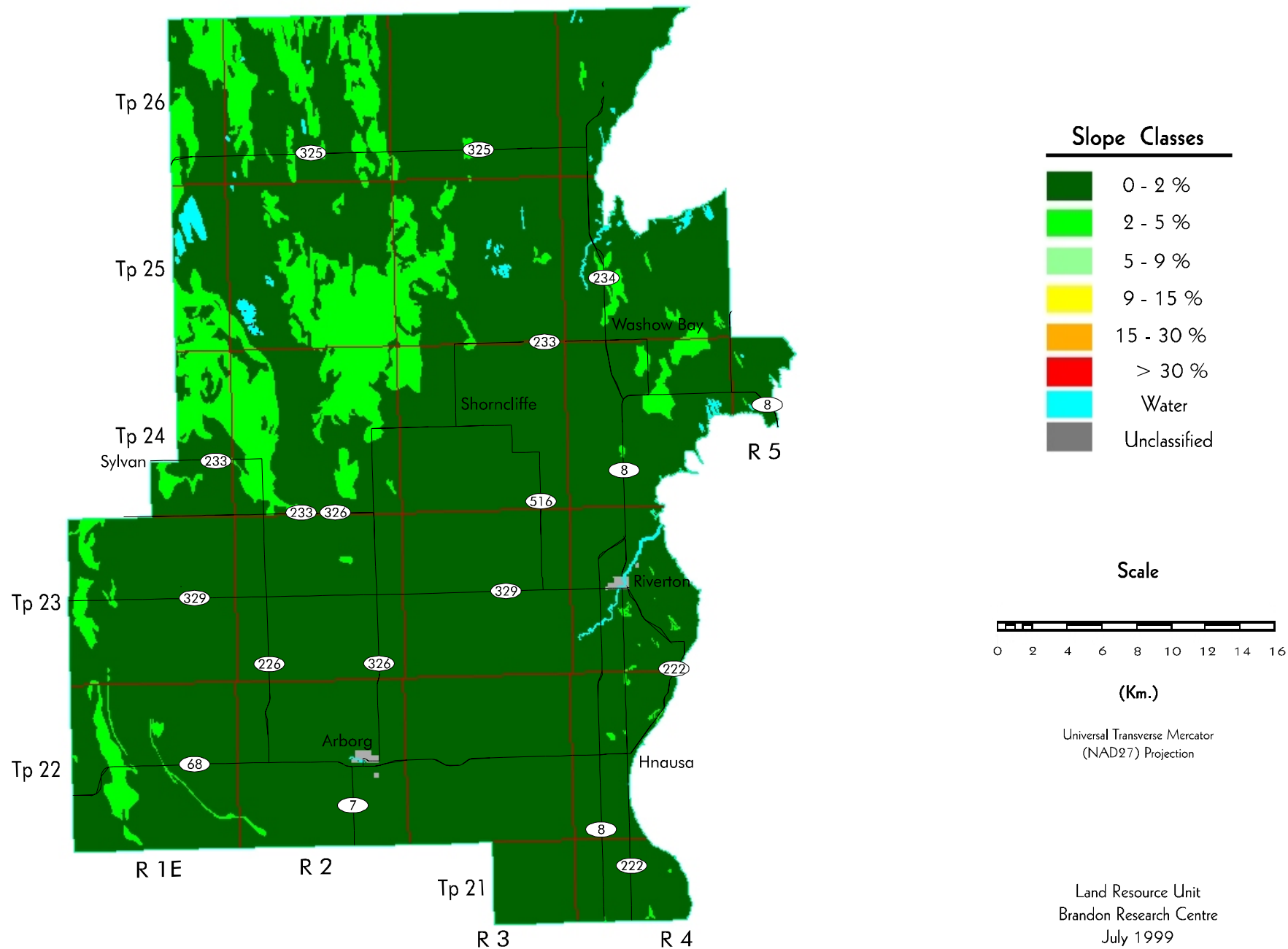
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area,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

Table 1. Slope Classes¹

Slope Class	Area (ha)	Percent of RM
0 - 2 %	145037	87.6
2 - 5 %	19554	11.8
5 - 9 %	0	0.0
9 - 15 %	0	0.0
15 - 30 %	0	0.0
> 30 %	0	0.0
Unclassified	186	0.1
Water	708	0.4
Total	165486	100.0

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

Slope Map



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.

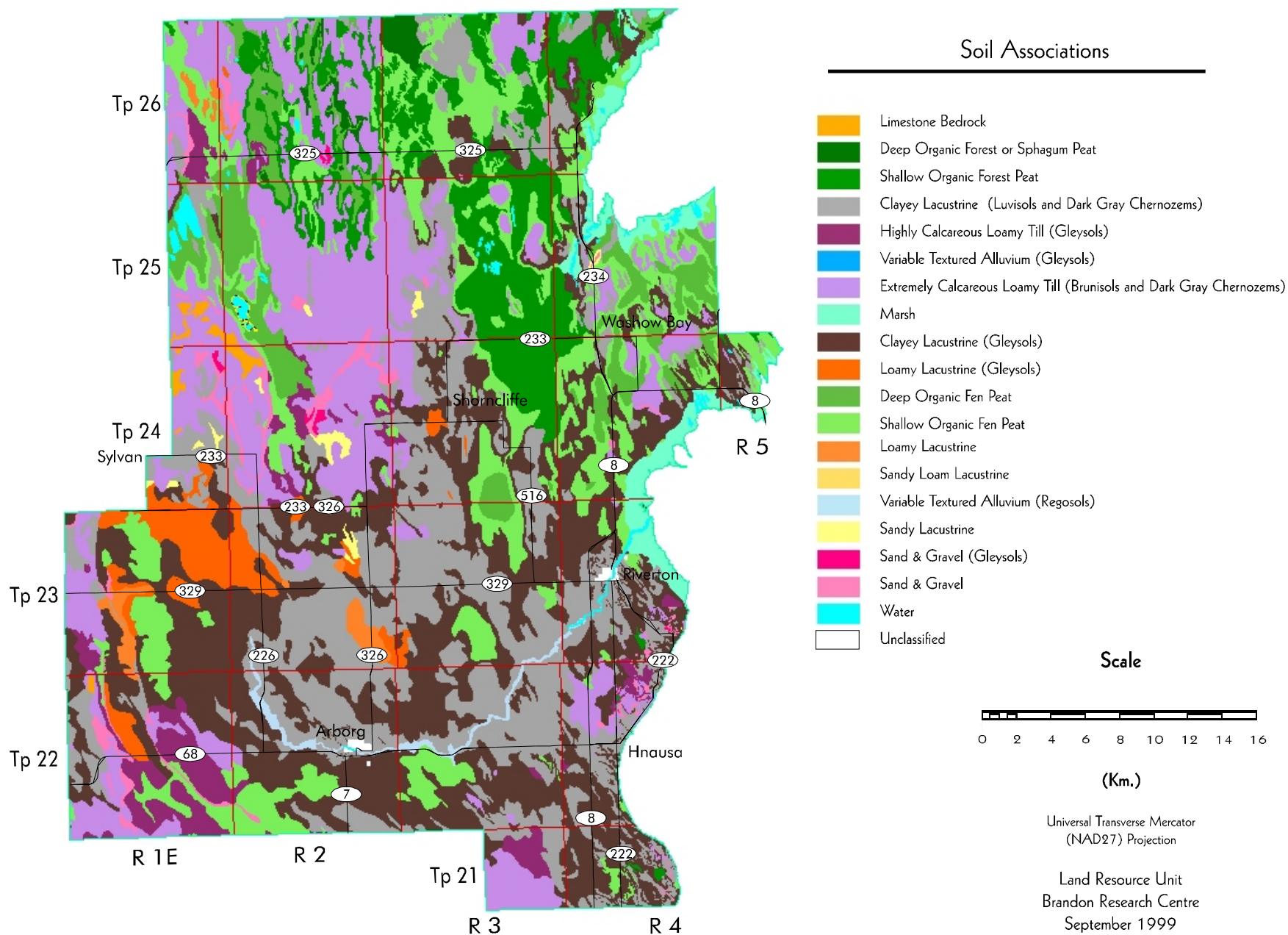
More detailed maps showing the dominant and subdominant soils in each polygon can also be produced at larger map scales.

Table 2. Generalized Soil Groups¹

Soil Groups	Area (ha)	Percent of RM
Limestone Bedrock	594	0.4
Deep Organic Forest or Sphagnum Peat	1084	0.7
Shallow Organic Forest Peat	13850	8.4
Clayey Lacustrine	34194	20.7
(Luvisols and Dark Gray Chernozems)		
Highly Calcareous Loamy Till (Gleysols)	5305	3.2
Variable Textured Alluvium (Gleysols)	4	0.0
Extremely Calcareous Loamy Till	28555	17.3
(Brunisols and Dark Gray Che		
Marsh	3621	2.2
Clayey Lacustrine (Gleysols)	38097	23.0
Loamy Lacustrine (Gleysols)	4426	2.7
Deep Organic Fen Peat	8398	5.1
Shallow Organic Fen Peat	21371	12.9
Loamy Lacustrine	1336	0.8
Sandy Loam Lacustrine	1	0.0
Variable Textured Alluvium (Regosols)	794	0.5
Sandy Lacustrine	560	0.3
Sand and Gravel (Gleysols)	179	0.1
Sand and Gravel	2223	1.3
Water	708	0.4
Unclassified	186	0.1
Total	165486	100.0

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

Generalized Soil 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. 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.

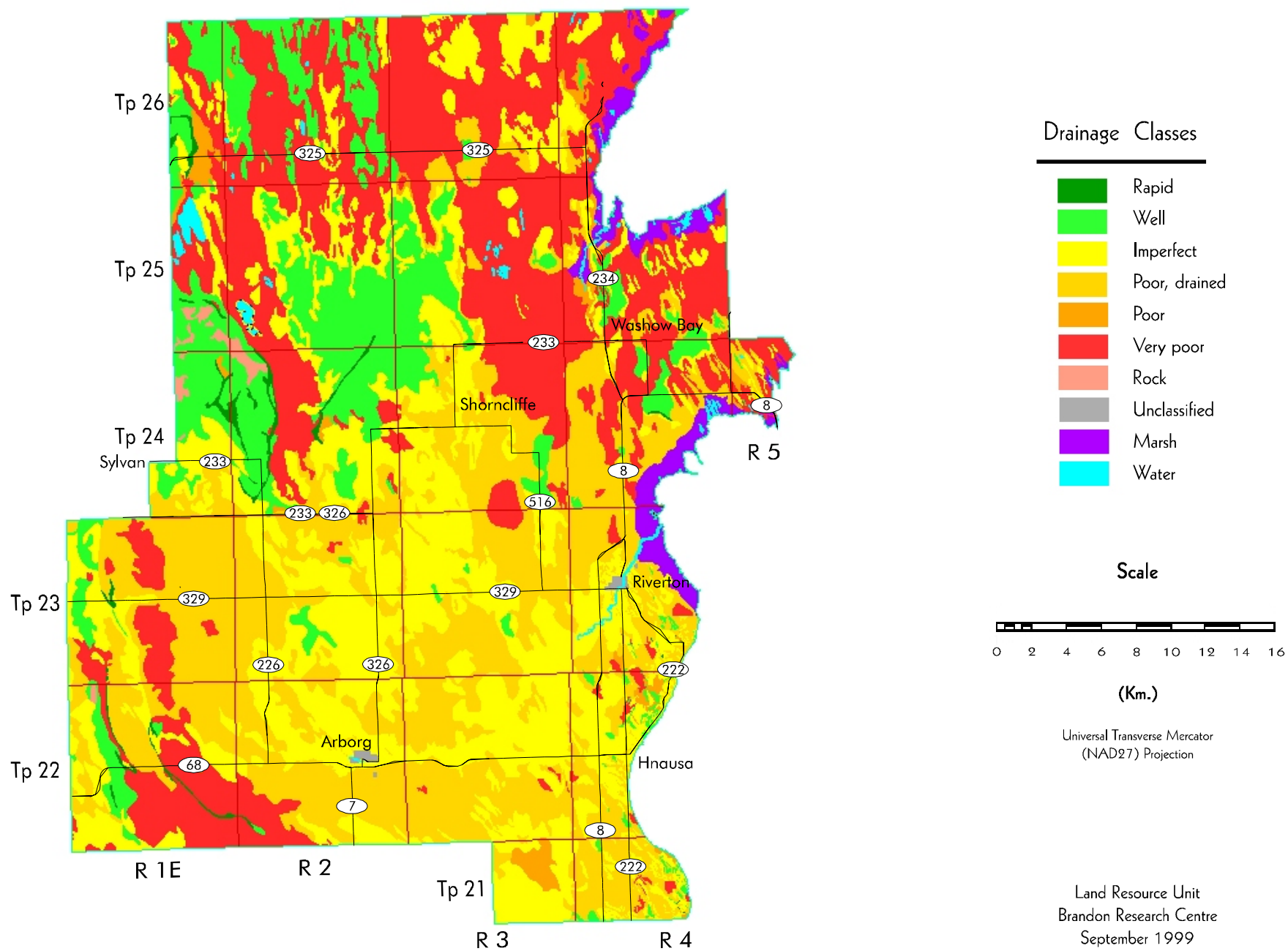
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes¹

Drainage Class	Area (ha)	Percent of RM
Very Poor	44734	27.0
Poor	2102	1.3
Poor, drained	45877	27.7
Imperfect	45717	27.6
Well	20917	12.6
Rapid	1029	0.6
Rock	594	0.4
Marsh	3621	2.2
Unclassified	186	0.1
Water	708	0.4
Total	165486	100.0

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

Soil Drainage 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.

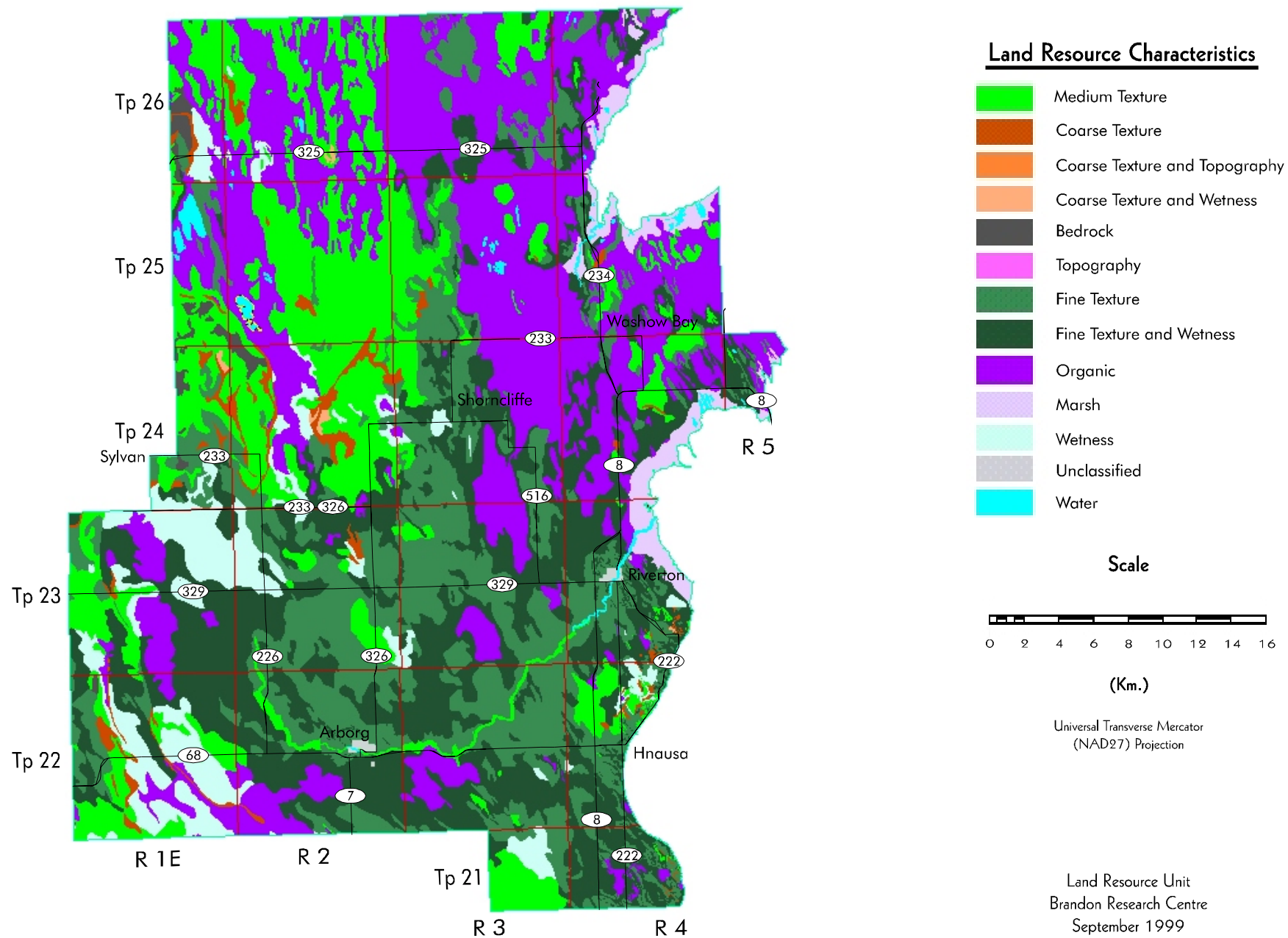
R = Bedrock - soil landscapes that have **shallow depth to bedrock (< 50 cm) and/or exposed bedrock** which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 4. Management Considerations¹

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	34083	20.6
Fine Texture and Wetness	38097	23.0
Fine Texture and Topography	0	0.0
Medium Texture	30300	18.3
Coarse Texture	2783	1.7
Coarse Texture and Wetness	179	0.1
Coarse Texture and Topography	0	0.0
Topography	0	0.0
Bedrock	1092	0.7
Wetness	9734	5.9
Organic	44704	27.0
Marsh	3621	2.2
Unclassified	186	0.1
Water	708	0.4
Total	165486	100.0

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

Management Considerations Map



Agricultural Capability Map.

This evaluation utilizes the 7 class Canada Land Inventory system (CLI, 1965). Classes 1 to 3 represent the prime agricultural land, class 4 land is marginal for sustained cultivation, class 5 land is capable of perennial forages and improvement is feasible, class 6 land is capable of producing native forages and pasture but improvement is not feasible, and class 7 land is considered unsuitable for dryland agriculture. Subclass 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 Capability¹

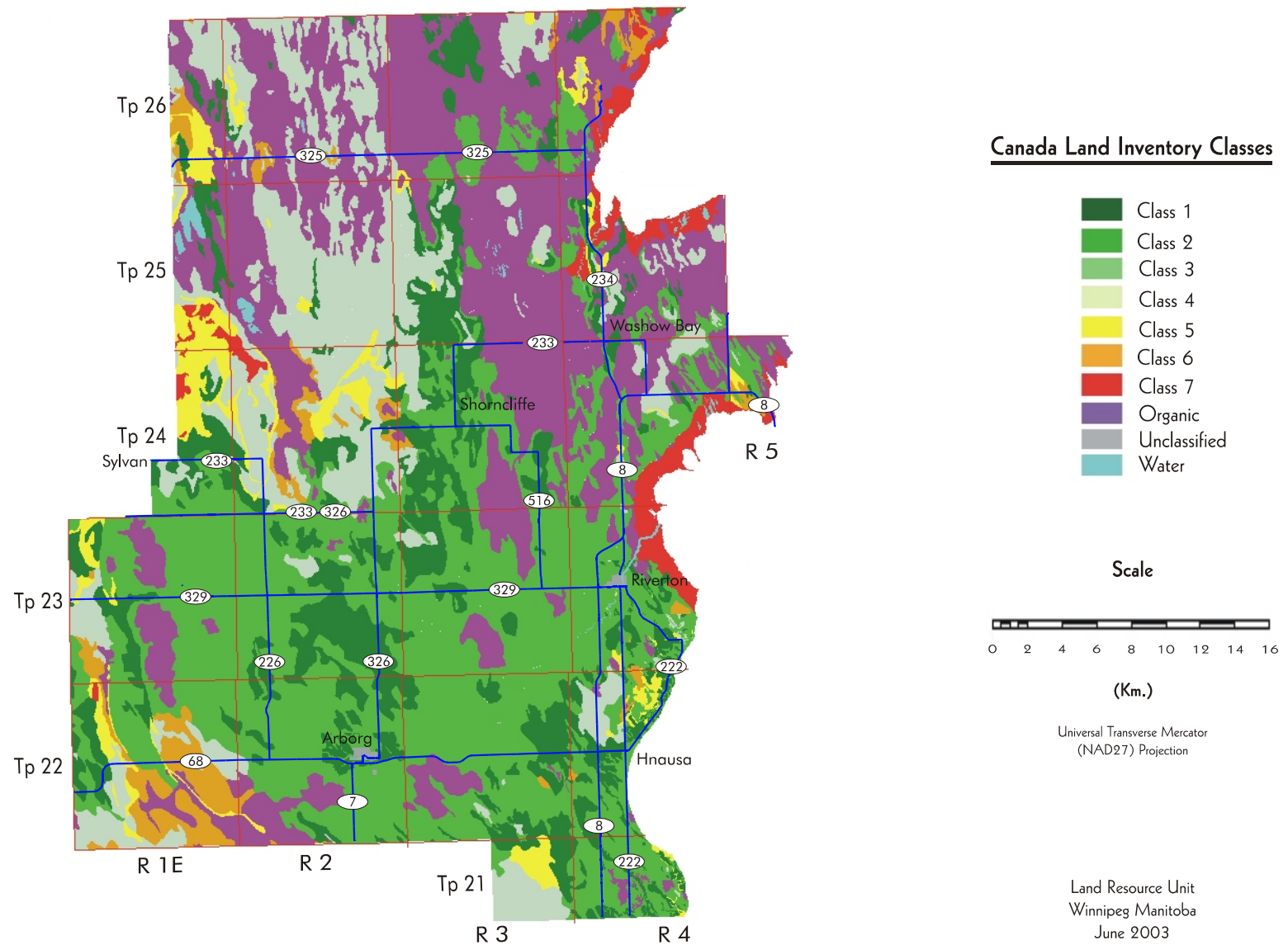
Class Subclass	Area (ha)	Percent of RM
2	23109	14.0
2D	2103	1.3
2DP	14	0.0
2MP	445	0.3
2TD	41	0.0
2TW	7	0.0
2W	20326	12.3
2WP	175	0.1
3	54953	33.3
3D	12751	7.7
3DN	50	0.0

Table 5. Agricultural Capability¹(cont.)

Class Subclass	Area (ha)	Percent of RM
3I	794	0.5
3M	55	0.0
3P	106	0.1
3W	41121	24.9
3X	76	0.0
4	25886	15.7
4DP	25746	15.6
4M	68	0.0
4P	7	0.0
4R	65	0.0
5	6284	3.8
5M	2213	1.3
5P	2121	1.3
5W	1946	1.2
5WI	4	0.0
6	5294	3.2
6P	386	0.2
6W	4907	3.0
7	4215	2.6
7R	593	0.4
7W	3622	2.2
Unclassified	188	0.1
Water	701	0.4
Organic	44622	27.0
Total	165252	100.0

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

Agriculture Capability Map



Irrigation Suitability Map.

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

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

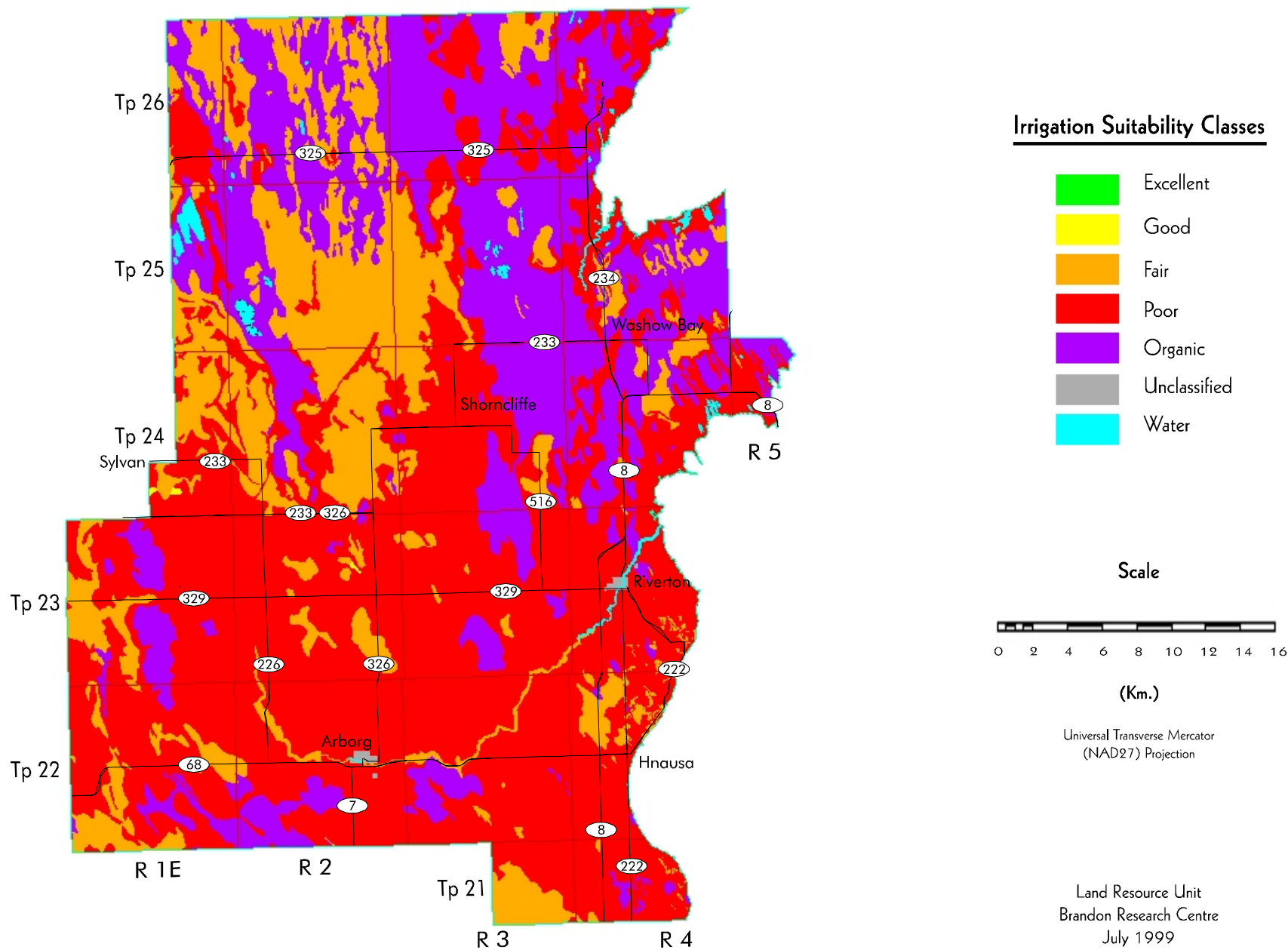
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 6. Irrigation Suitability¹

Class	Area (ha)	Percent of RM
Excellent	0	0.0
Good	55	0.0
Fair	33003	19.9
Poor	86830	52.5
Organic	44704	27.0
Unclassified	186	0.1
Water	708	0.4
Total	165486	100.0

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

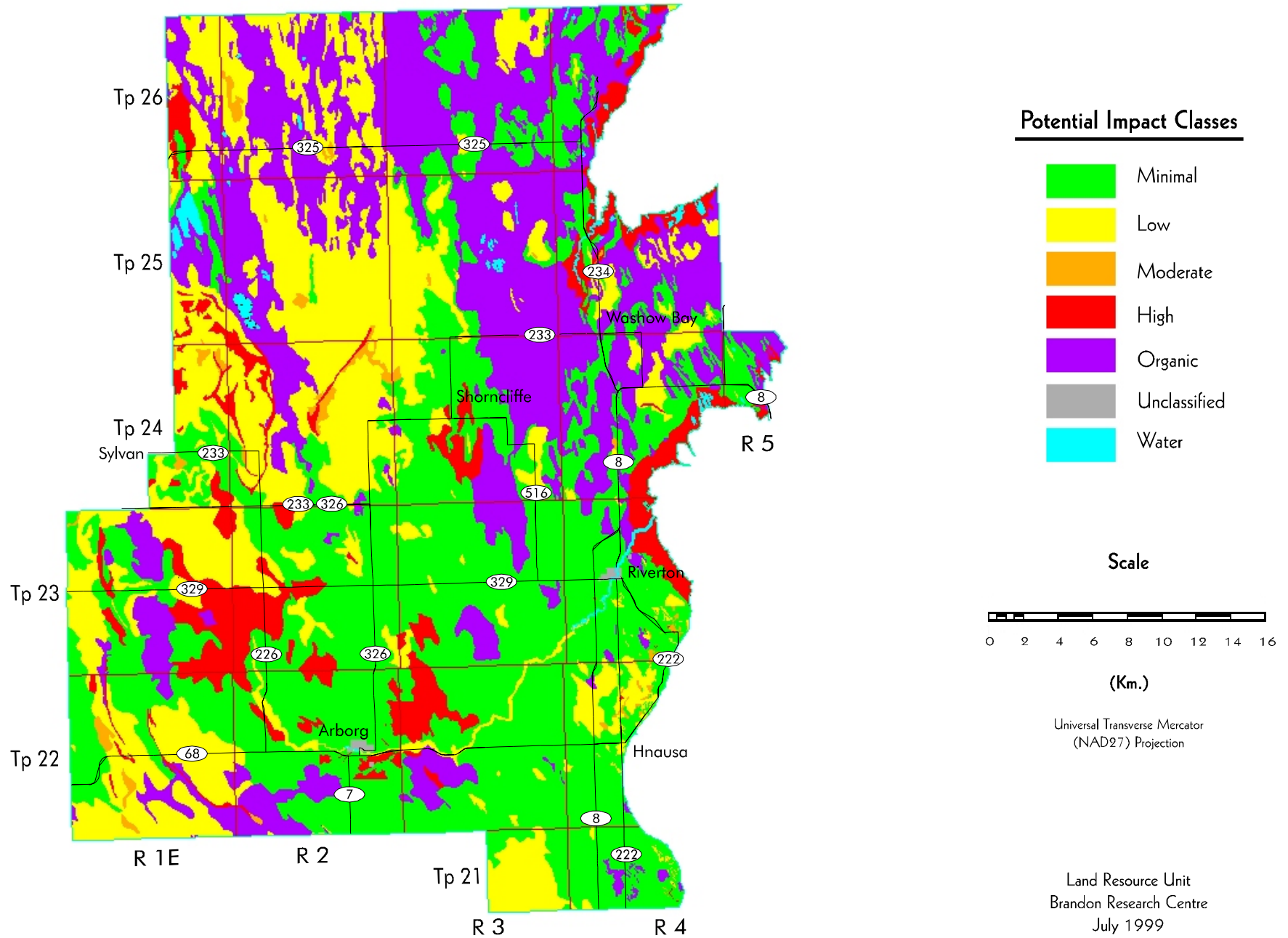
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Potential Environmental Impact Under Irrigation¹

Class	Area (ha)	Percent of RM
Minimal	63955	38.6
Low	41718	25.2
Moderate	1453	0.9
High	12767	7.7
Organic	44699	27.0
Unclassified	186	0.1
Water	708	0.4
Total	165486	100.0

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

Potential Environmental Impact Under Irrigation



Water Erosion Risk Map.

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

negligible
low
moderate
high
severe

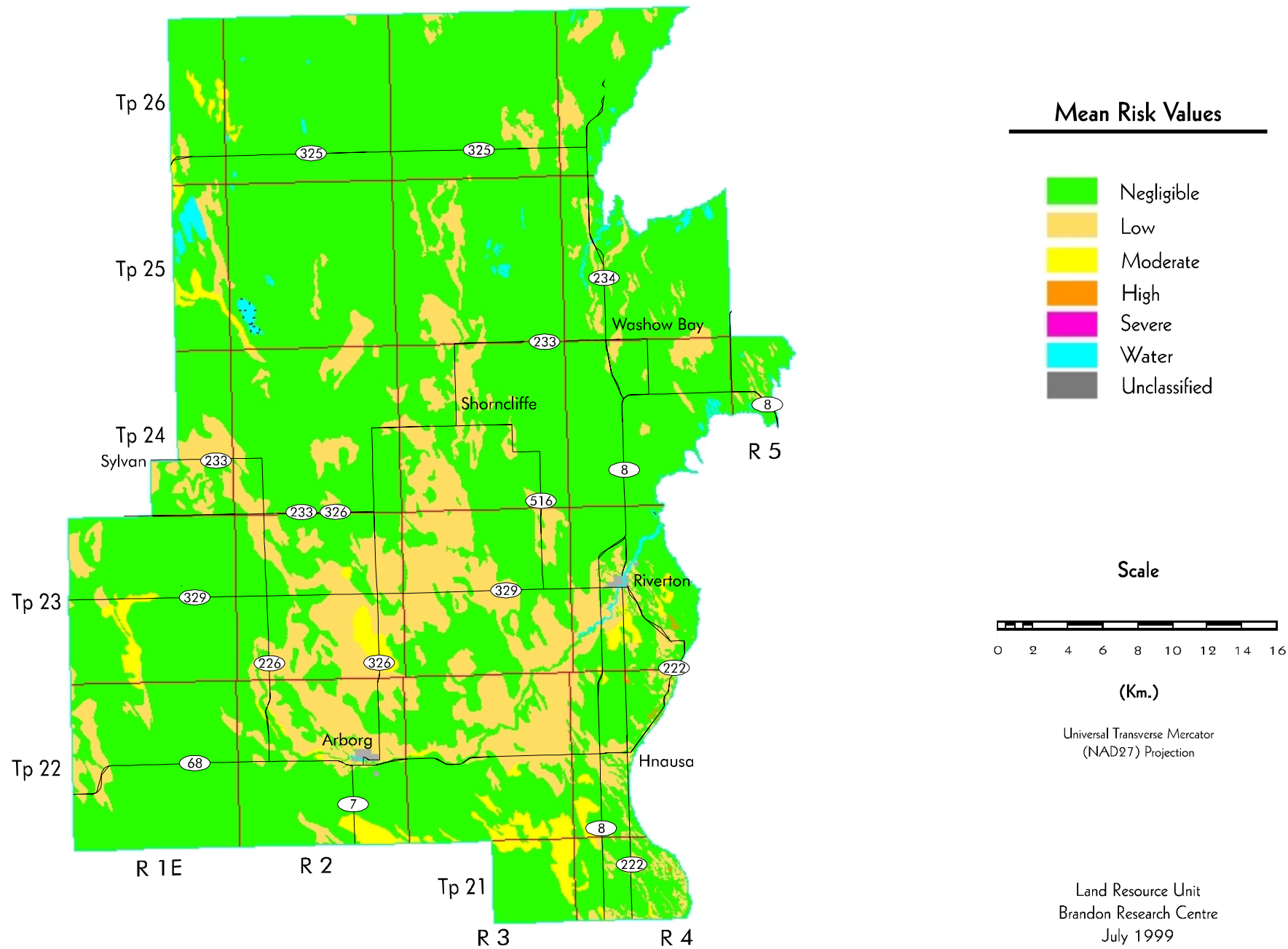
Cropping and residue management practices will significantly reduce this risk depending on crop rotation program, soil type, and landscape features.

Table 8. Water Erosion Risk¹

Class	Area (ha)	Percent of RM
Negligible	130288	78.7
Low	29897	18.1
Moderate	4344	2.6
High	63	0.0
Severe	0	0.0
Unclassified	186	0.1
Water	708	0.4
Total	165486	100.0

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

Water Erosion Risk Map



Land Use Map.

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

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

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

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

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

Trees - lands that are primarily in tree cover.

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

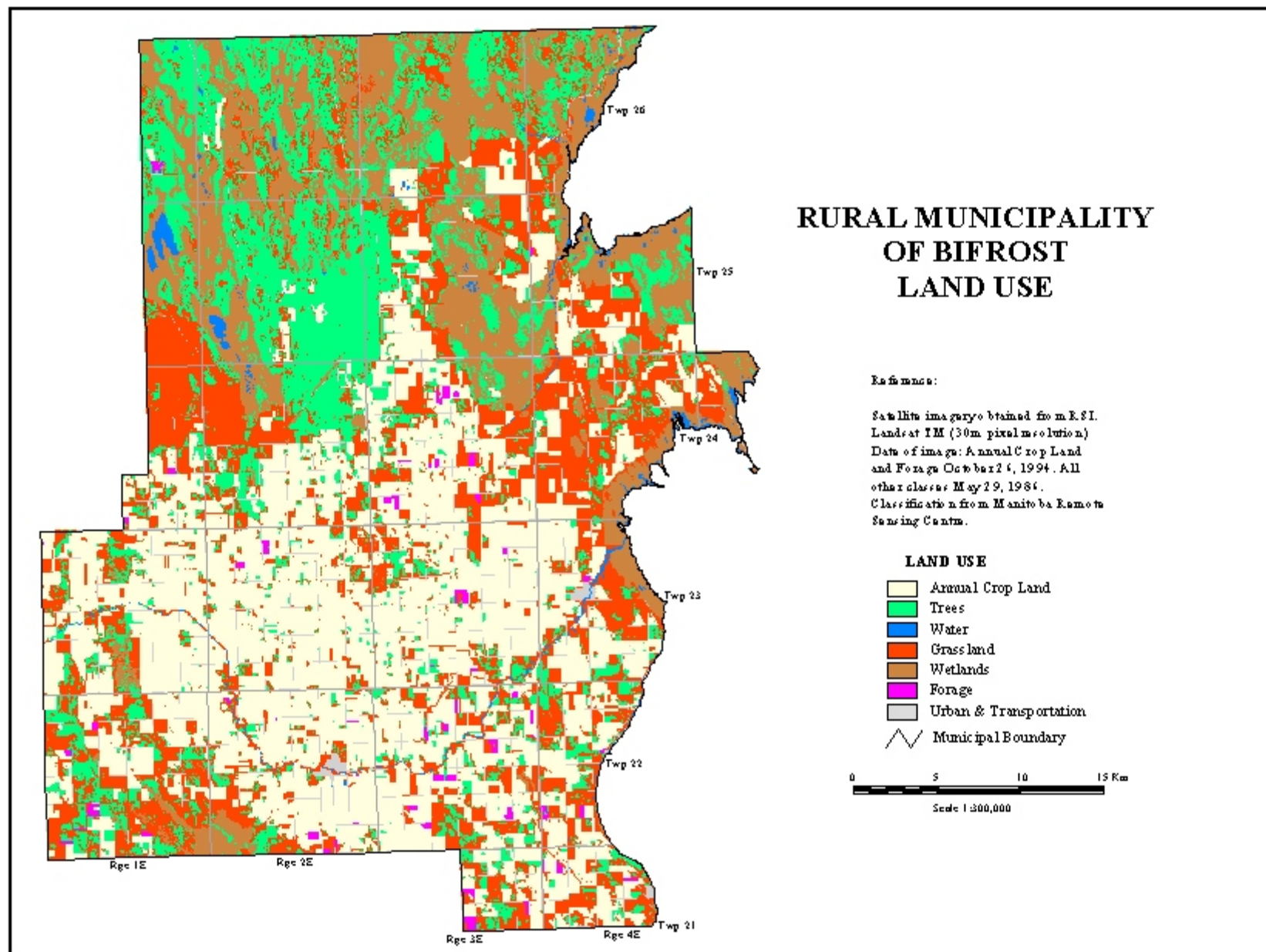
Water - open water - lakes, rivers streams, ponds, and lagoons.

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

Table 9. Land Use¹

Class	Area (ha)	Percent of RM
Annual Crop Land	58037	36.2
Forage	1021	0.6
Grasslands	37531	23.4
Trees	32816	20.5
Wetlands	26244	16.4
Water	1879	1.2
Urban and transportation	2805	1.7
Total	160333	100.0

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



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