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Rural Municipality of Alexander

Information Bulletin 99-27

Soils and Terrain

An introduction to the land resource

Land Resource Unit
Brandon Research Centre

Canada

Rural Municipality of Alexander

Information Bulletin 99-27

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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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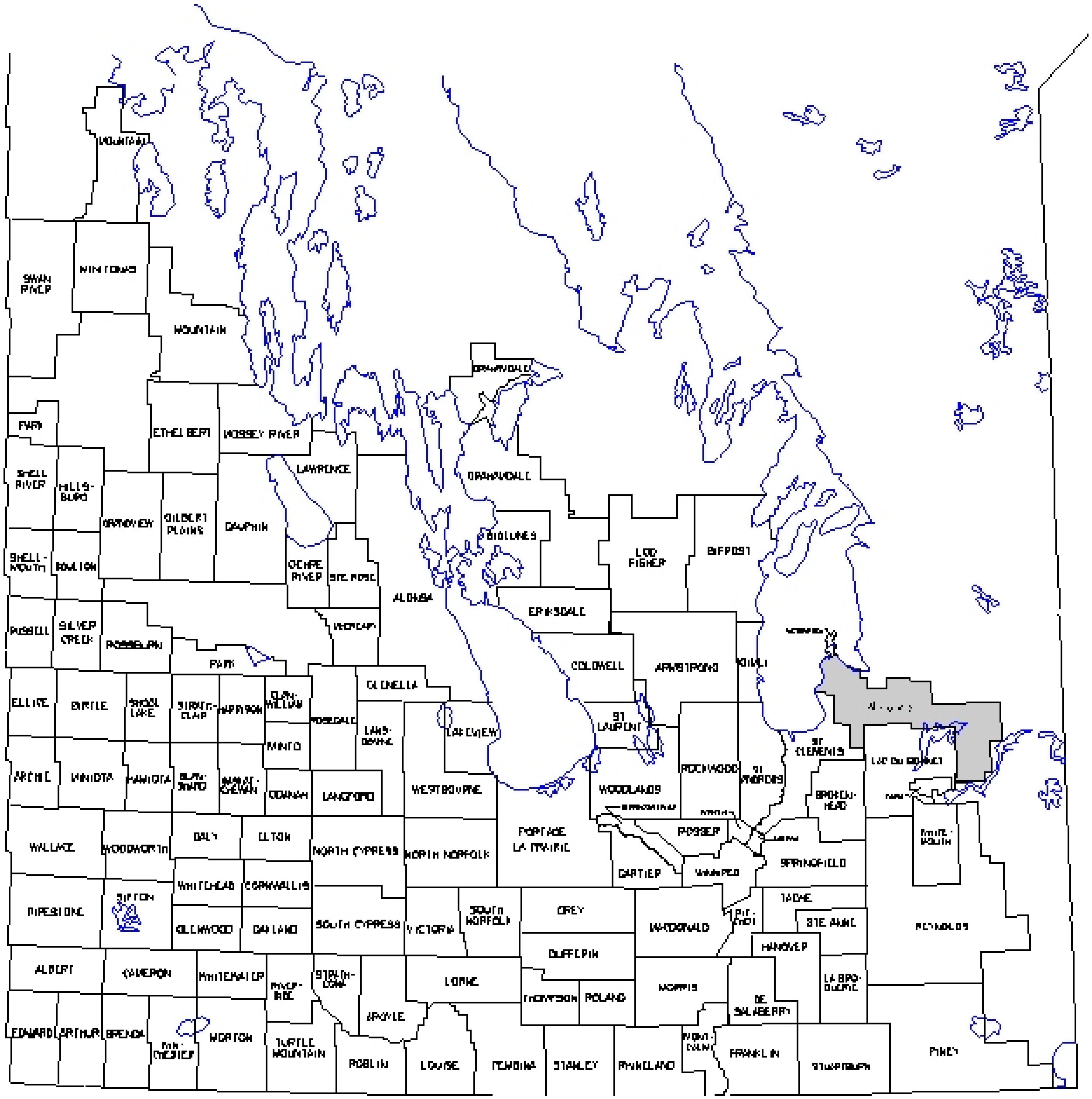


Figure 1. Rural municipalities of southern Manitoba.

INTRODUCTION

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

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

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

LAND RESOURCE DATA

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

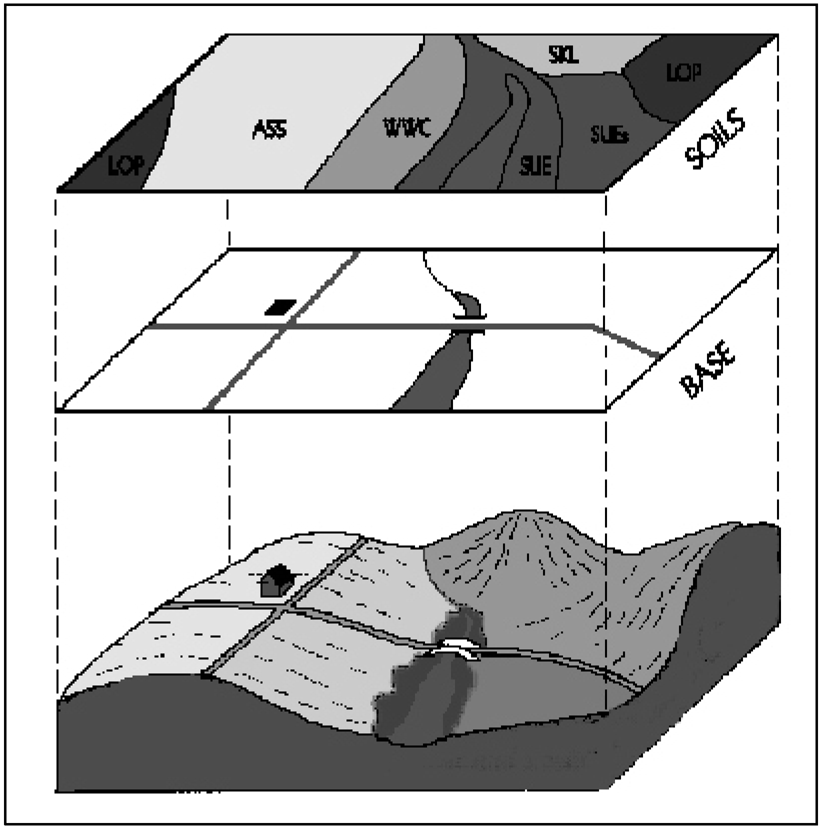


Figure 2. Soil and Base Map data.

Base Layer

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

Soil Layer

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

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

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

SOIL AND TERRAIN OVERVIEW

The Rural Municipality (RM) of Alexander covers an area of 163132 ha (approximately 17.7 townships) in southeastern Manitoba. It is located south of Traverse Bay on Lake Winnipeg and includes Grand Beach Provincial Park, the Belair Provincial Forest and part of the Brightstone Sand Hills Provincial Forest (page 3). Pine Falls and Powerview are the main population and service centres although the greatest concentration of people resides on the Fort Alexander Indian Reserve located just north of the RM on Traverse Bay. The municipality is sparsely populated as large areas of forested terrain are uninhabited except for seasonal workers harvesting forest products. However, the population of the area increases during the summer months with the influx of cottagers and vacationers attracted to recreation activities associated with Lake Winnipeg and the Winnipeg and Bird Rivers.

Climatic conditions in the municipality are characterized by weather data from Pine Falls. Mean annual temperature is 1.9˚C and mean annual precipitation is 523 mm (Environment Canada, 1993). The average frost-free period is 107 days and degree-days above 5˚C accumulated from May to September average 1579 (Ash, 1991). An evaluation of growing conditions in this region of Manitoba can be related to estimates of seasonal moisture deficit and effective growing degree-days (EGDD) above 5˚C. The seasonal moisture deficit calculated between May and September is slightly greater than 200 mm. The estimated effective growing degree-days accumulated from May to September vary from 1400 to 1500 (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.

The municipality is located on the eastern edge of the Canadian Shield: the western half is in the Lac du Bonnet Plain while the eastern portion is in the Bloodvein River Plain. The Lac du Bonnet Plain consists of level to very gently sloping terrain (slopes less than 2 percent) broken by prominent upland areas at Grand Beach, Belair, Murray Hill and the Kanipatenak Hills. These uplands are characterized by hummocky and ridged topography with higher local relief and in places, slopes in excess of 5 percent. In contrast, the Bloodvein River Plain is characterized by greater local relief and more rugged terrain as near level areas of organic deposits and clayey lacustrine sediments are broken by sharply hummocky areas of Precambrian bedrock with higher relief and slopes of 9 to 15 percent (Canada-Manitoba Soil Survey, 1980). Elevation in the Lac du Bonnet Plain decreases gradually from 234 metres above sea level (m asl) in the south to 217 m asl on Lake Winnipeg in the northwest.

Elevation in the Bloodvein River Plain reaches 300 m asl in places on higher rock outcrops (page 9). The generally low gradient of the land surface (0.6 m/km or 2.8 ft/mi) results in poorly developed drainage except for the upland areas and the land along the Winnipeg River. Surface waters from south and east of the municipality are carried via the Winnipeg River flowing into Traverse Bay while drainage of the western part of the RM is provided by Jackfish and Catfish creeks.

Soil materials in the municipality were deposited during the last glaciation and during the time of glacial Lake Agassiz. Extensive organic deposits occur throughout the area and loamy to clayey textured lacustrine sediments, some of which are underlain by loamy textured, stony glacial till occur at lower elevations. Areas of sandy and gravelly lacustrine and outwash deposits associated with stony, loam textured calcareous glacial till are common on the upland areas. Precambrian bedrock outcrops most commonly to the east of the Winnipeg River (page 11).

Soils in the municipality have been mapped at a reconnaissance level (1:126 720 scale) and published in the soil survey report for the Lac du Bonnet map sheet area (Smith et al., 1967). Portions of the Bird River and the Lac du Bonnet shoreline have been mapped at a detailed 1:20 000 scale (Fraser et al., 1979). According to the Canadian System of Soil Classification (Soil Classification Working Group, 1998), well to imperfectly drained clayey textured soils are classified as Gray Luvisols and Dark Gray Chernozems. Weakly developed Luvisol and Eutric Brunisol soils are found on glacial till Eutric and Dystric Brunisols develop on sandy glaciofluvial deposits. Poorly drained sites are characterized by Rego and Humic Gleysol soils and extensive, level to depressional areas are characterized by Organic soils developed on fen, forest and sphagnum peat (page 11). A more detailed and complete description of the type, distribution and textural variability of soils in the municipality is provided in the published soil surveys.

The flat topography throughout the area and the high watertable associated with many of the soils result in a dominance of very poorly drained (29 percent) and imperfectly drained (19 percent) conditions. Surface drainage has been improved in the agriculturally developed areas by ditches constructed to enhance runoff and reduce the duration of surface ponding. Well drained soils occupy 25 percent of the area and bedrock outcrops cover 13 percent (page 13).

Major management considerations are related to organic soils, wetness, fine and coarse textures and bedrock (page 15). Stony and cobbly surface soils characterize the glacial till and many of the glaciofluvial deposits. Soils throughout the municipality are nonsaline.

Fifteen percent of the soils in the municipality are rated in **Class 2** for agriculture capability while 20 percent of the area is rated in **Class 3**. Increased limitation for agricultural use is recognized in **Class 5** and **6** soils. The major problems limiting the agricultural use of soils is clayey texture, adverse soil structure, inadequate drainage and droughtiness (page 17). The organic soils covering 30 percent of the area have very limited capability for agriculture in their native undrained state. Bedrock dominated terrain covering 14 percent of the area has no capability for agriculture and is rated in **Class 7**. Surface stones and cobbles, peaty surface soils and potential degradation due to erosion by wind are other important limitations. About 55 percent of the soils are rated as **Poor** for irrigation primarily due to clay textures and poor drainage. Eight percent of the area is rated **Fair** and 4 percent is rated **Good** for irrigation suitability (page 19). Organic soils covering 30 percent of the area are not classified.

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 has been included in this bulletin (page 21). As shown, the risk of degradation varies from **Minimal** on well drained clay soils to **High** on deep, permeable, coarse textured materials and steeply sloping bedrock areas. 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 and where special practices should be adopted to mitigate this risk are shown on page 23. Sixty-eight percent of the land in the municipality is at Negligible risk of degradation from water erosion although the risk increases to **Low, Moderate and High** on local soil areas with steeper slopes. Management practices focus primarily on maintaining adequate vegetative cover to protect the soil surface.

Land use in the RM of Alexander consists of forestry, recreation and agriculture. The forest areas are utilized for production of pulp fiber and wood products, and in conjunction with the organic terrain also provide habitat for wildlife and various recreation opportunities. The limited land area developed for agriculture is used mainly for mixed farming. Infrastructure to support agriculture, forestry, urban areas, transportation and recreation also occupies a small land area.

The majority of soils in the RM of Alexander have moderately severe to very severe limitations for arable agriculture. All soils require careful management to help reduce the risk of degradation and maintain productivity during any activity which disturbs the soil surface. Extremely stony and cobbly soil surface conditions require stone clearing to permit annual cultivation. A major portion of the municipality has low relief and a dominance of organic soils which require special management if developed for agriculture.

DERIVED AND INTERPRETIVE MAPS

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

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

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

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

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

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

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

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

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

Slope Map.

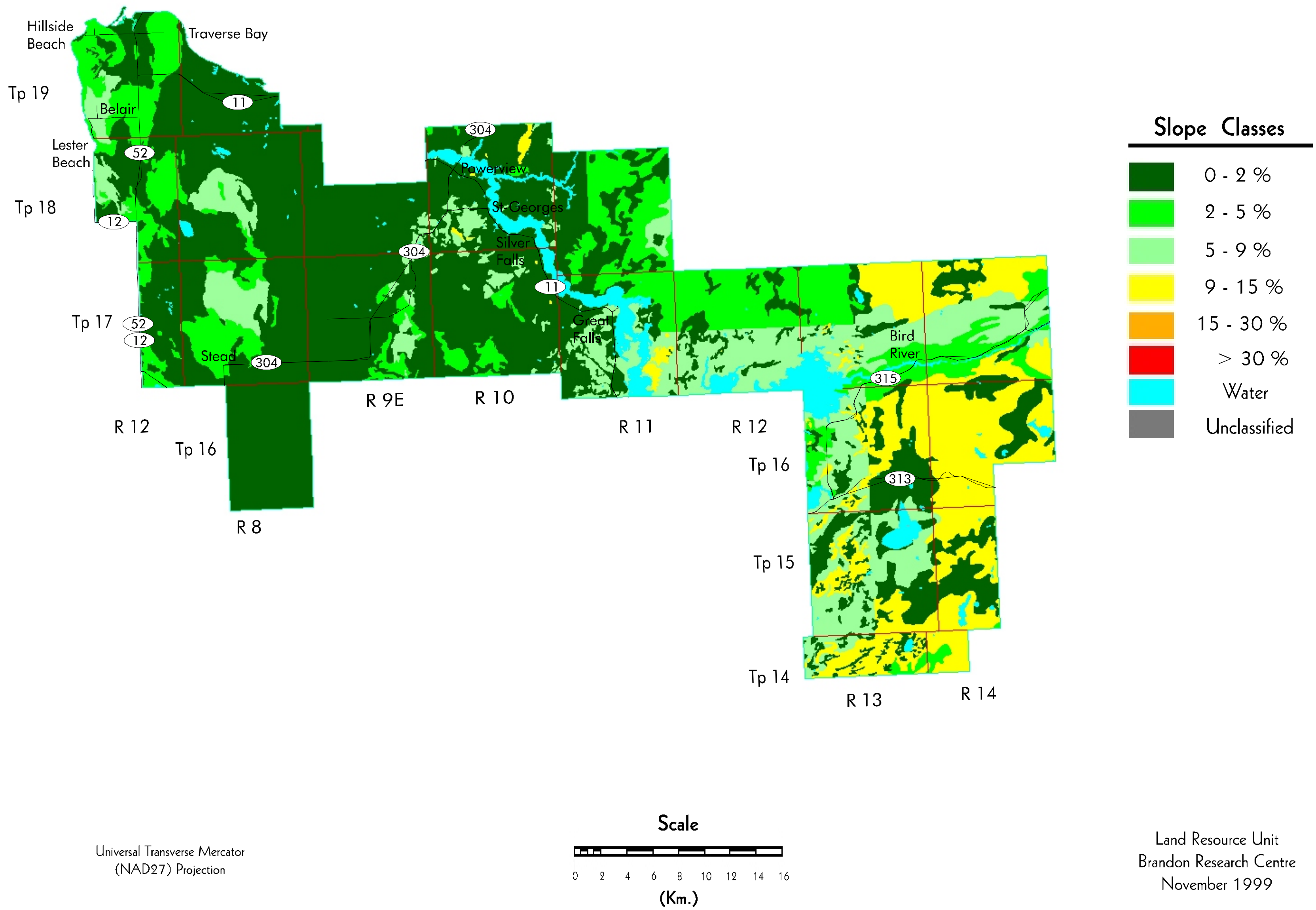
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area,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

Table 1. Slope Classes[1]

Slope Class	Area (ha)	Percent of RM
0 - 2 %	82691	50.6
2 - 5 %	27338	16.7
5 - 9 %	25299	15.5
9 - 15 %	21842	13.4
15 - 30 %	0	0.0
> 30 %	0	0.0
Unclassified	42	0.0
Water	6181	3.8
Total	163393	100.0

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

Slope Map


Hillside Beach
Traverse Bay
Tp 19
Belair
Lester Beach
Tp 18
Tp 17
Stead
R 12
Tp 16
R 8
R 9E
R 10
Powerview
St-Georges
Silver Falls
Great Falls
R 11
R 12
Tp 16
Bird River
Tp 15
Tp 14
R 13
R 14
11
52
12
304
315
313
Slope Classes
0 - 2 %
2 - 5 %
5 - 9 %
9 - 15 %
15 - 30 %
> 30 %
Water
Unclassified
Scale
0 2 4 6 8 10 12 14 16
(Km.)
Universal Transverse Mercator
(NAD27) Projection
Land Resource Unit
Brandon Research Centre
November 1999

Generalized Soil Map.

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

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

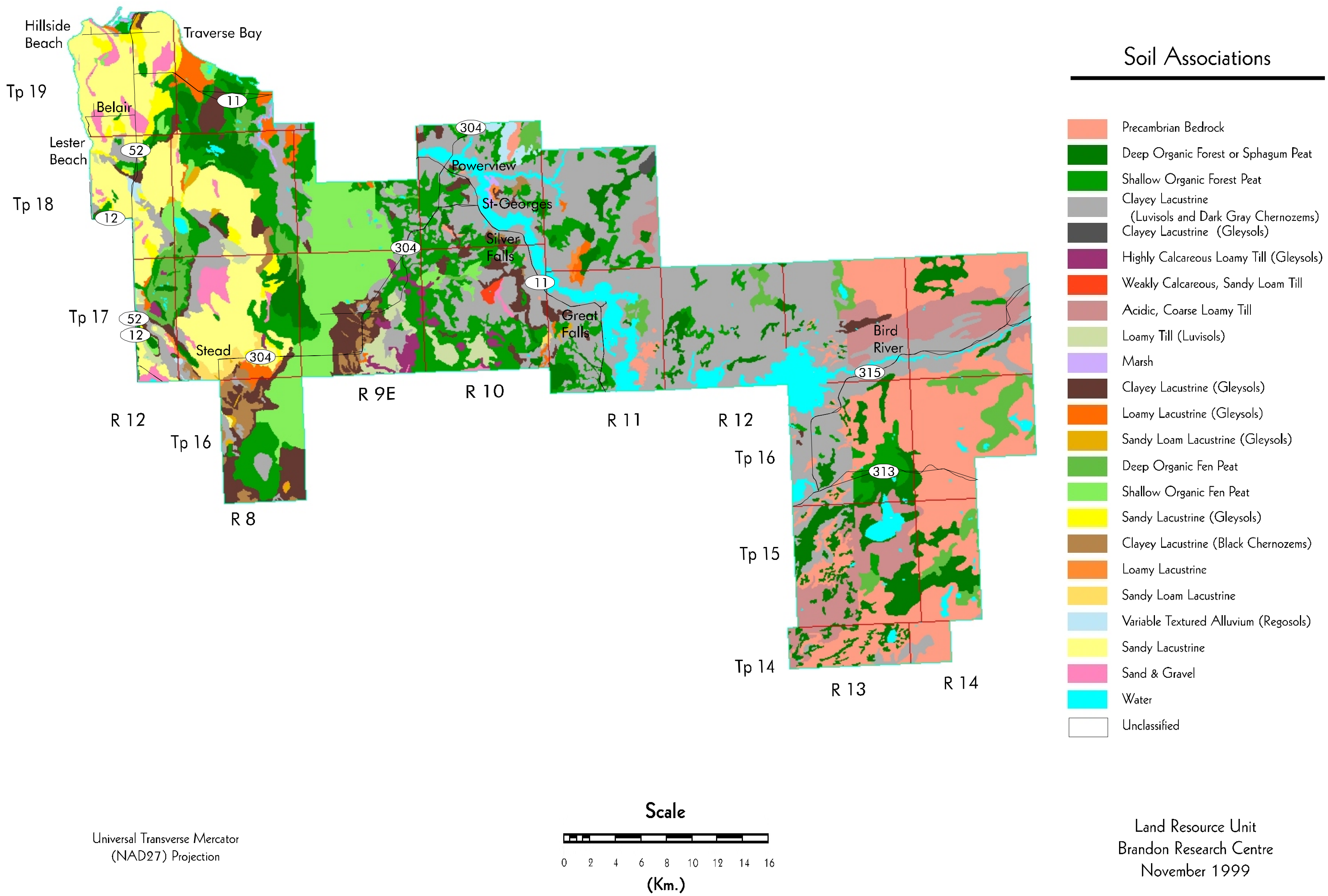
More detailed maps showing the dominant and subdominant soils in each polygon can also be produced at larger map scales.

Table 2. Generalized Soil Groups[1]

Soil Groups	Area (ha)	Percent of RM
Precambrian Bedrock	21842	13.4
Deep Organic Forest or Sphagnum Peat	13211	8.1
Shallow Organic Forest Peat	19788	12.1
Clayey Lacustrine (Luvisols and Dark Gray Chernozems)	42907	26.3
Clayey Lacustrine (Gleysols)	149	0.1
Highly Calcareous Loamy Till (Gleysols)	1197	0.7
Weakly Calcareous, Sandy Loam Till	159	0.1
Acidic, Coarse Loamy Till	8253	5.1
Loamy Till (Luvisols)	2132	1.3
Marsh	325	0.2
Clayey Lacustrine (Gleysols)	7026	4.3
Loamy Lacustrine (Gleysols)	1985	1.2
Sandy Loam Lacustrine (Gleysols)	362	0.2
Deep Organic Fen Peat	6150	3.8
Shallow Organic Fen Peat	9890	6.1
Sandy Lacustrine (Gleysols)	1824	1.1
Clayey Lacustrine (Black Chernozems)	1760	1.1
Loamy Lacustrine	290	0.2
Sandy Loam Lacustrine	715	0.4
Variable Textured Alluvium (Regosols)	656	0.4
Sandy Lacustrine	14336	8.8
Sand and Gravel	2211	1.4
Water	6181	3.8
Unclassified	42	0.0
Total	163393	100.0

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

Generalized Soil Map



Universal Transverse Mercator (NAD27) Projection

Land Resource Unit
Brandon Research Centre
November 1999

Soil Drainage Map.

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

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

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

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

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

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

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

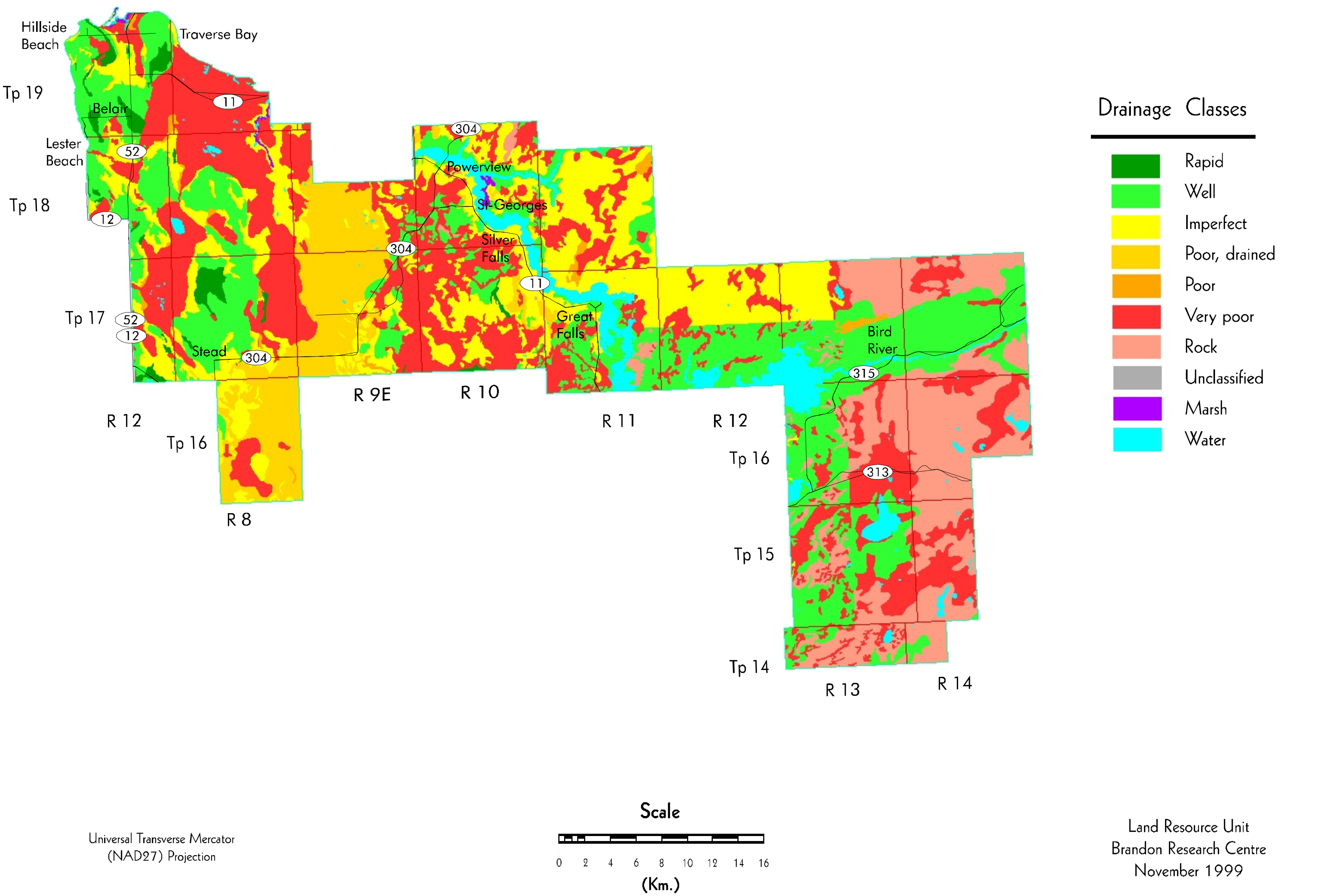
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes[1]

Drainage Class	Area (ha)	Percent of RM
Very Poor	46517	28.5
Poor	1244	0.8
Poor, drained	13823	8.5
Imperfect	30909	18.9
Well	40375	24.7
Rapid	2136	1.3
Rock	21842	13.4
Marsh	325	0.2
Unclassified	42	0.0
Water	6181	3.8
Total	163393	100.0

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

Soil Drainage Map



Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
November 1999

Management Considerations Map.

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

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

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

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

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

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

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

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

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

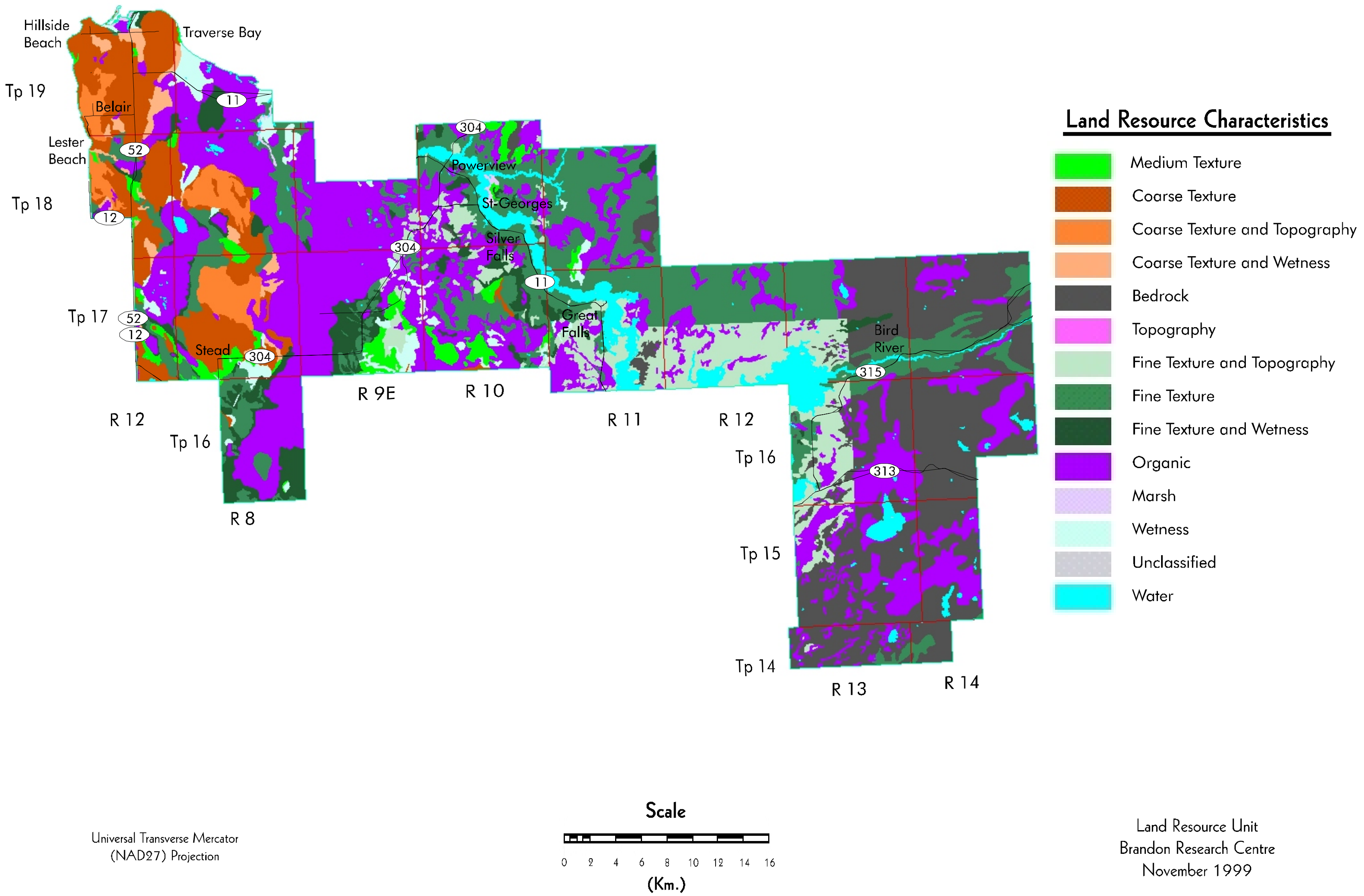
R = Bedrock - soil landscapes that have shallow depth to bedrock (< 50 cm) and/or exposed bedrock which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 4. Management Considerations[1]

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	31728	19.4
Fine Texture and Wetness	7174	4.4
Fine Texture and Topography	12940	7.9
Medium Texture	3952	2.4
Coarse Texture	12441	7.6
Coarse Texture and Wetness	1824	1.1
Coarse Texture and Topography	4106	2.5
Topography	0	0.0
Bedrock	30095	18.4
Wetness	3545	2.2
Organic	49040	30.0
Marsh	325	0.2
Unclassified	42	0.0
Water	6181	3.8
Total	163393	100.0

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

Management Considerations Map



Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
November 1999

Agricultural Capability Map.

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

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

Table 5. Agricultural Capability[1]

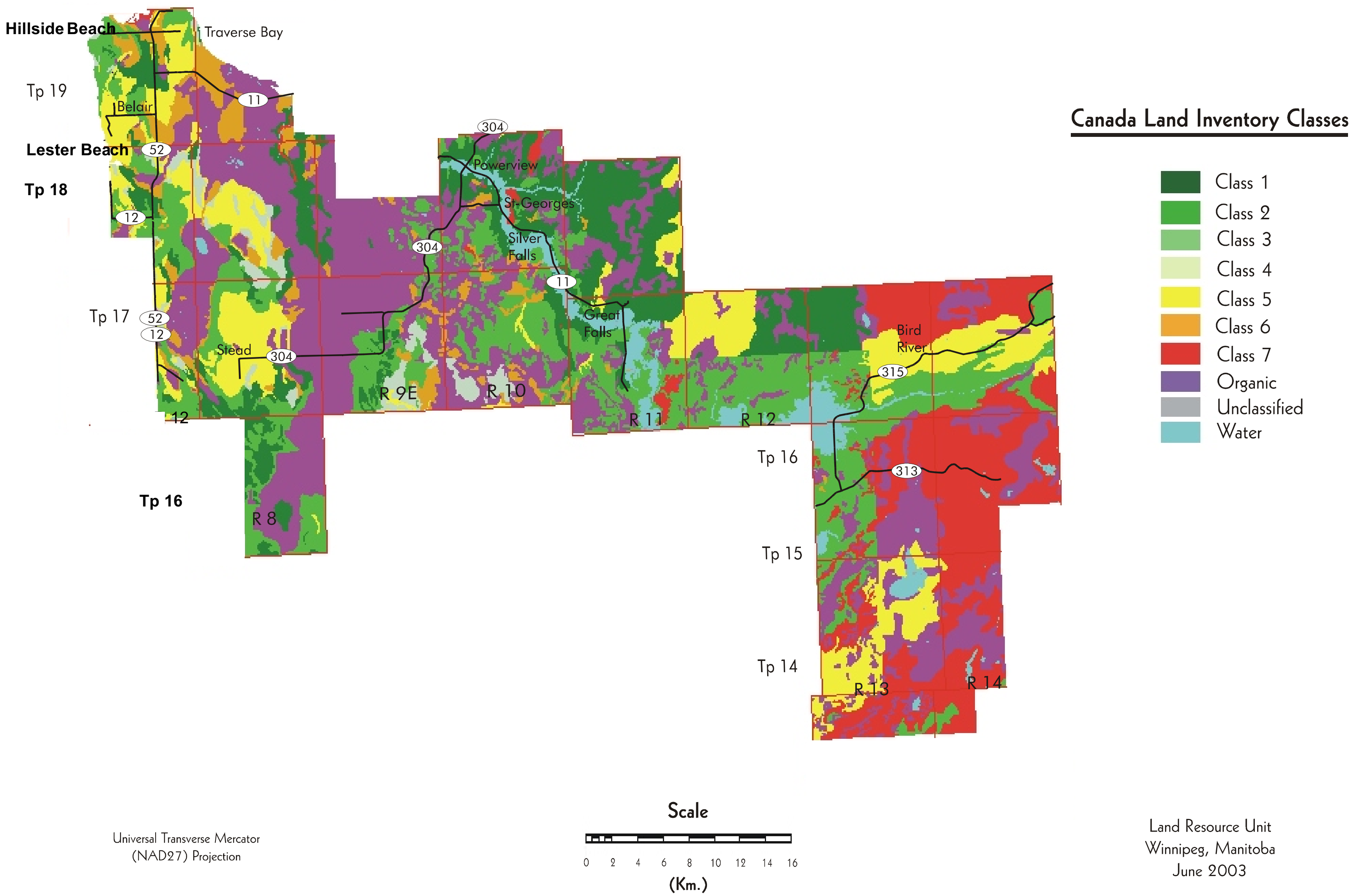
Class Subclass	Area (ha)	Percent of RM
2	**24165**	**14.8**
2D	1916	1.2
2DW	612	0.4
2I	15	0.0
2IW	605	0.4
2M	1332	0.8
2MI	333	0.2
2MP	745	0.5
2TD	109	0.1
2TW	10723	6.6
2W	7776	4.8

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

Class Subclass	Area (ha)	Percent of RM
3	**32567**	**20.0**
3D	9433	5.8
3DW	1486	0.9
3M	3866	2.4
3MP	157	0.1
3MT	126	0.1
3TD	12934	7.9
3W	4566	2.8
4	**3588**	**2.2**
4DP	2128	1.3
4M	1460	0.9
5	**18077**	**11.1**
5M	8594	5.3
5RP	8260	5.1
5W	1224	0.8
6	**7168**	**4.4**
6P	640	0.3
6W	6708	4.1
7	**22128**	**13.6**
7M	13	0.0
7R	21790	13.4
7W	325	0.2
Unclassified	**41**	**0.0**
Water	**6349**	**3.9**
Organic	**49049**	**30.1**
Total	**163132**	**100.0**

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

Agriculture Capability Map



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(NAD27) Projection

Land Resource Unit
Winnipeg, Manitoba
June 2003

Irrigation Suitability Map.

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

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

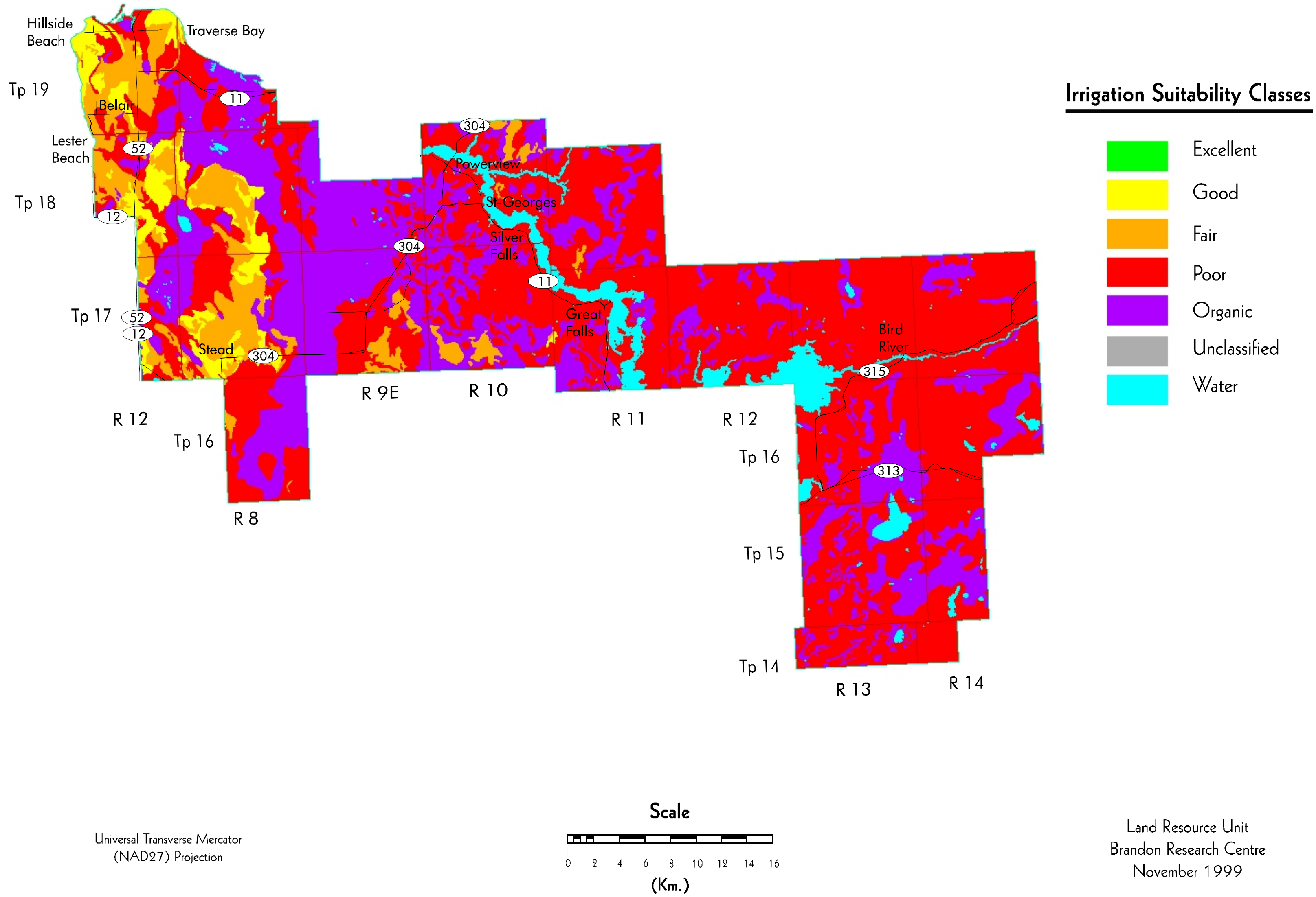
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 6. Irrigation Suitability[1]

Class	Area (ha)	Percent of RM
Excellent	**0**	**0.0**
Good	**5742**	**3.5**
Fair	**12671**	**7.8**
Poor	**89718**	**54.9**
Organic	**49040**	**30.0**
Unclassified	**42**	**0.0**
Water	**6181**	**3.8**
Total	**163393**	**100.0**

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

Irrigation Suitability Map



Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
November 1999

Potential Environmental Impact Under Irrigation Map.

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

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

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

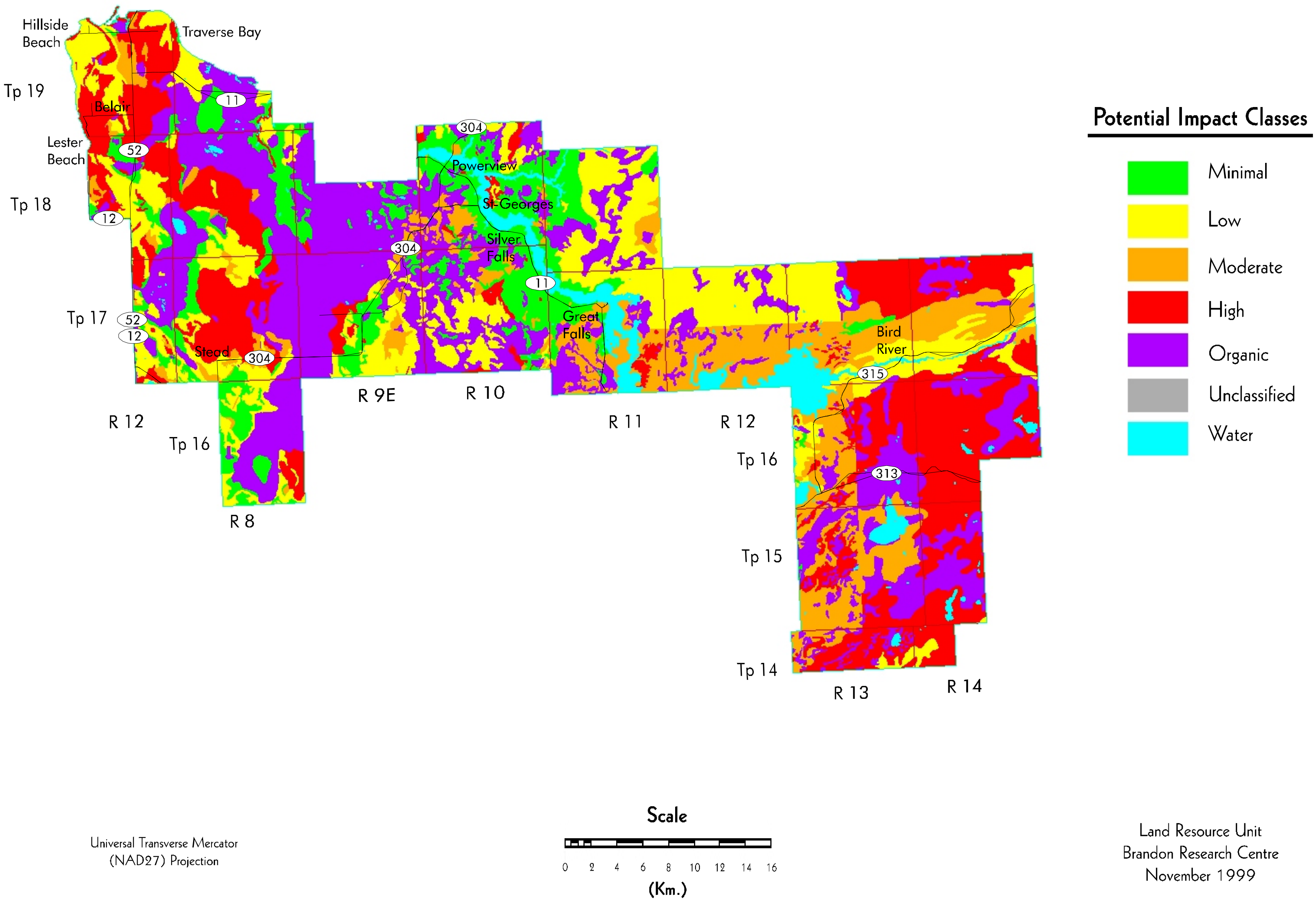
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Potential Environmental Impact Under Irrigation[1]

Class	Area (ha)	Percent of RM
Minimal	17810	10.9
Low	31214	19.1
Moderate	23336	14.3
High	35771	21.9
Organic	49040	30.0
Unclassified	42	0.0
Water	6181	3.8
Total	163393	100.0

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

Potential Environmental Impact Under Irrigation



Universal Transverse Mercator (NAD27) Projection

Land Resource Unit
Brandon Research Centre
November 1999

Water Erosion Risk Map.

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

negligible
low
moderate
high
severe

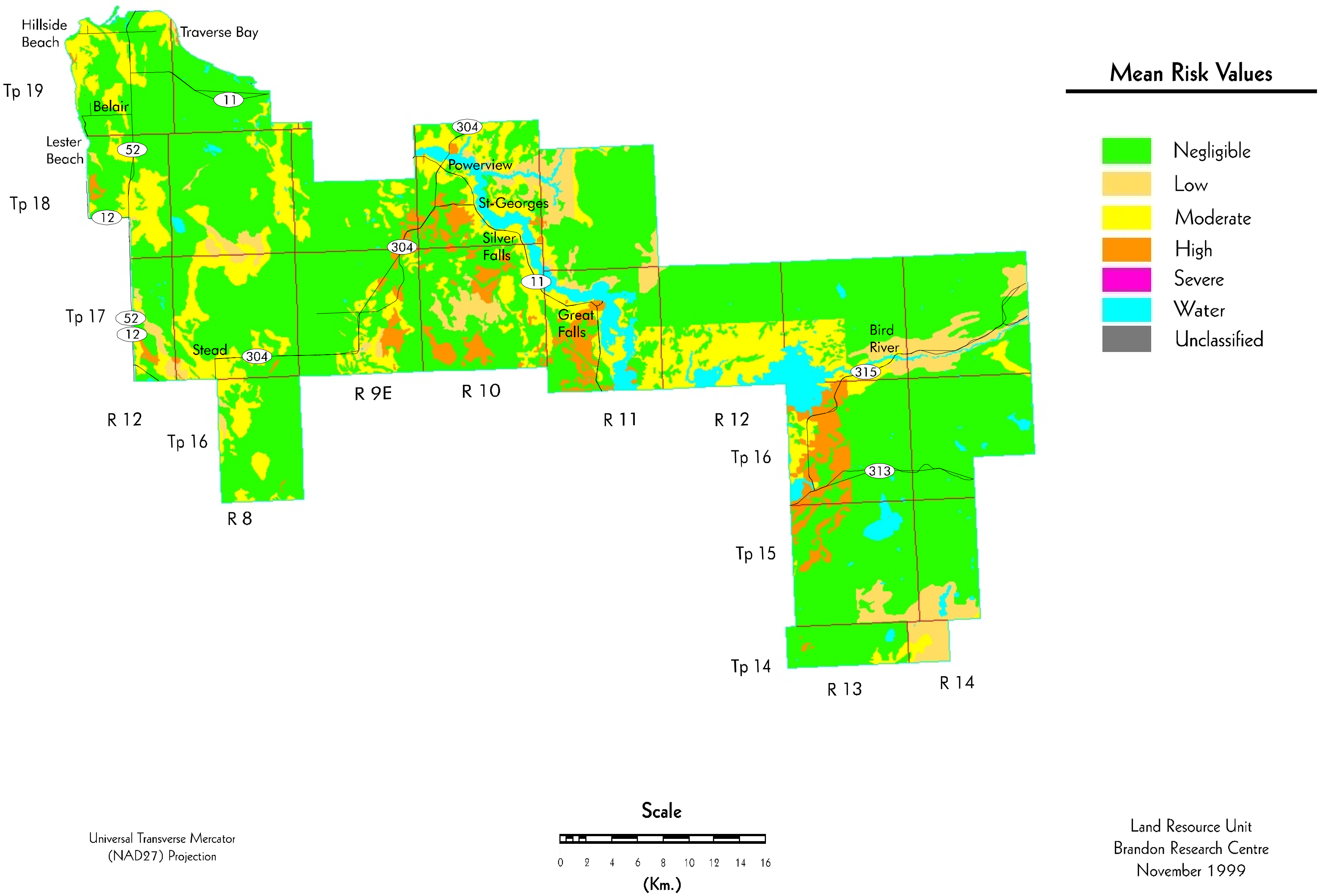
Cropping and residue management practices will significantly reduce this risk depending on crop rotation program, soil type, and landscape features.

Table 8. Water Erosion Risk[1]

Class	Area (ha)	Percent of RM
Negligible	110782	67.8
Low	11080	6.8
Moderate	27319	16.7
High	7990	4.9
Severe	0	0.0
Unclassified	42	0.0
Water	6181	3.8
Total	163393	100.0

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

Water Erosion Risk Map



Universal Transverse Mercator
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