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Rural Municipality of Dauphin


Information Bulletin 99-40

Soils and Terrain

An introduction
to the land resource

Land Resource Unit
Brandon Research Centre



Canada 

Rural Municipality of Dauphin

Information Bulletin 99-40

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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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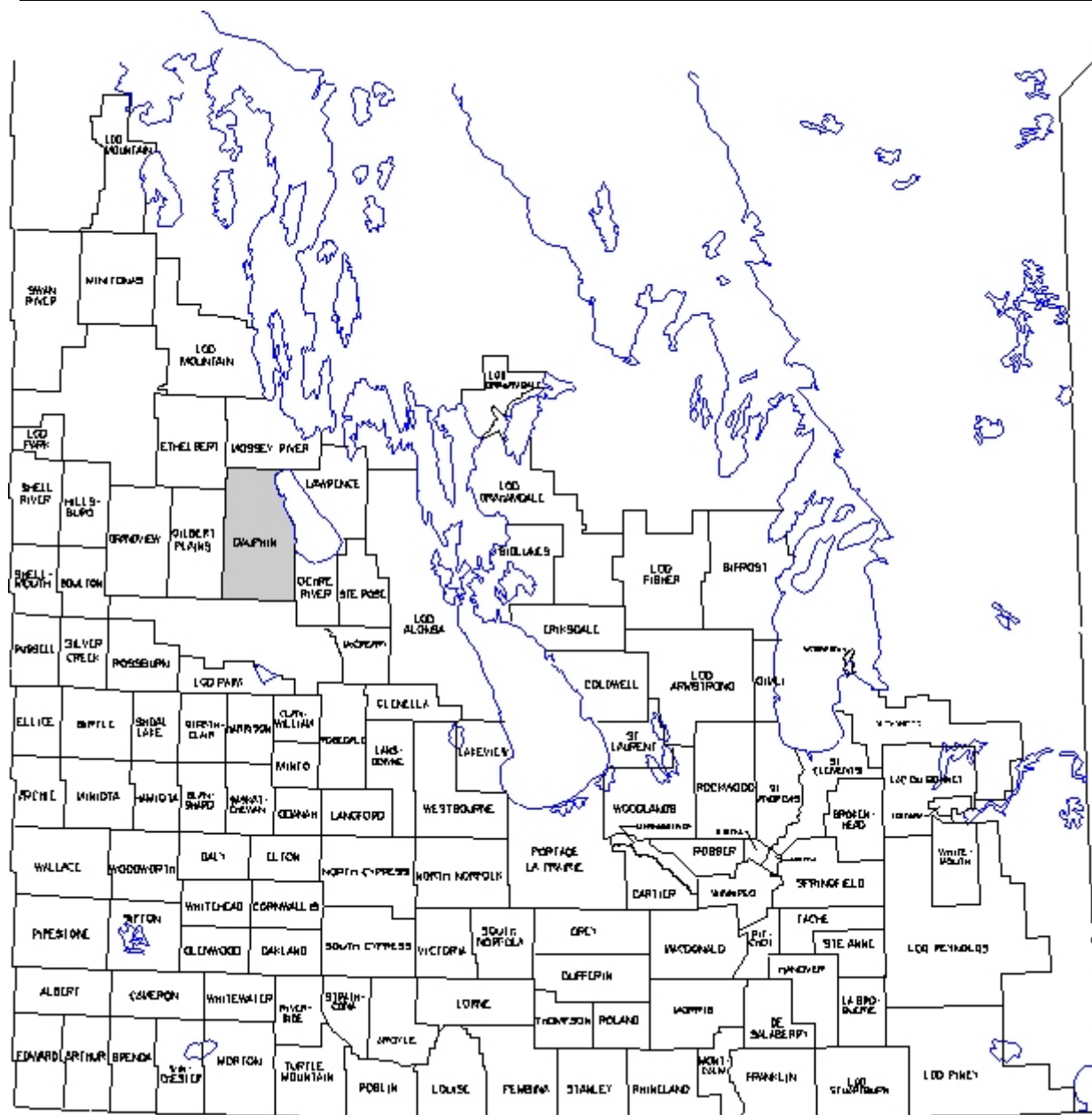


Figure 1. Rural municipalities of southern Manitoba.

INTRODUCTION

The location of the Rural Municipality of Dauphin 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.

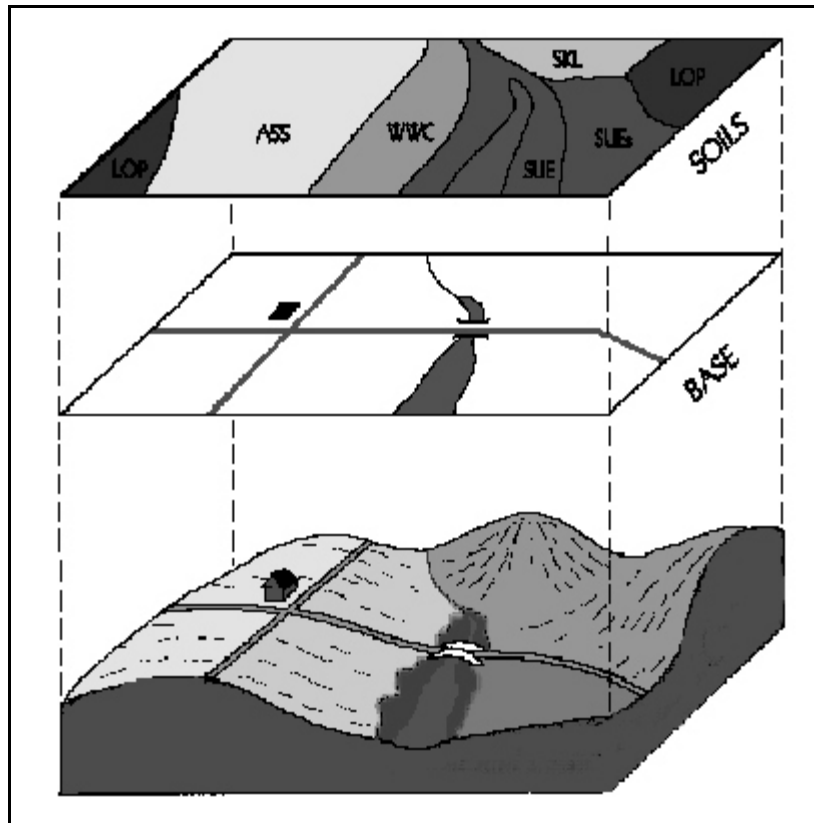


Figure 2. Soil and Base Map data.

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 Dauphin covers an area of 152 879 ha (approximately 16.6 townships) of land located north of Riding Mountain National Park in western Manitoba (page 3). The area within the park (approximately 1.5 townships) is not classified. Dauphin is the main population and agriculture service centre although smaller population centres are located in the villages of Sifton, Fishing River and Valley River.

The climate in the municipality can be related to weather data from Dauphin. The mean annual temperature at Dauphin is 1.7°C and the mean annual precipitation is 492 mm (Environment Canada, 1993). The average frost-free period is 112 days and degree-days above 5°C average 1580 (Ash, 1991). The calculated seasonal moisture deficit for the period between May and September ranges from slightly less than 200 mm at higher elevations in the Riding Mountain Upland to slightly greater than 200 mm throughout the remainder of the municipality. The estimated effective growing degree days (EGDD) above 5°C accumulated from date of seeding to the date of the first fall frost varies from 1100 at the higher elevations to in excess of 1400 in the rest of the municipality (Agronomic Interpretations Working Group, 1995). These parameters indicate that except for the higher elevations, moisture and heat energy available for crop growth are generally adequate to support a wide range of crops adapted to western Canada.

The Riding Mountain Upland in the southern part of the municipality varies in elevation from 570 metres above sea level (m asl) to 330 m asl at the foot of the Riding Mountain Escarpment. This Escarpment area is dissected by numerous drainage channels and gullies as it slopes steeply to the north at a rate of 38 m/km (200 ft/mi). Elevation of the Valley River Plain in the southwest corner of the area ranges from 420 m asl to about 330 metres along the Manitoba Escarpment as the land surface slopes northeast at a rate of about 7 m/km (37 ft/mi). The Dauphin Lake Plain slopes at a rate of about 2.5 m/km (13 ft/mi), gradually decreasing in elevation to 256 m asl on Dauphin Lake (Canada-Manitoba Soil Survey, 1980). The land surface in the Valley River and Dauphin Lake Plains is dominantly very gently undulating to level with low relief

and slopes of less than 2 percent whereas the Riding Mountain area is hilly with local relief in excess of 8 metres and slopes ranging from 9 to 30 percent.(page 9). Drainage of the municipality is towards Dauphin Lake via the Fishing, Mink, Valley and Wilson Rivers from the west while the Vermillion and Ochre Rivers flow from Riding Mountain to the south. Soils below the Escarpment area are dominantly imperfectly drained while areas of well drained soils occur primarily in the Valley River Plain and in the Riding Mountain Upland. Depressional areas throughout the municipality are poorly drained (page 13). Removal of surface water for agricultural purposes is accomplished by a system of local ditches and several larger drains to carry runoff from the Escarpment area.

Soil materials in the municipality were deposited during the last glaciation and during the time of glacial Lake Agassiz. The Riding Mountain Upland consists of loamy textured glacial till (morainal deposits) while the Valley River Plain is a complex area of loamy till and sandy and loamy textured lacustrine sediments. The Dauphin Lake Plain consists of sandy, loamy and clayey textured lacustrine sediments, loamy alluvial deposits and scattered areas of waterworked, stony, loam textured glacial till and low, narrow sand and gravel beach ridges (page 11).

Soils in the municipality have been mapped at a reconnaissance map scale of 1:126 720 and published in the soil survey reports for the Grandview Map Sheet Area (Ehrlich et al., 1959) and the Ste. Rose Du Lac Area (Mills et al., 1981). Soils around the Town of Dauphin are mapped at a detailed 1:20 000 scale (Eilers et al., 1981). According to the Canadian System of Soil Classification (Soil Classification Working Group, 1998), the soils in the municipality are classified as dominantly Black Chernozems (Meharry, Gilbert, Dauphin, Lakeland and Isafold associations). Dark Gray Chernozems (Erickson association) and Luvisols (Rose Ridge and Waitville associations) occur at higher elevations of the Riding Mountain Upland. Regosolic soils occur on stratified alluvial deposits in valleys and floodplains below the Escarpment (Edwards association) and on steeply sloping areas of Eroded Slopes Complex. Poorly drained depressional sites in all landscapes are characterized by Humic Gleysol soils (page 11).

Management considerations are related mainly to coarse and fine soil textures, topography and wetness (page 15). Many soils below the Escarpment are subject to flooding in spring and during periods of heavy rainfall. Although variably stony surface conditions occur on the glacial till soils, very stony soils are of particular concern on the water worked till soils in the Dauphin Lake Plain.

Sixty-one percent of the land in the municipality is rated in **Classes 1, 2 and 3** for agriculture capability (page 17) and about 15 percent of the area is rated **Good** for irrigation suitability (page 19). Limitations affecting agriculture use are droughtiness, excess water stoniness and topography. Very poorly drained soils and steeply sloping soils are rated in **Class 6** for agriculture. These soils and clayey textured soils are rated **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 21). As shown, the majority of the RM is at a **Minimal to Low** risk of potential impact although coarse textured soils and land adjacent to drainage channels are rated as having a **High** potential impact under irrigation. These conditions increase the risk for deep leaching of potential contaminants on the soil surface and the potential for rapid runoff from the soil surface into adjacent wetlands or water bodies. This EI map is intended to be used in association with the irrigation suitability map.

Another issue of concern to producers, soil conservationists 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 23). About 65 percent of the land in the RM, mainly in the level terrain of the Dauphin Lake Plain is at a **Negligible to Low** risk of degradation. The risk increases to **Moderate, High and Severe** as steepness and length of slope increase in the upland areas above the escarpment. Management practices for land in annual crop focus on maintaining adequate crop residues to provide sufficient surface cover.

However, adequate protection of the sloping lands and the sandy soils most at risk from wind erosion may require a shift in land use away from annual cultivation to production of perennial forages and pasture or permanent tree cover.

Agriculture is the dominant land use in the RM of Dauphin. An assessment of the status of land use in 1994 obtained through analysis of satellite imagery showed that 43 percent of the land is in annual cropland with production of perennial forages occupying 3 percent of the area. Most of the wooded area (25 percent) occurs in the National Park but many gravel ridges and stony till soils are also tree covered. Treed areas outside the National Park, together with the grassland areas (24 percent) provide forage and grazing capacity as well as wildlife habitat. Wetlands and small water bodies cover 1.7 percent of the area. Various non-agricultural uses such as recreation and infrastructure for urban areas and transportation occupy about 3 percent of the municipality. Land within the National Park provides wildlife habitat as well as recreation opportunities (page 25).

The majority of the soils in the RM of Dauphin have moderate to moderately severe limitations for arable agriculture. Careful choice of crops and maintenance of adequate surface cover is essential for the management of sensitive lands with coarse texture or steep slopes. Implementation of minimum tillage practices and crop rotations including forage on a site by site basis 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 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.

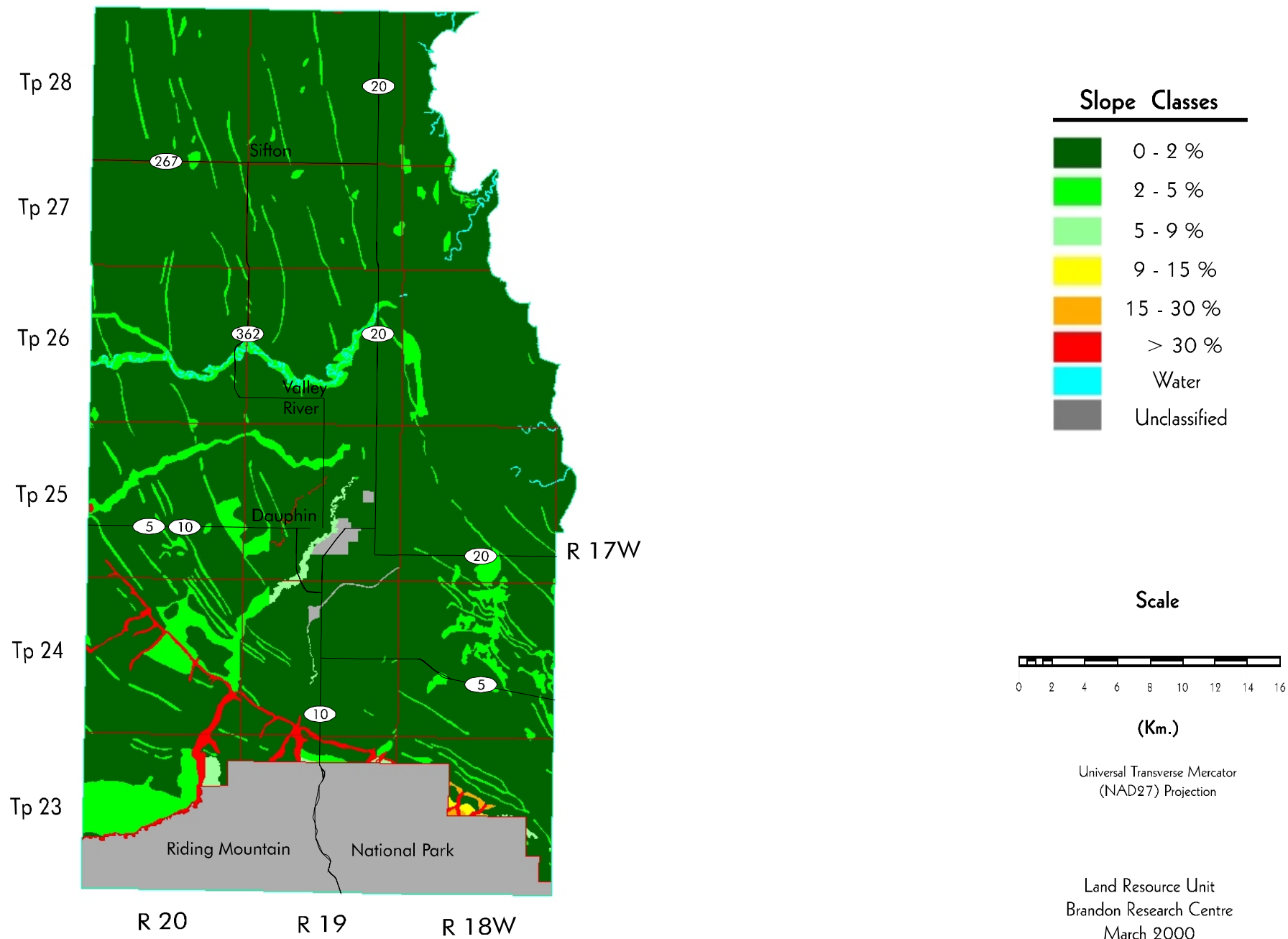
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area,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

Table 1. Slope Classes¹

Slope Class	Area (ha)	Percent of RM
0 - 2 %	120813	79.0
2 - 5 %	12146	7.9
5 - 9 %	712	0.5
9 - 15 %	1282	0.8
15 - 30 %	2693	1.8
> 30 %	1632	1.1
Unclassified	13385	8.8
Water	214	0.1
Total	152879	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

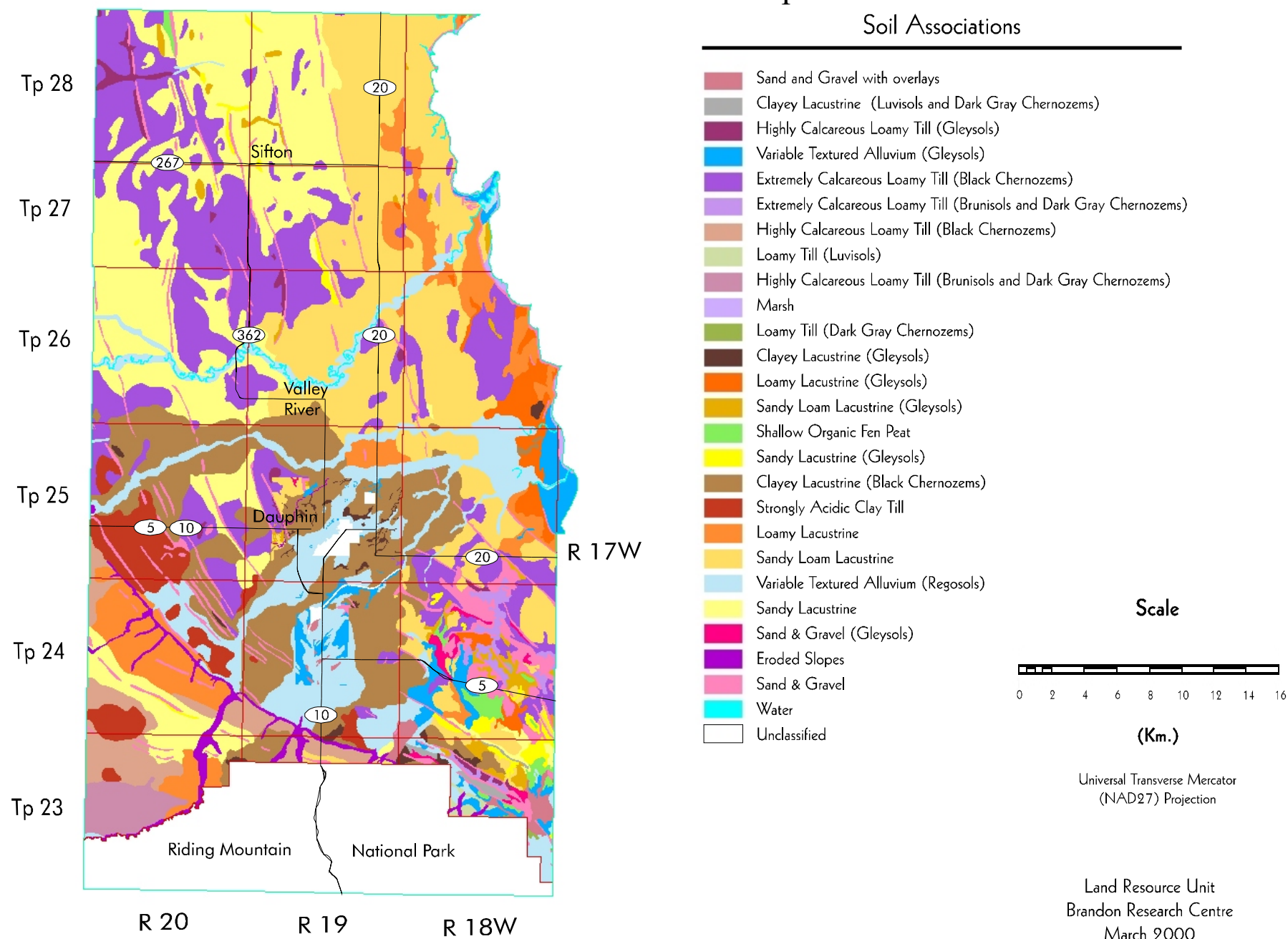
Soil Groups	Area (ha)	Percent of RM
Sand and Gravel with overlays	794	0.5
Clayey Lacustrine (Luvisols and Dark Gray Chernozems)	266	0.2
Highly Calcareous Loamy Till (Gleysols)	794	0.5
Variable Textured Alluvium (Gleysols)	3102	2.0
Extremely Calcareous Loamy Till (Black Chernozems)	22061	14.4

Table 2. Generalized Soil Groups¹ (cont.)

Soil Groups	Area (ha)	Percent of RM
Extremely Calcareous Loamy Till (Brunisols and Dark Gray Chernozems)	802	0.5
Highly Calcareous Loamy Till (Black Chernozems)	3374	2.2
Loamy Till (Luvisols)	3976	2.6
Highly Calcareous Loamy Till (Brunisols and Dark Gray Chernozems)	1594	1.0
Marsh	328	0.2
Loamy Till (Dark Gray Chernozem)	145	0.1
Clayey Lacustrine (Gleysols)	678	0.4
Loamy Lacustrine (Gleysols)	1989	1.3
Sandy Loam Lacustrine (Gleysols)	1308	0.9
Shallow Organic Fen Peat	677	0.4
Sandy Lacustrine (Gleysols)	1027	0.7
Clayey Lacustrine (Black Chernozems)	16880	11.0
Strongly Acidic Clay Till	3878	2.5
Loamy Lacustrine	7749	5.1
Sandy Loam Lacustrine	23512	15.4
Variable Textured Alluvium (Regosols)	13320	8.7
Sandy Lacustrine	22984	15.0
Sand and Gravel (Gleysols)	421	0.3
Eroded Slopes	1632	1.1
Sand and Gravel	5987	3.9
Water	214	0.1
Unclassified	13385	8.8
Total	152879	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.

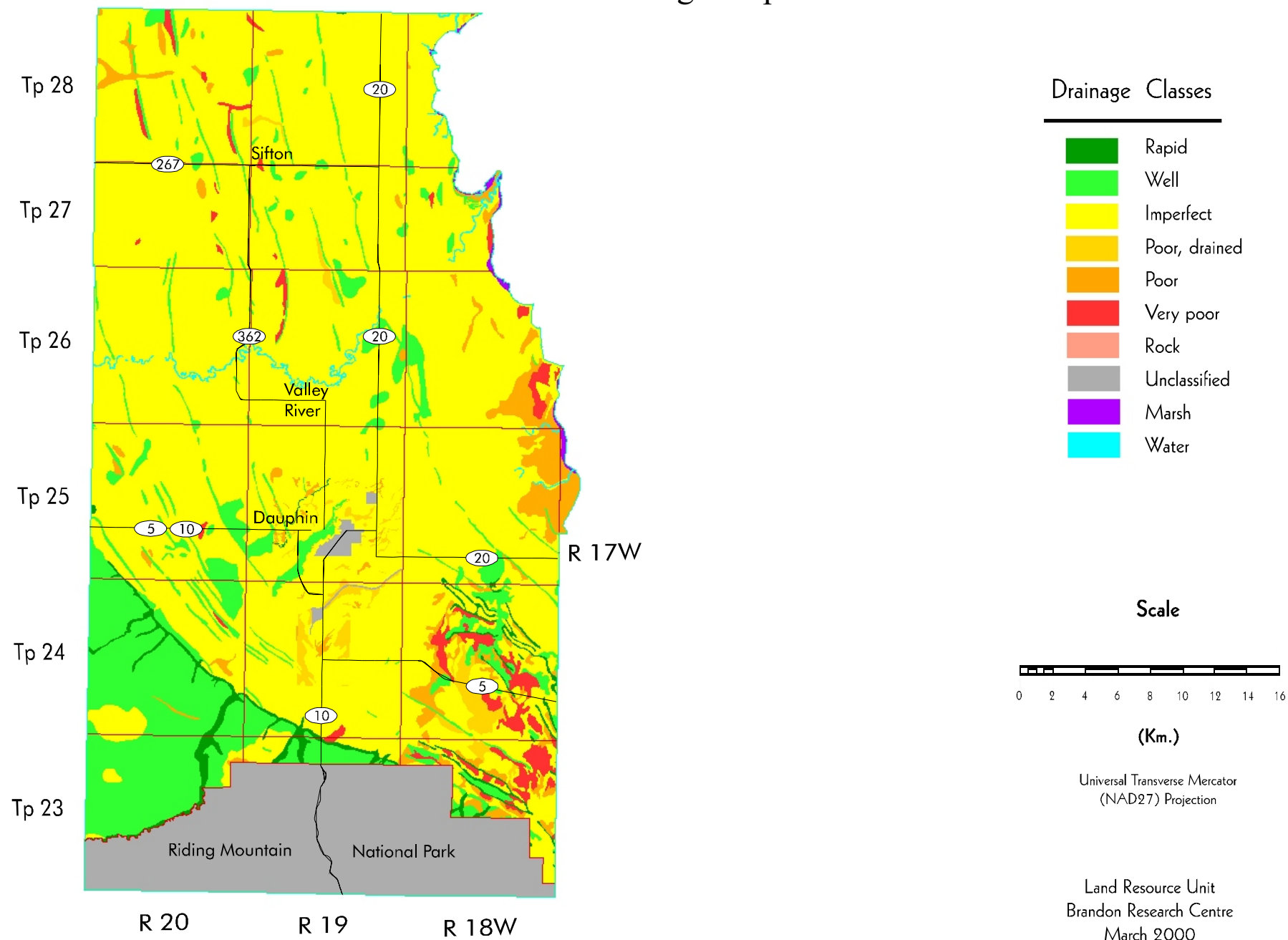
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes¹

Drainage Class	Area (ha)	Percent of RM
Very Poor	2777	1.8
Poor	5460	3.6
Poor, drained	1905	1.2
Imperfect	103286	67.6
Well	22952	15.0
Rapid	2570	1.7
Rock	0	0.0
Marsh	328	0.2
Unclassified	13385	8.8
Water	214	0.1
Total	152879	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.

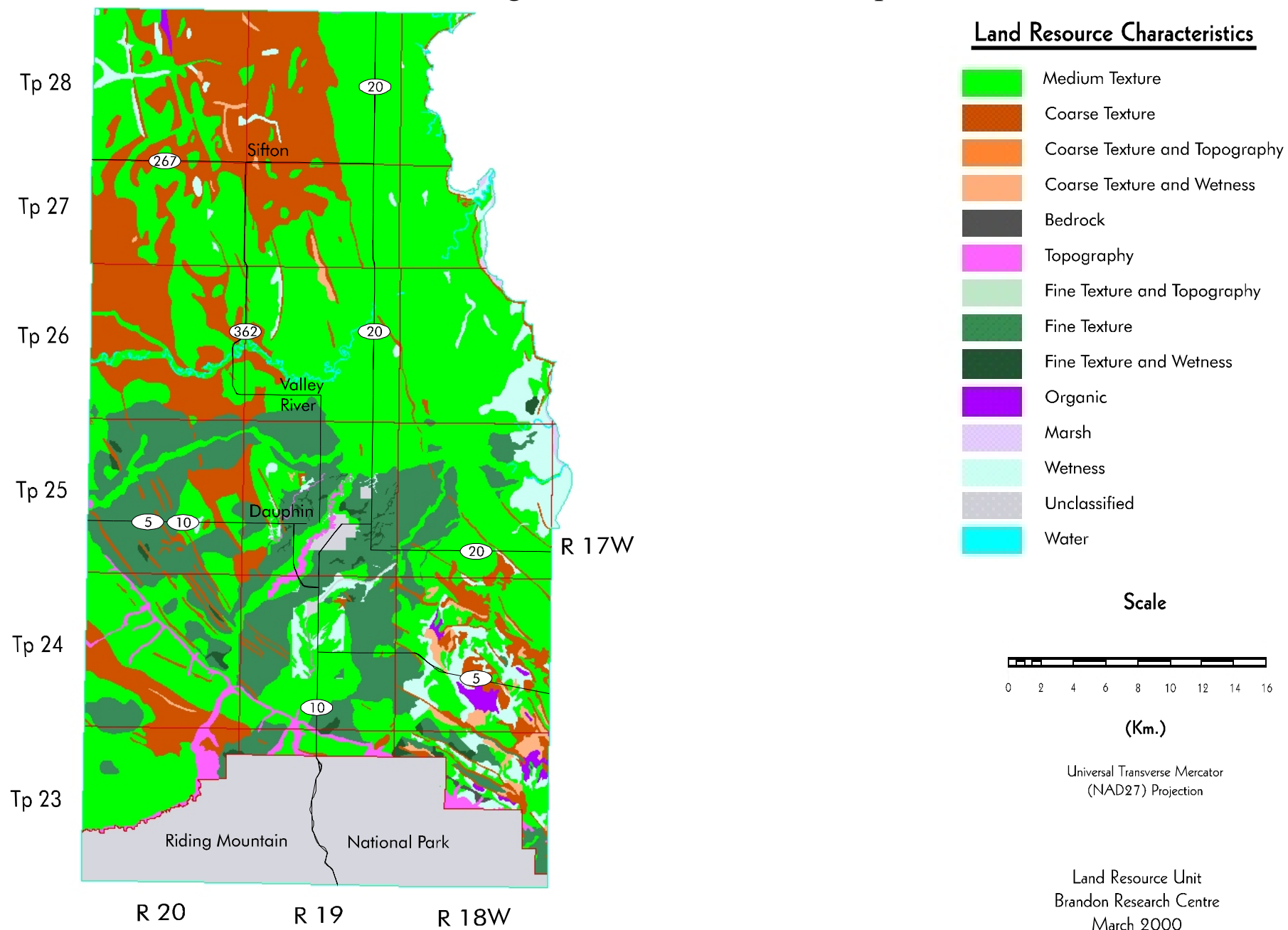
R = Bedrock - soil landscapes that have **shallow depth to bedrock (< 50 cm) and/or exposed bedrock** which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 4. Management Considerations¹

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	22593	14.8
Fine Texture and Wetness	825	0.5
Fine Texture and Topography	0	0.0
Medium Texture	70923	46.4
Coarse Texture	28972	19.0
Coarse Texture and Wetness	1449	0.9
Coarse Texture and Topography	0	0.0
Topography	6135	4.0
Bedrock	186	0.1
Wetness	7193	4.7
Organic	677	0.4
Marsh	328	0.2
Unclassified	13385	8.8
Water	214	0.1
Total	152879	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

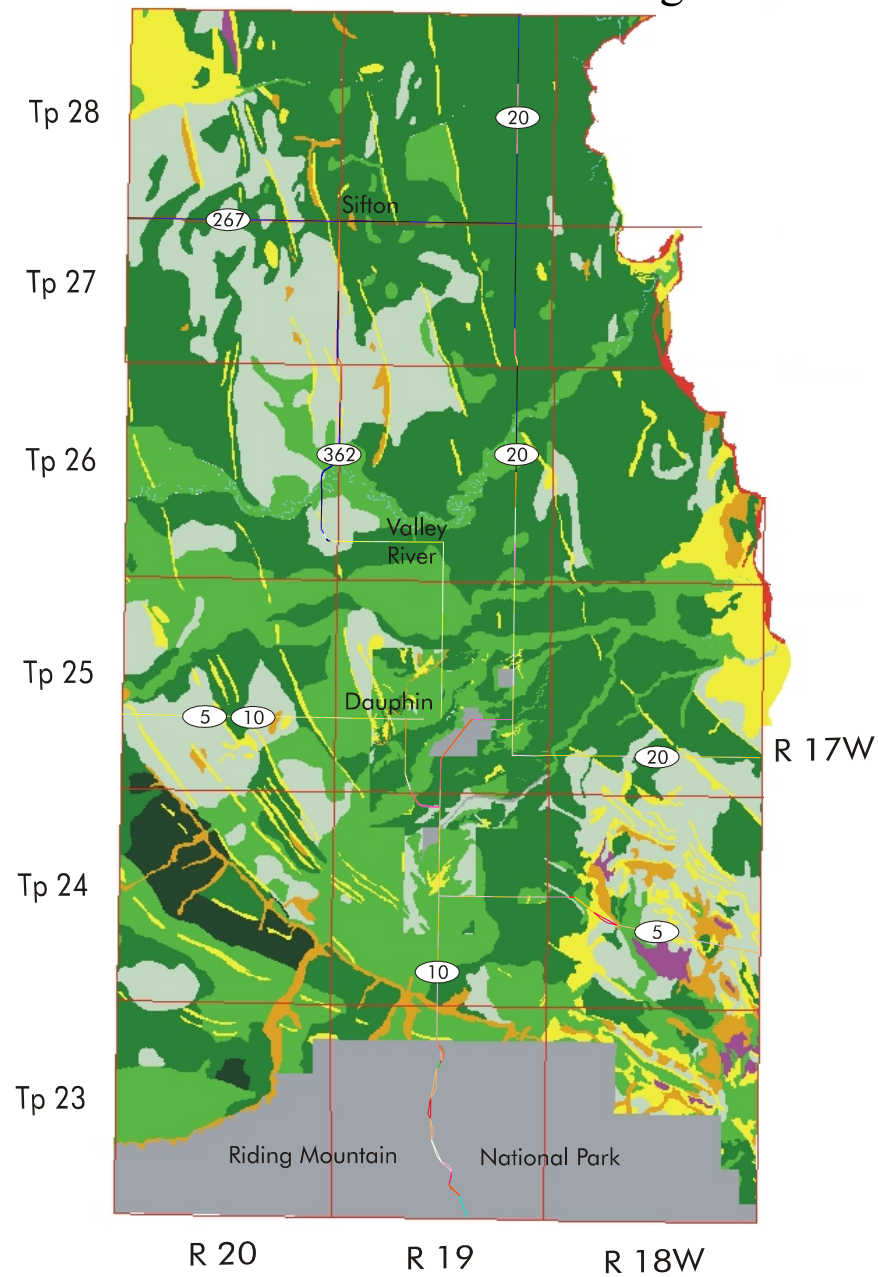
Class Subclass	Area (ha)	Percent of RM
1	2623	1.7
2	60360	39.5
2I	381	0.2
2IW	131	0.1
2M	36845	24.1
2MP	3320	2.2
2P	541	0.4
2T	812	0.5
2TW	28	0.0
2W	14078	9.2
2WP	2009	1.3
2X	2215	1.5
3	30098	19.7
3D	2696	1.8
3DN	4795	3.1

Table 5. Agricultural Capability¹(cont.)

Class Subclass	Area (ha)	Percent of RM
3I	10774	7.1
3M	6135	4.0
3MT	37	0.0
3N	1962	1.3
3P	772	0.5
3T	202	0.1
3TI	363	0.2
3W	763	0.5
3X	1600	1.0
4	25146	16.5
4DP	17679	11.6
4IW	605	0.4
4M	1594	1.0
4N	1091	0.7
4R	3736	2.4
4T	78	0.1
4W	363	0.2
5	10359	6.8
5M	3899	2.6
5P	1116	0.7
5T	101	0.1
5W	3215	2.1
5WI	2027	1.3
6	3956	2.6
6NW	8	0.0
6T	1497	1.0
6W	2027	1.3
7	593	0.4
7M	265	0.2
7W	328	0.2
Unclassified	18723	12.3
Water	214	0.1
Organic	678	0.4
Total	152750	100.0

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

Agriculture Capability Map



Canada Land Inventory Classes



Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Winnipeg Manitoba
June 2003

Irrigation Suitability Map.

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

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

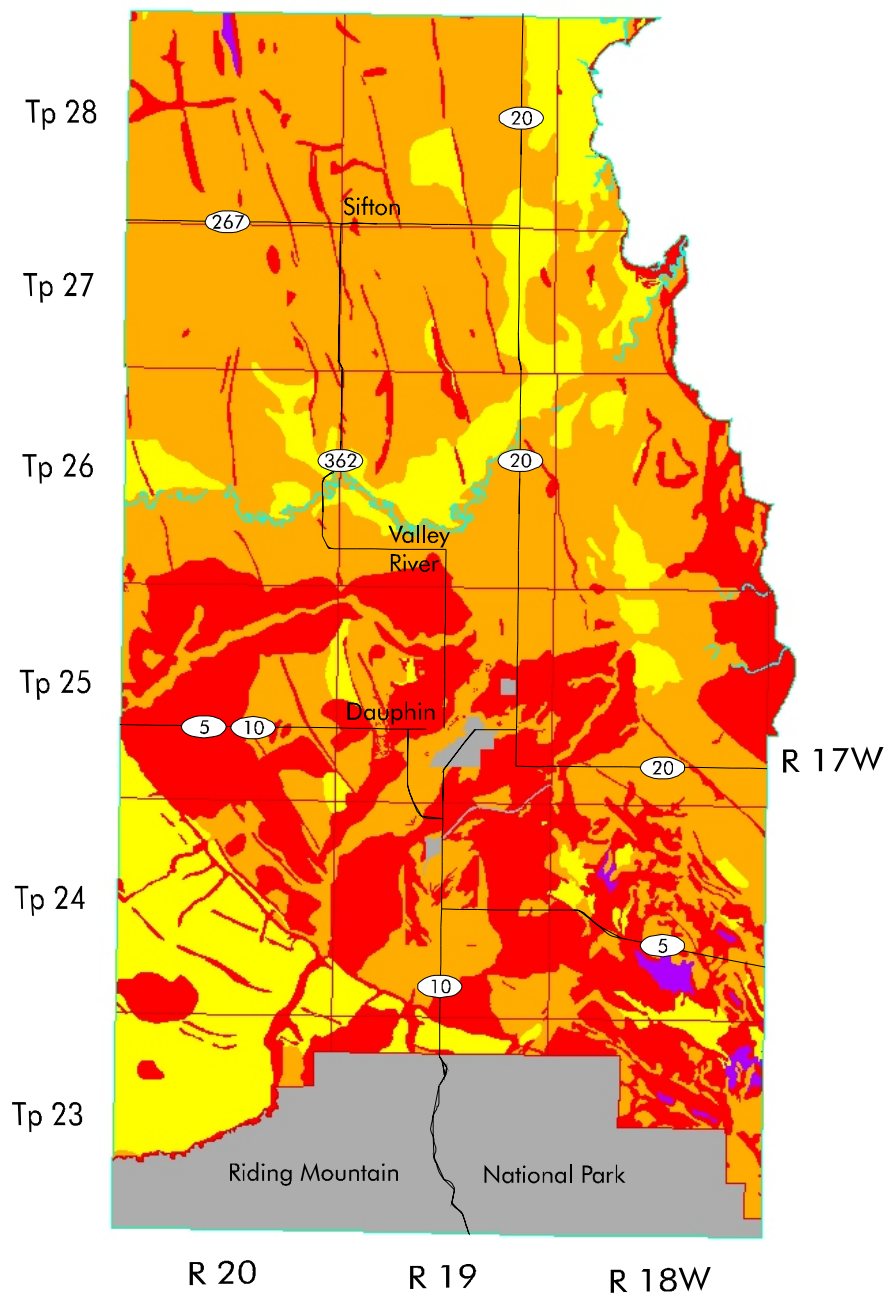
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 6. Irrigation Suitability¹

Class	Area (ha)	Percent of RM
Excellent	0	0.0
Good	23284	15.2
Fair	74217	48.5
Poor	41101	26.9
Organic	677	0.4
Unclassified	13385	8.8
Water	214	0.1
Total	152879	100.0

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

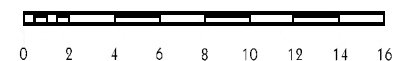
Irrigation Suitability Map



Irrigation Suitability Classes



Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
March 2000

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.

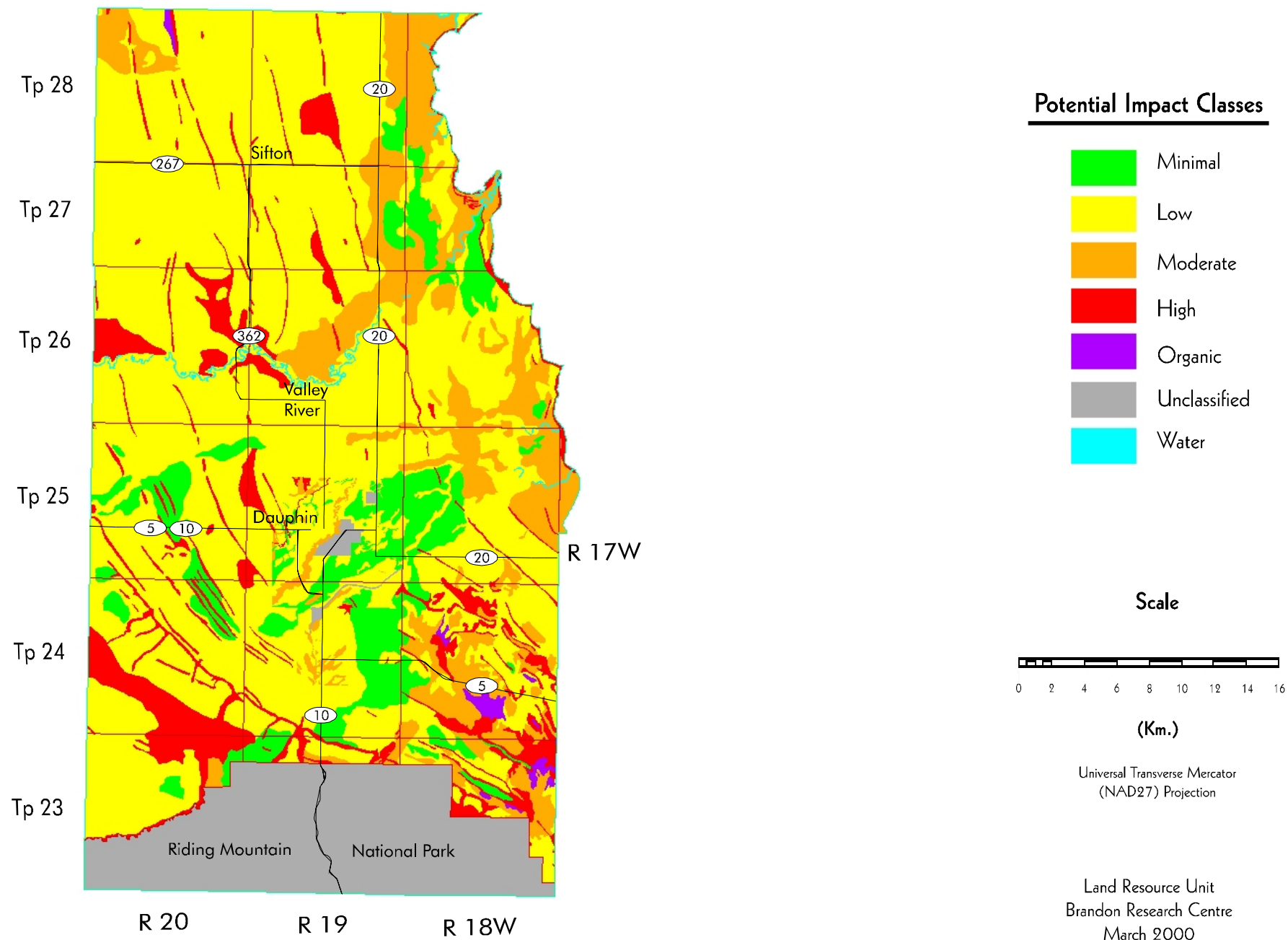
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Potential Environmental Impact Under Irrigation¹

Class	Area (ha)	Percent of RM
Minimal	12349	8.1
Low	88855	58.1
Moderate	19736	12.9
High	17662	11.6
Organic	677	0.4
Unclassified	13385	8.8
Water	214	0.1
Total	152879	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

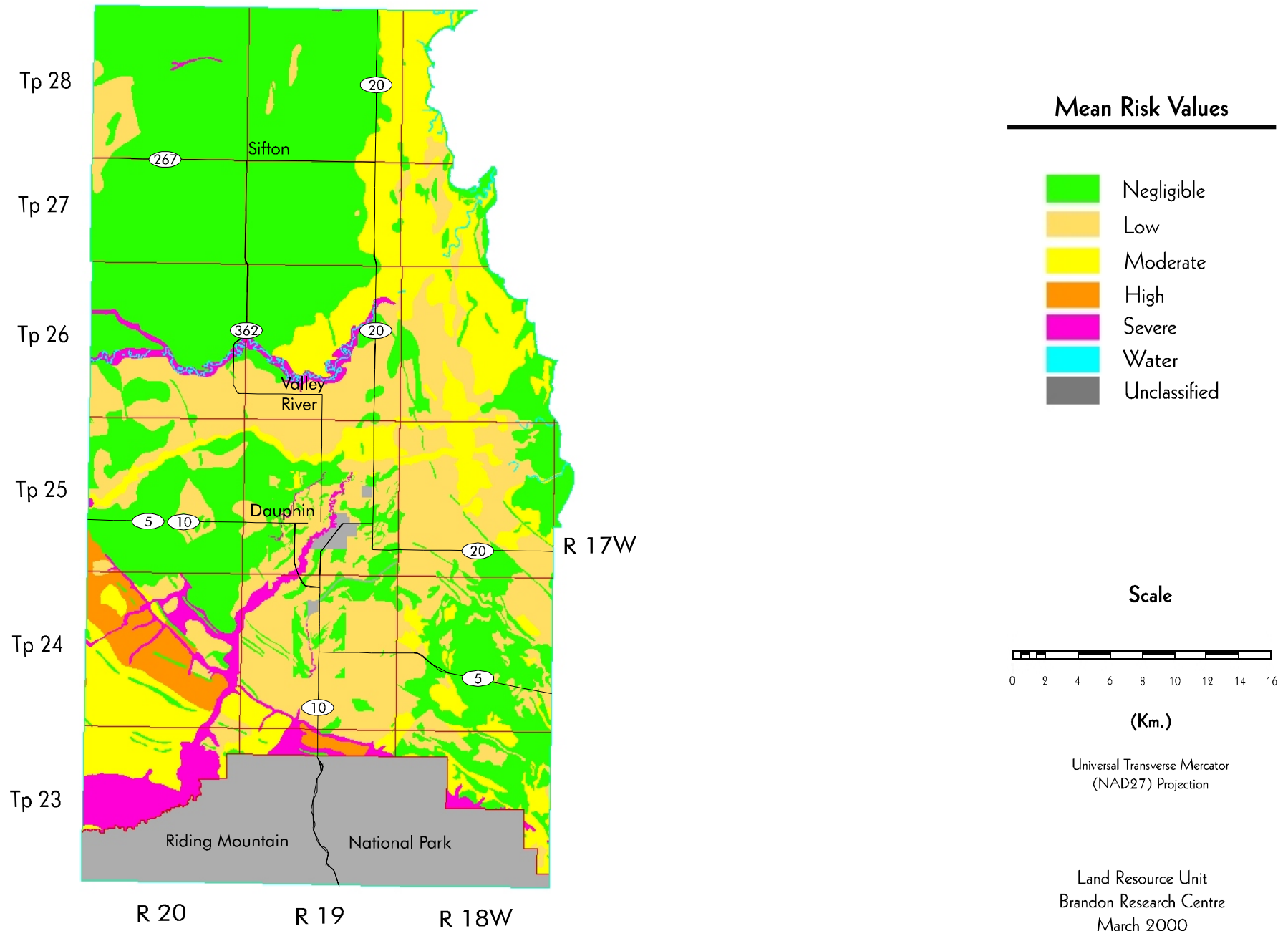
Cropping and residue management practices will significantly reduce this risk depending on crop rotation program, soil type, and landscape features.

Table 8. Water Erosion Risk¹

Class	Area (ha)	Percent of RM
Negligible	62830	41.1
Low	36868	24.1
Moderate	25747	16.8
High	3290	2.2
Severe	10545	6.9
Unclassified	13385	8.8
Water	214	0.1
Total	152879	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.

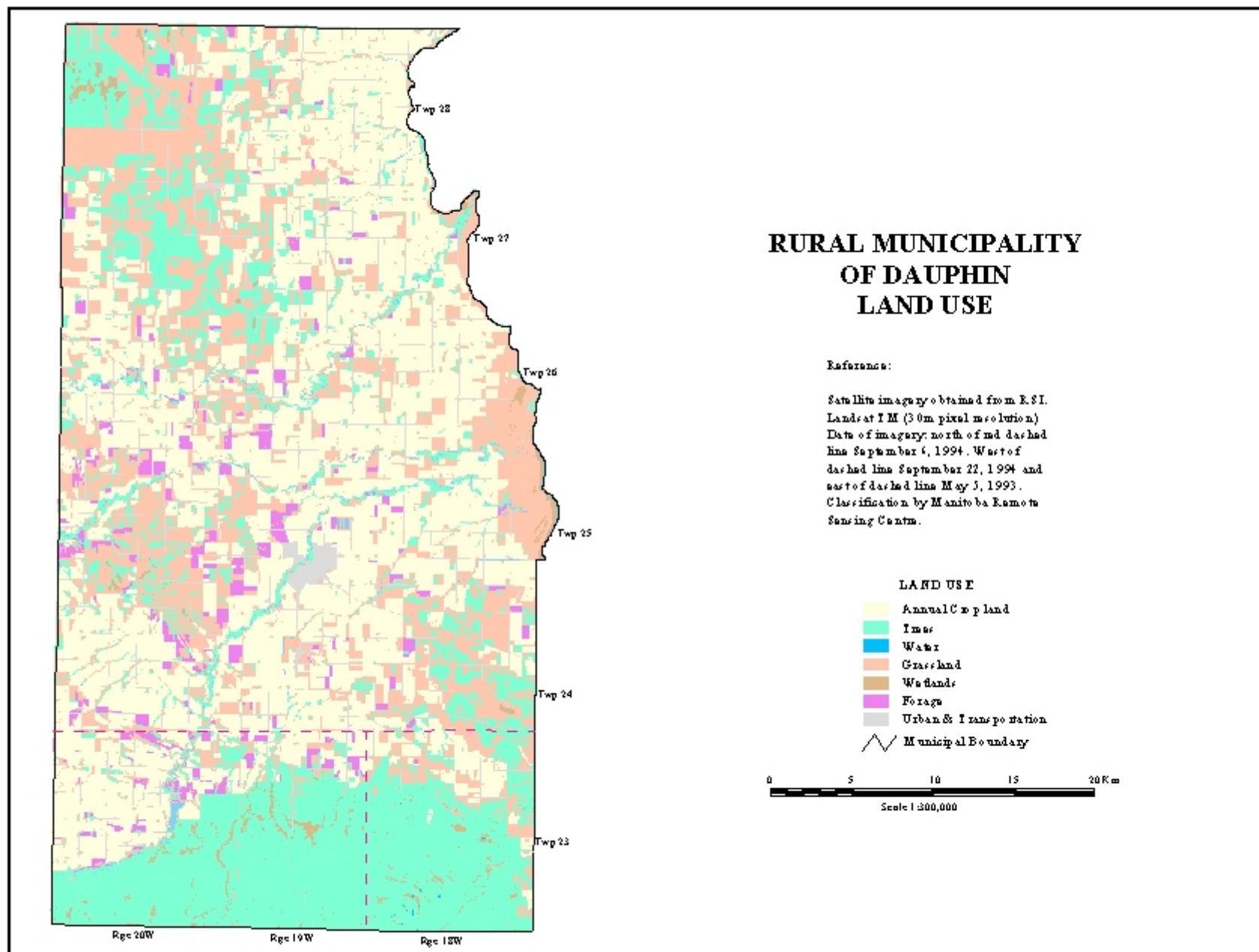
Water - open water - lakes, rivers streams, ponds, and lagoons.

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

Table 9. Land Use¹

Class	Area (ha)	Percent of RM
Annual Crop Land	66249	42.9
Forage	4430	2.9
Grasslands	36798	23.8
Trees	39051	25.3
Wetlands	1566	1.0
Water	1131	0.7
Urban and transportation	5105	3.3
Undifferentiated	0	0.0
Total	154,330	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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