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Rural Municipality of McCreary

Information Bulletin 99-33

Soils and Terrain

An introduction
to the land resource

Land Resource Unit
Brandon Research Centre



Canada

Rural Municipality of McCreary

Information Bulletin 99-33

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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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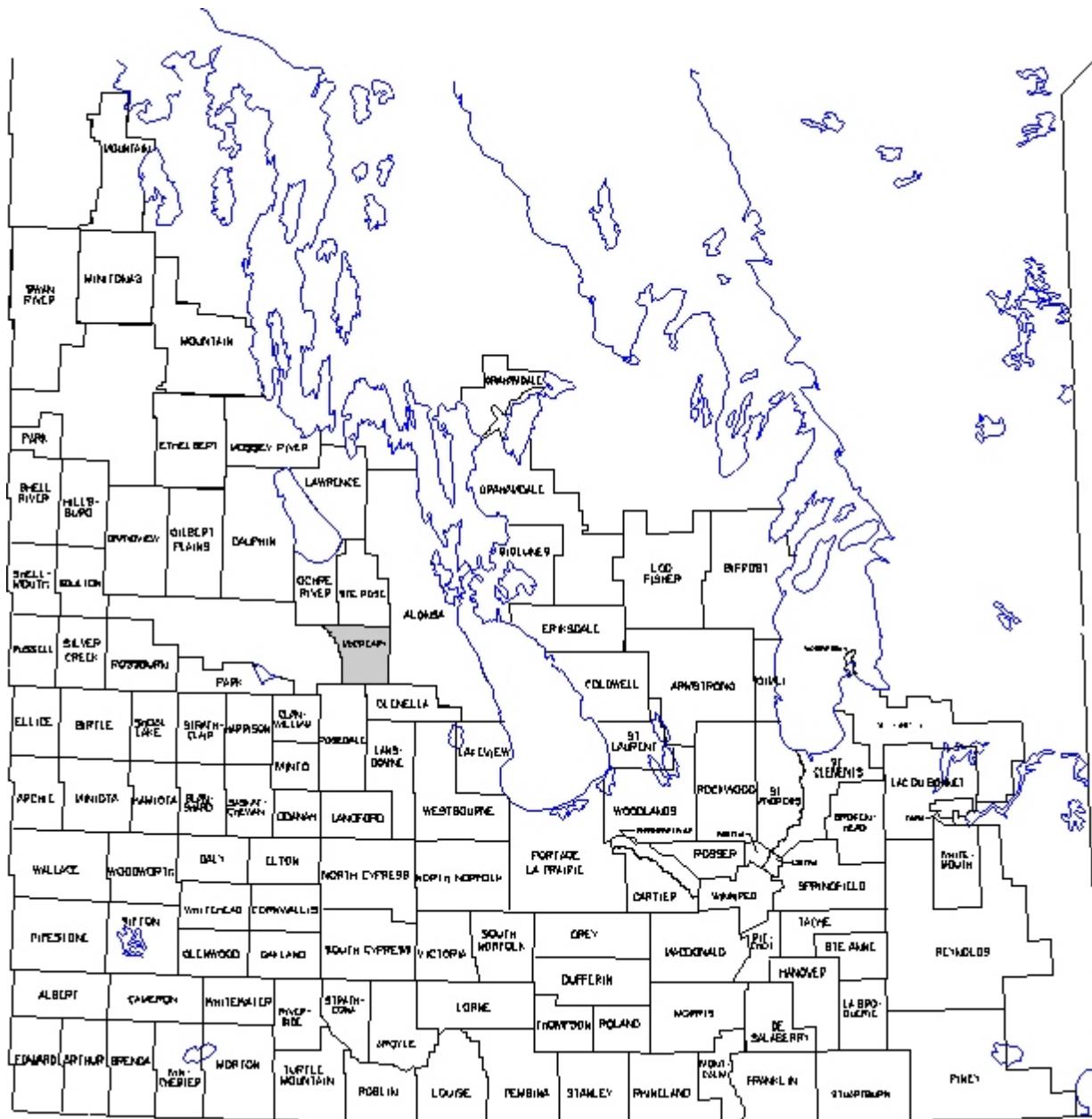
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INTRODUCTION

The location of the Rural Municipality of McCreary 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.

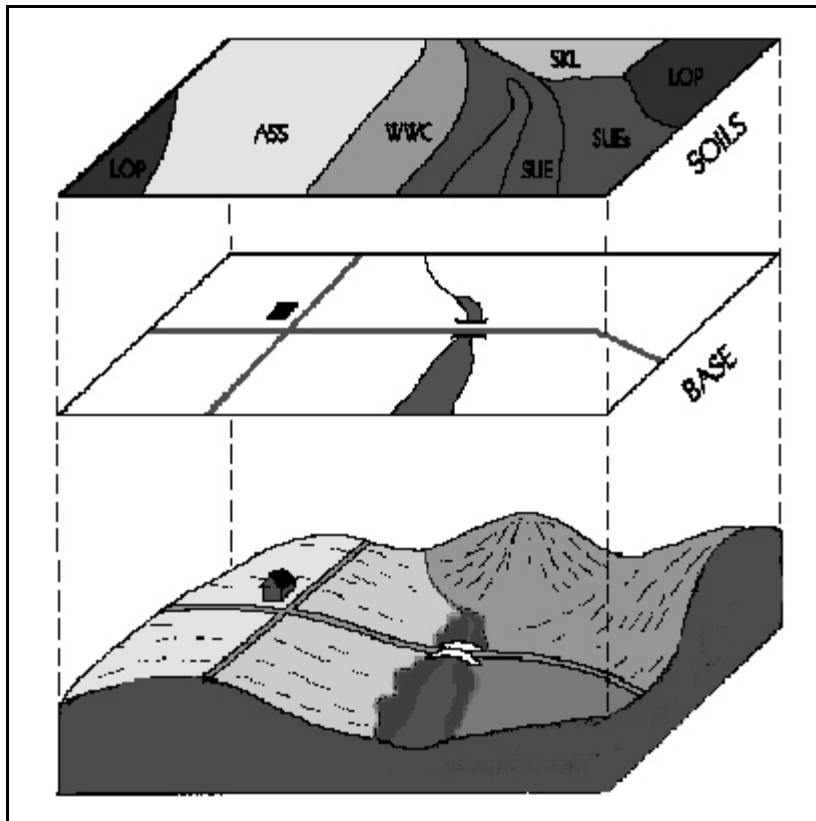


Figure 2. Soil and Base Map data.

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 McCreary covers 52 850 ha (approximately 5.7 townships) adjacent to the east side of Riding Mountain National Park in the Westlake district of southern Manitoba (page 3). McCreary is the main population centre as most of the population is rural farm-based. Agricultural services are provided from McCreary and from larger towns in the surrounding region.

Climatic conditions can be related to weather data from Ochre River, located 25 kilometres northwest of the municipality. The mean annual temperature at Ochre River is 2.0°C and the mean annual precipitation is 527 mm (Environment Canada, 1982). The average frost-free period is 113 days and degree-days above 5°C accumulated from May to September average 1682 (Environment Canada, 1982). The growing season along the Riding Mountain Escarpment in the southwest corner of the area is expected to be slightly cooler and shorter due to the higher elevation. 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 averages about 200 mm at the higher elevation and near 250 mm through the remainder of the area. The estimated effective growing degree-days accumulated from May to September range from 1200 in the Escarpment area to in excess of 1400 in eastern portions of the municipality (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 western part of the municipality is in the Dauphin Lake Plain physiographic section while the eastern part is in the Westlake Till Plain. The Riding Mountain Escarpment crosses the southwest corner of the municipality (Canada-Manitoba Soil Survey, 1980). Elevation of the land surface decreases from 525 to 413 metres above sea level (m asl) in the Escarpment area, falling rapidly at 70 m/km (37 ft/mi). Below the Escarpment, the land slopes at a rate of 7 m/km (37 ft/ mi) and then more gradually at about 2 m/km (10 ft/mi), decreasing to 292 m asl along the eastern edge of the area.

Local relief is generally under 3 metres with slopes under 2 percent except in steeply sloping portions of the Escarpment where relief exceeds 9 metres and slopes range from 15 to 30 percent (page 9). The municipality receives runoff from the Riding Mountain Upland resulting in high groundwater levels in much of the lower-lying terrain to the east. Surface drainage of the municipality is to the northeast via Wilson Creek and numerous other creeks and streams flowing from the Escarpment. A system of ditches assists in removing surface water for agricultural purposes and several larger drains carry runoff from the Escarpment.

Soil materials in the municipality were deposited during the last glaciation and during the time of glacial Lake Agassiz. The Dauphin Lake Plain is a complex area of waterworked glacial till, narrow beach ridges and thin sandy to clayey lacustrine materials underlain by glacial till. The Westlake Till Plain consists mainly of extremely calcareous, waterworked, loamy glacial till while the Escarpment consists of shaly glacial till, colluvial deposits and shaly alluvium (page 11). The dominantly gently sloping landscape and generally high watertables throughout the municipality result in the majority of soils being classified as imperfectly to poorly drained (page 13).

Soils in the municipality have been mapped at a reconnaissance level (1:126 720 scale) and published in the soil survey report for the West-Lake map sheet area (Ehrlich et al., 1958). According to the Canadian System of Soil Classification (Soil Classification Working Group, 1998), well to imperfectly drained Black Chernozem soils are dominant. These soils are developed on calcareous, waterworked loamy glacial till (Isafold association) and thin lacustrine sediments ranging from sand (Almasippi association), to loam (Lakeland and McCreary associations) and clay textures (Westbourne, Dauphin and Norgate associations). Gray Luvisol soils developed on loamy till with high shale content (Clarksville and Wapus associations) occur in the Escarpment area and Regosolic soils developed on recent alluvial deposits (Edwards association) occur below the Escarpment. Humic Gleysol soils occupy poorly drained sites in all landscapes.

Major management considerations are related to texture (sandy and clayey soils), wetness and topography (page 15). Saturated soils

and seasonal high water tables (at 1 to 2 metres) are common in level to depressional areas while the soils in the steeply sloping Escarpment area are susceptible to water erosion. Moderately to excessively stony conditions are associated with the till soils and beach deposits throughout the area. Scattered areas of weak salinity occur below the Escarpment.

Thirty-one percent of the soils are rated in **Class 2** for agricultural capability while 19 percent are rated in **Class 3** due to stoniness, compact subsoil and potential inundation. 23.7 percent of the soils are placed in **Class 4** and 17 percent are rated in **Class 5** due to droughtiness and excess wetness. **Class 6** soils affected by excessive wetness and topography occupy 9 percent of the area (page 17). The irrigation suitability of soils in this municipality varies from **Good** (5 percent) to **Fair** (49 percent) and **Poor** (46 percent). Soils rated as **Poor** for irrigation suitability include poorly drained soils, clayey textures and rapidly drained gravels (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 risk for adverse impact is **Low** on loamy till and clay loam lacustrine soils and **Minimal** on clay soils. Areas at **High** potential risk consist of steeply sloping land and highly permeable sand and gravel soils. 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. Fifty-five percent of the land in the municipality is at a **Negligible** risk of degradation from water erosion. Although extensive areas are rated as **Low** and **Moderate**, steeply sloping soils along the Escarpment are at **Severe** risk of erosion. Current management practices focus on maintaining adequate crop residues and surface cover to protect the soils from both wind and water erosion and the maintenance of grass or tree cover on steeply sloping land.

Agriculture is the dominant land use in the RM of McCreary. An assessment of the status of land use in 1993, obtained through an analysis of satellite imagery, showed annual crops and forage crops occupying 34 percent and 2 percent respectively of the land area, mainly in the central part of the municipality. Treed areas occur along the Escarpment and intermixed with grasslands in the eastern part of the area. The grasslands (41 percent of area) and treed areas (14 percent) provide forage and grazing capacity as well as wildlife habitat. Wetlands occupying nearly 6 percent of the area also provide wildlife habitat. Various non-agricultural uses such as infrastructure for urban areas, transportation and recreation occupy 3 percent of the municipality (page 25).

Most soils in the RM of McCreary have moderate to moderately severe limitations for arable agriculture. Soils with low relief and a dominance of imperfect to poor drainage are frequently saturated and subject to surface ponding, particularly during spring runoff or following heavy rains. In addition, the subdued ridge and swale topography associated with the till soils in the western part to the municipality impedes drainage improvement. Where the land pattern permits, improvement and maintenance of water management infrastructure is required to remove surface water while maintaining adequate soil moisture for crop growth. 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 forages on a site by site basis will help to reduce the risk of soil degradation, maintain productivity and insure that agricultural 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

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.

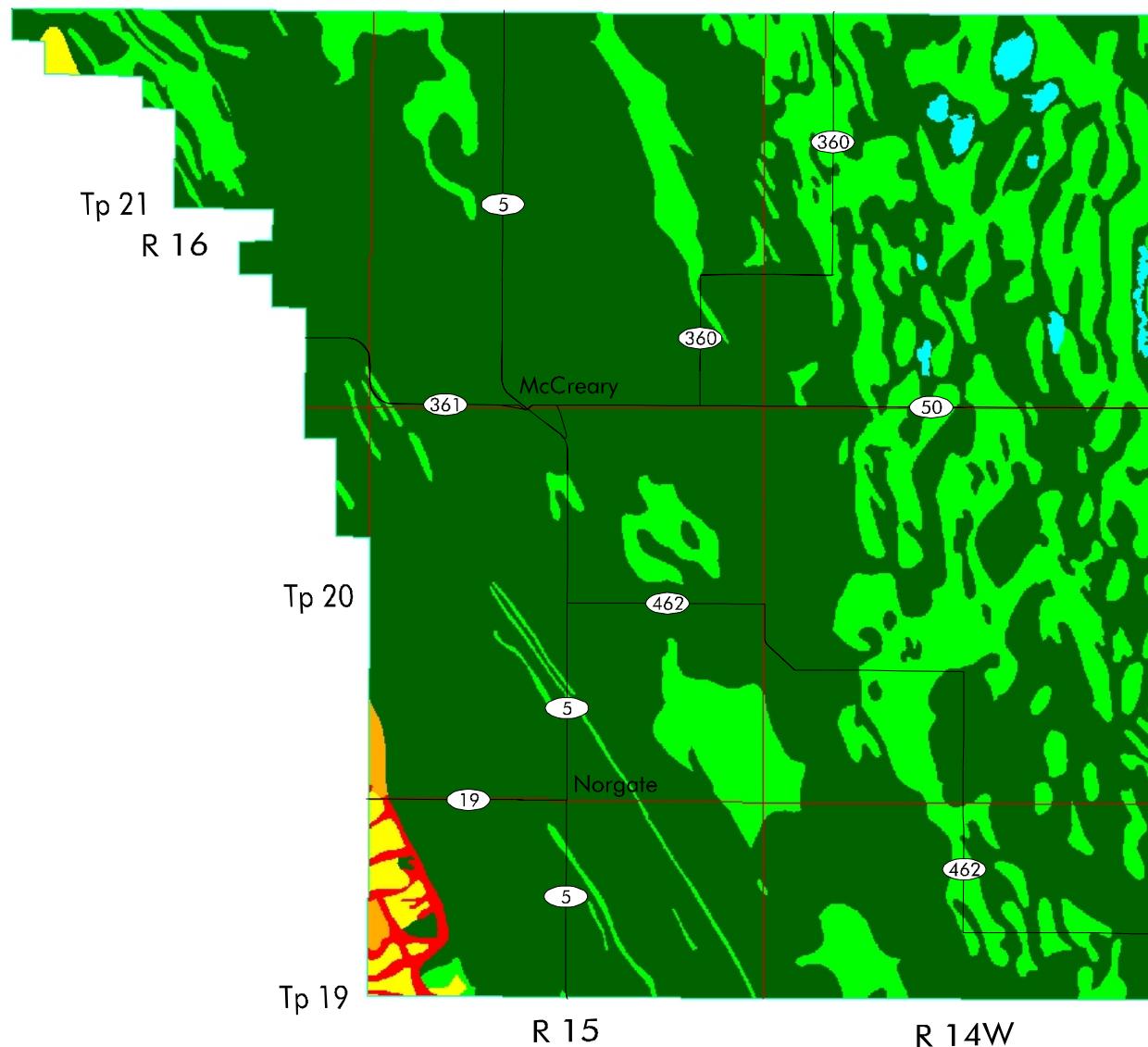
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area,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

Table 1. Slope Classes¹

Slope Class	Area (ha)	Percent of RM
0 - 2 %	39201	74.2
2 - 5 %	12540	23.7
5 - 9 %	0	0.0
9 - 15 %	405	0.8
15 - 30 %	131	0.2
> 30 %	306	0.6
Unclassified	0	0.0
Water	267	0.5
Total	52850	100.0

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

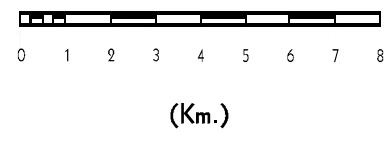
Slope Map



Slope Classes

0 - 2 %
2 - 5 %
5 - 9 %
9 - 15 %
15 - 30 %
> 30 %
Water
Unclassified

Scale



Universal Transverse Mercator
(NAD27) Projection

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.

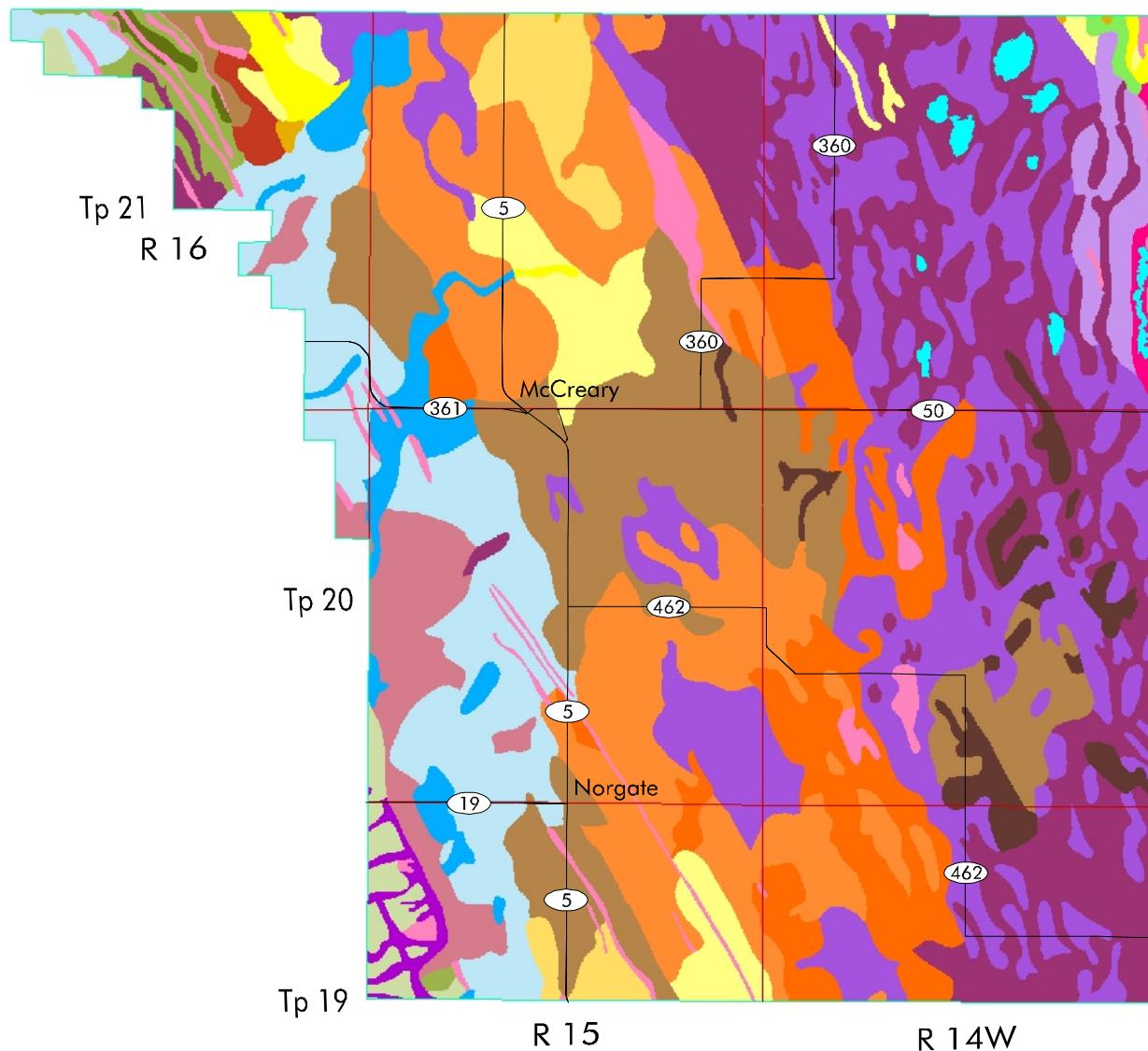
More detailed maps showing the dominant and subdominant soils in each polygon can also be produced at larger map scales.

Table 2. Generalized Soil Groups¹

Soil Groups	Area (ha)	Percent of RM
Sand and Gravel with overlays	1689	3.2
Highly Calcareous Loamy Till (Gleysols)	8281	15.7
Variable Textured Alluvium (Gleysols)	1324	2.5
Extremely Calcareous Loamy Till (Black Chernozems)	9981	18.9
Extremely Calcareous Loamy Till (Brunisols and Dark Gray Chernozems)	799	1.5
Loamy Till (Luvisols)	536	1.0
Loamy Till (Dark Gray Chernozem)	453	0.9
Clayey Lacustrine (Gleysols)	1128	2.1
Loamy Lacustrine (Gleysols)	3833	7.3
Sandy Loam Lacustrine (Gleysols)	49	0.1
Shallow Organic Fen Peat	90	0.2
Sandy Lacustrine (Gleysols)	414	0.8
Clayey Lacustrine (Black Chernozems)	6758	12.8
Strongly Acidic Clay Till	205	0.4
Loamy Lacustrine	7528	14.2
Sandy Loam Lacustrine	1226	2.3
Loamy Till (Gleysols)	98	0.2
Variable Textured Alluvium (Regosols)	4471	8.5
Sandy Lacustrine	1878	3.6
Sand and Gravel (Gleysols)	189	0.4
Eroded Slopes	306	0.6
Sand and Gravel	1347	2.5
Water	267	0.5
Total	52850	100.0

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

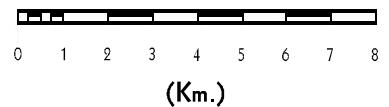
Generalized Soil Map



Soil Associations

Sand and Gravel with overlays
Highly Calcareous Loamy Till (Gleysols)
Variable Textured Alluvium (Gleysols)
Extremely Calcareous Loamy Till (Black Chernozems)
Extremely Calcareous Loamy Till (Brunisols and Dark Gray Chernozems)
Loamy Till (Luvisols)
Loamy Till (Dark Gray Chernozems)
Clayey Lacustrine (Gleysols)
Loamy Lacustrine (Gleysols)
Sandy Loam Lacustrine (Gleysols)
Shallow Organic Fen Peat
Sandy Lacustrine (Gleysols)
Clayey Lacustrine (Black Chernozems)
Strongly Acidic Clay Till
Loamy Lacustrine
Sandy Loam Lacustrine
Loamy Till (Gleysols)
Variable Textured Alluvium (Regosols)
Sandy Lacustrine
Sand & Gravel (Gleysols)
Eroded Slopes
Sand & Gravel
Water
Unclassified

Scale



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.

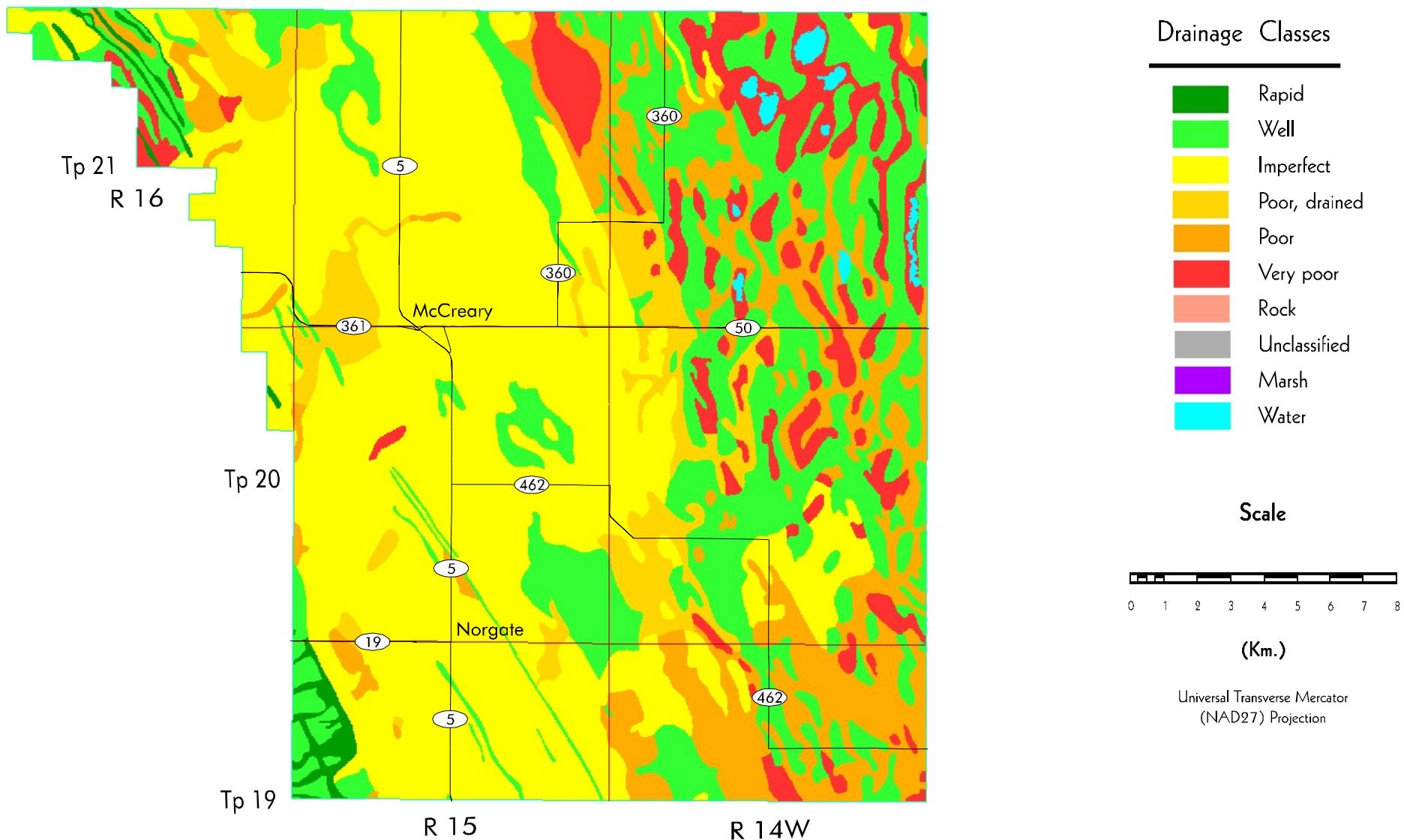
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes¹

Drainage Class	Area (ha)	Percent of RM
Very Poor	4304	8.1
Poor	7568	14.3
Poor, drained	3739	7.1
Imperfect	23551	44.6
Well	12821	24.3
Rapid	600	1.1
Rock	0	0.0
Marsh	0	0.0
Unclassified	0	0.0
Water	267	0.5
Total	52850	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.

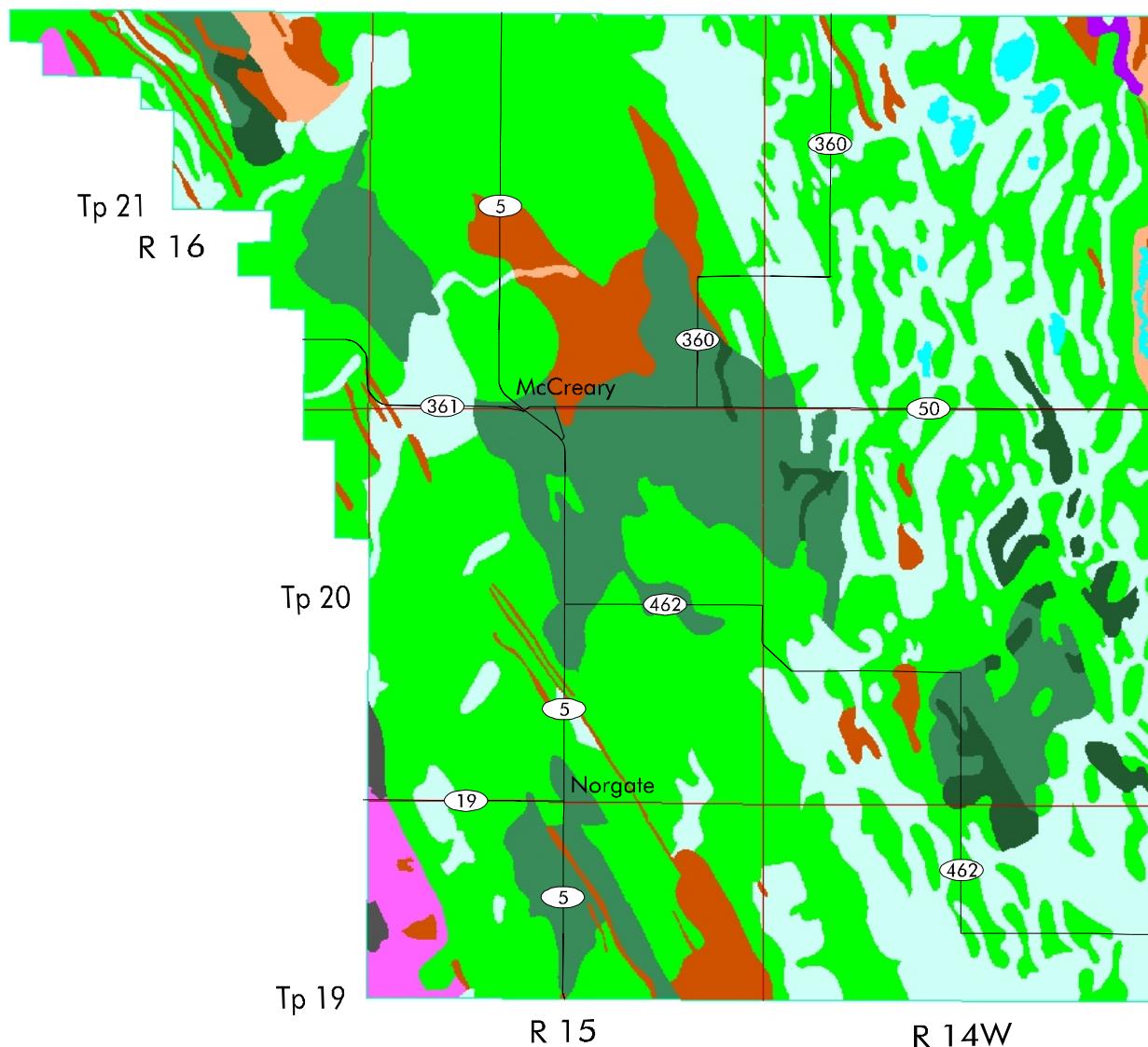
R = Bedrock - soil landscapes that have **shallow depth to bedrock (< 50 cm) and/or exposed bedrock** which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 4. Management Considerations¹

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	6979	13.2
Fine Texture and Wetness	1333	2.5
Fine Texture and Topography	0	0.0
Medium Texture	25927	49.1
Coarse Texture	3225	6.1
Coarse Texture and Wetness	603	1.1
Coarse Texture and Topography	0	0.0
Topography	711	1.3
Bedrock	131	0.2
Wetness	13585	25.7
Organic	90	0.2
Marsh	0	0.0
Unclassified	0	0.0
Water	267	0.5
Total	52850	100.0

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

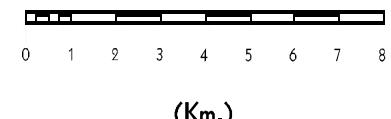
Management Considerations Map



Land Resource Characteristics

- █ Medium Texture
- █ Coarse Texture
- █ Coarse Texture and Topography
- █ Coarse Texture and Wetness
- █ Bedrock
- █ Topography
- █ Fine Texture and Topography
- █ Fine Texture
- █ Fine Texture and Wetness
- █ Organic
- █ Marsh
- █ Wetness
- █ Unclassified
- █ Water

Scale



Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
February 2000

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

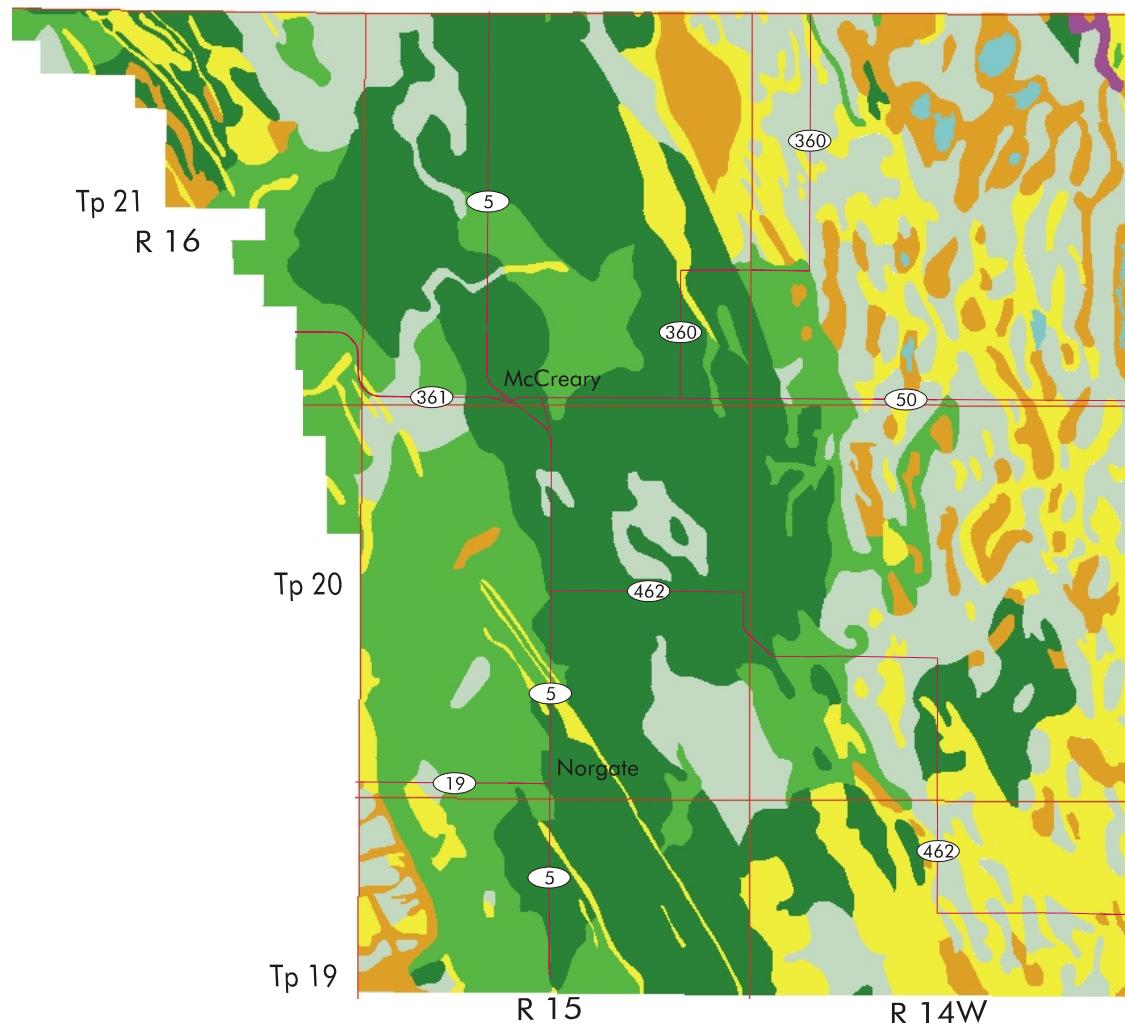
Class	Area	Percent
Subclass	(ha)	of RM
2	16498	31.2
2M	1572	3.0
2T	459	0.9
2W	13458	25.5
2WP	1008	1.9
3	9878	18.7
3I	5951	11.3
3M	1529	2.9
3W	2398	4.5

Table 5. Agricultural Capability¹(cont.)

Class	Area	Percent
Subclass	(ha)	of RM
4	12533	23.7
4DP	10783	20.4
4IW	1028	1.9
4T	407	0.8
4W	315	0.6
5	9033	17.1
5M	1347	2.6
5T	130	0.2
5W	7255	13.7
5WI	301	0.6
6	4513	8.5
6T	307	0.6
6W	4206	8.0
Water	263	0.5
Organic	90	0.2
Total	52809	100.0

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

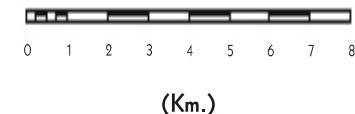
Agriculture Capability Map



Canada Land Inventory Classes



Scale



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.

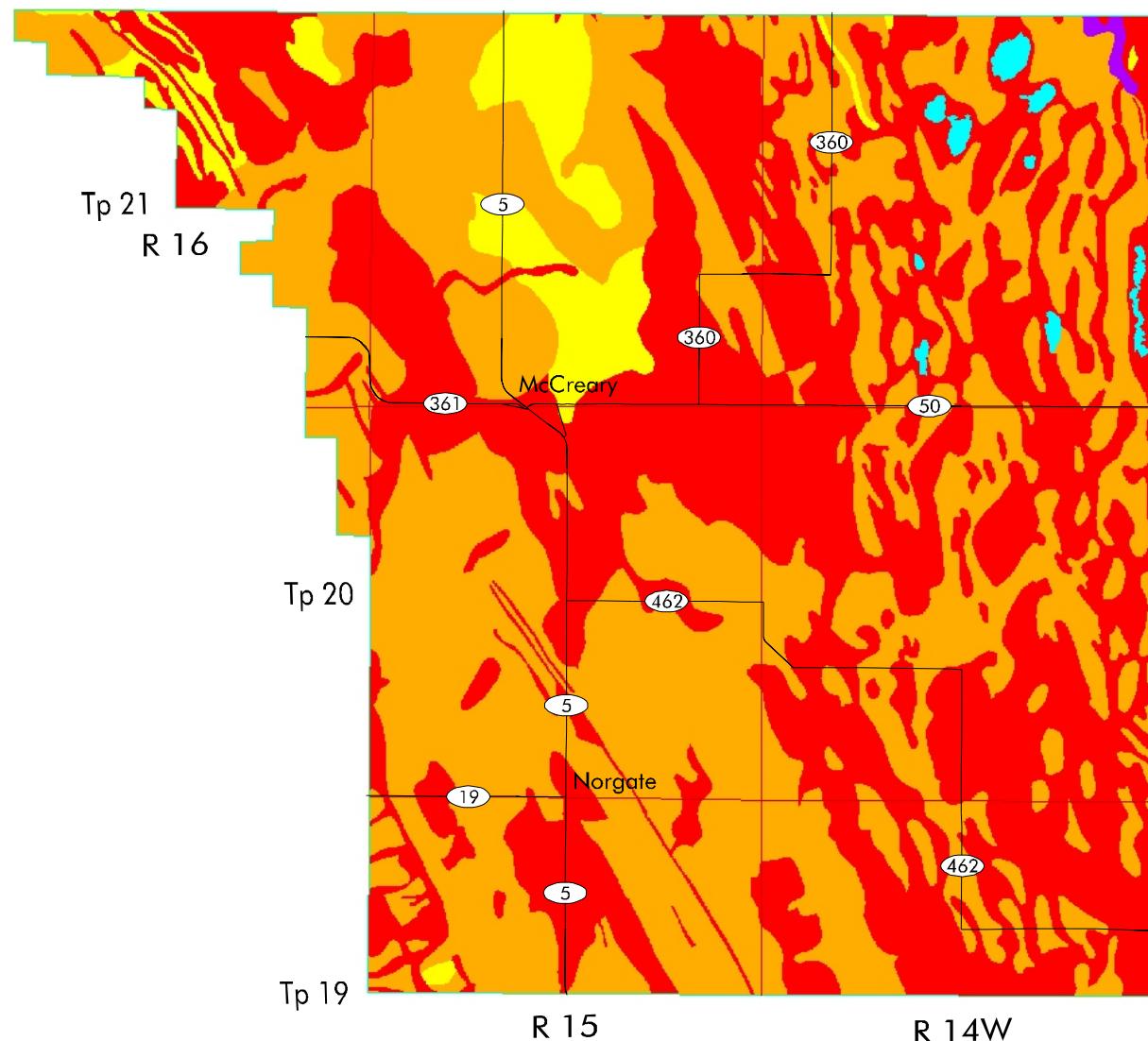
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 6. Irrigation Suitability¹

Class	Area (ha)	Percent of RM
Excellent	0	0.0
Good	2584	4.9
Fair	25848	48.9
Poor	24062	45.5
Organic	90	0.2
Unclassified	0	0.0
Water	267	0.5
Total	52850	100.0

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

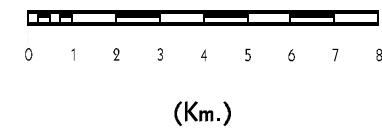
Irrigation Suitability Map



Irrigation Suitability Classes

	Excellent
	Good
	Fair
	Poor
	Organic
	Unclassified
	Water

Scale



Universal Transverse Mercator
(NAD27) Projection

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.

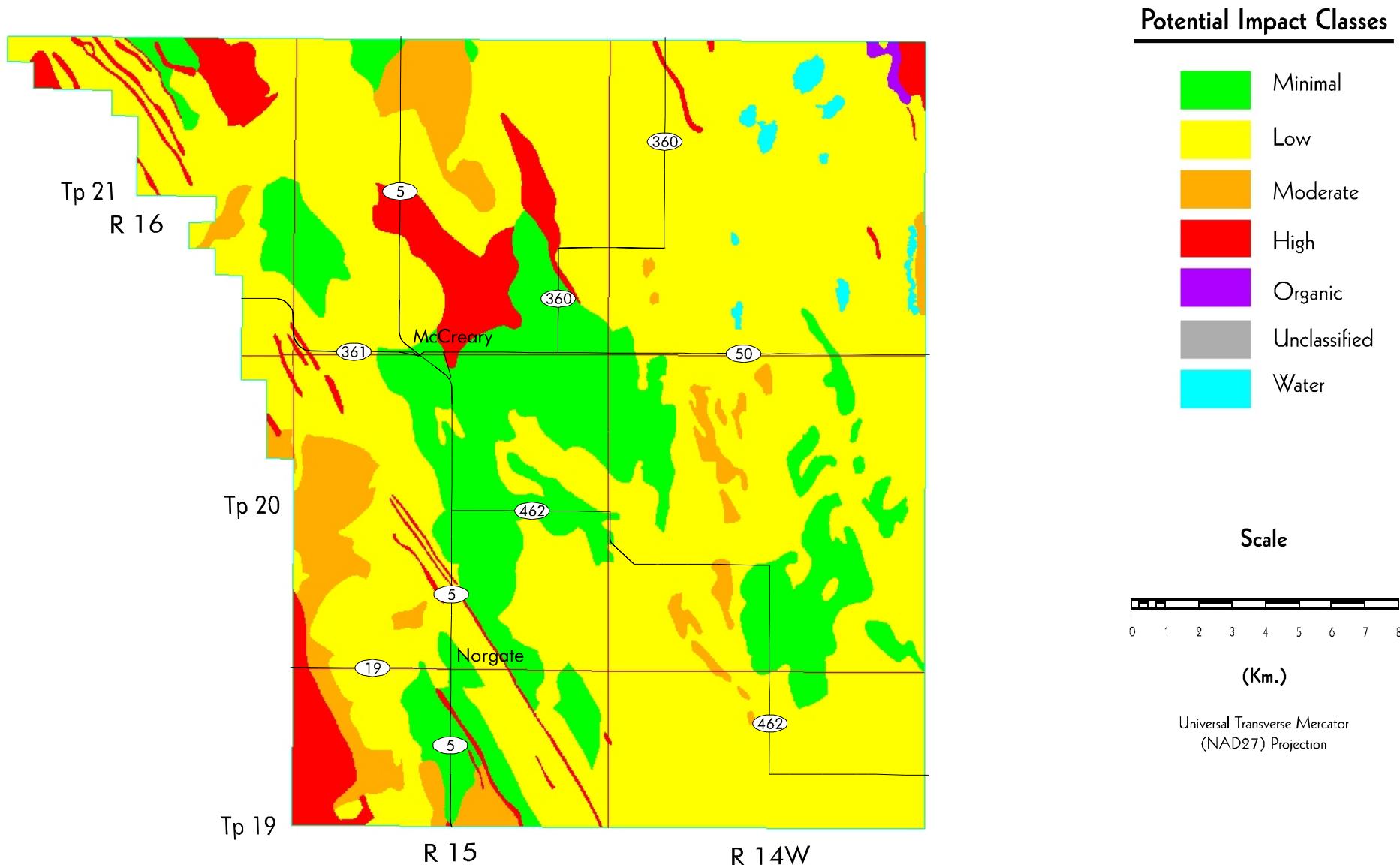
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Potential Environmental Impact Under Irrigation¹

Class	Area (ha)	Percent of RM
Minimal	9422	17.8
Low	36008	68.1
Moderate	3561	6.7
High	3503	6.6
Organic	90	0.2
Unclassified	0	0.0
Water	267	0.5
Total	52850	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

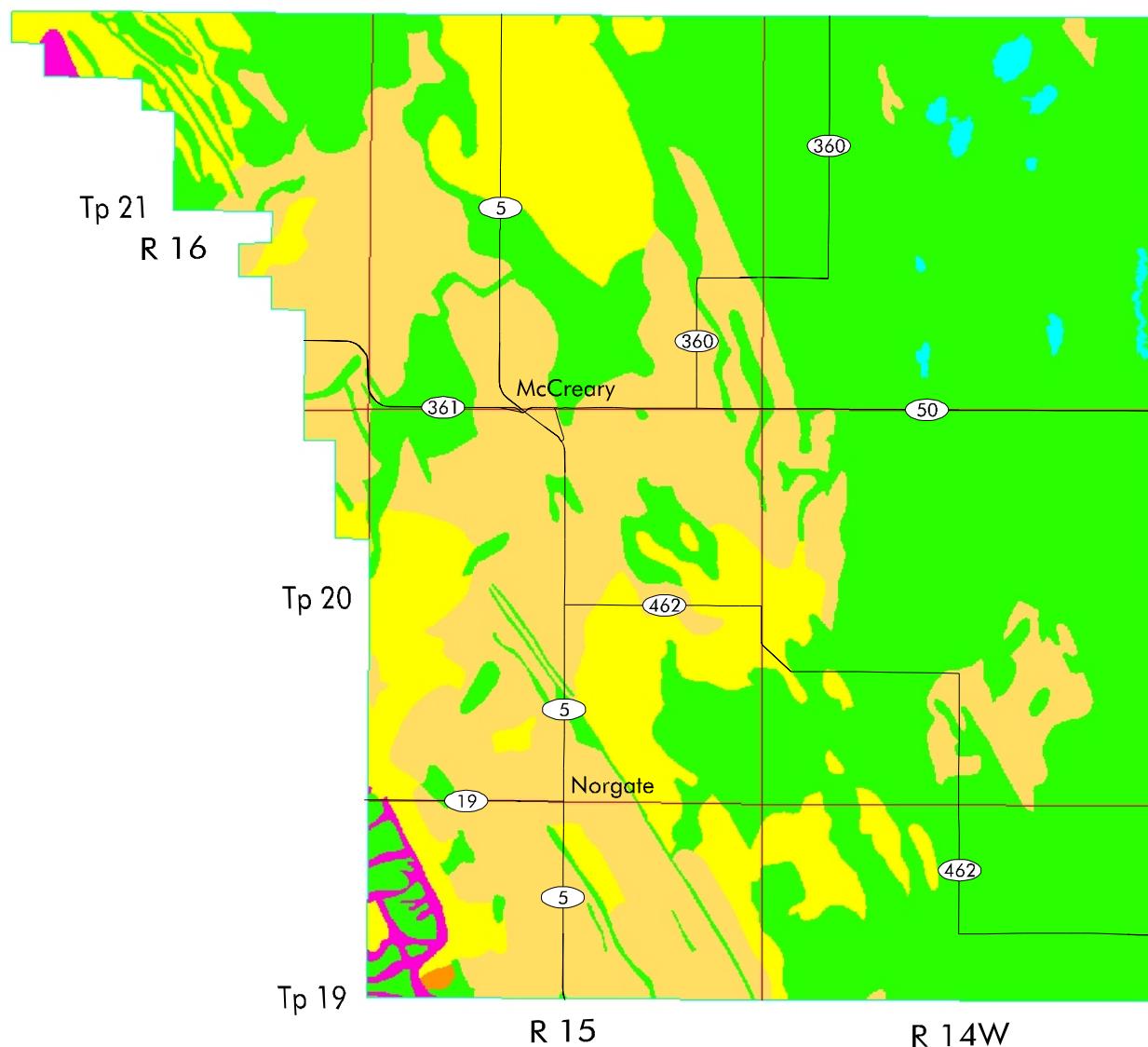
Cropping and residue management practices will significantly reduce this risk depending on crop rotation program, soil type, and landscape features.

Table 8. Water Erosion Risk¹

Class	Area (ha)	Percent of RM
Negligible	29285	55.4
Low	14351	27.2
Moderate	8530	16.1
High	37	0.1
Severe	380	0.7
Unclassified	0	0.0
Water	267	0.5
Total	52850	100.0

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

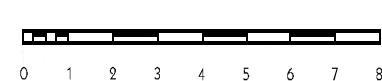
Water Erosion Risk Map



Mean Risk Values

Green	Negligible
Yellow	Low
Orange	Moderate
Red	High
Purple	Severe
Cyan	Water
Grey	Unclassified

Scale



Universal Transverse Mercator
(NAD27) Projection

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.

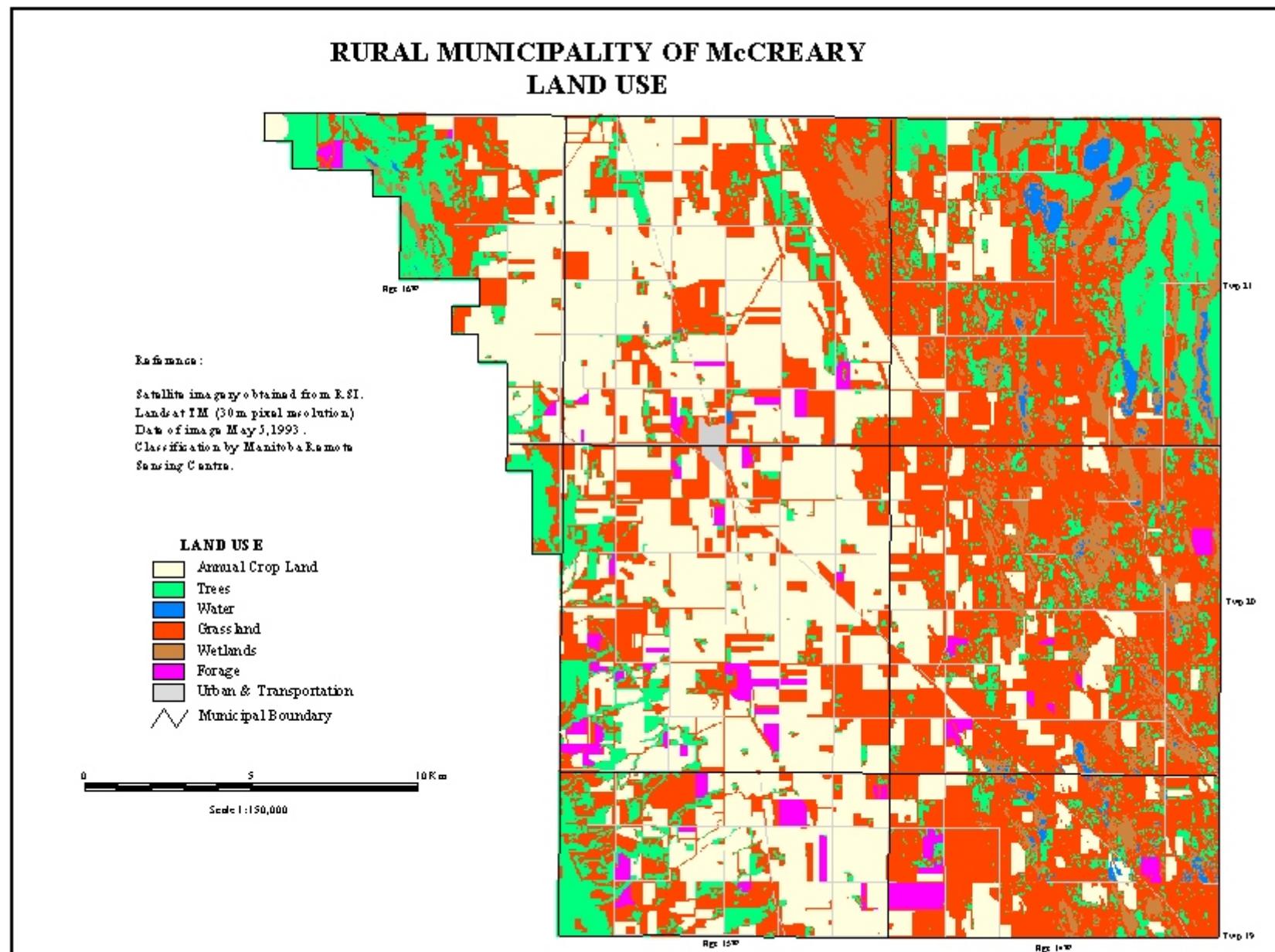
Water - open water - lakes, rivers streams, ponds, and lagoons.

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

Table 9. Land Use¹

Class	Area (ha)	Percent of RM
Annual Crop Land	17902	33.5
Forage	1109	2.1
Grasslands	21862	40.9
Trees	7354	13.8
Wetlands	3065	5.7
Water	474	0.9
Urban and transportation	1659	3.1
Undifferentiated	0	0.0
Total	53425	100.0

¹ Land use information (1993) and map supplied by Prairie Farm Rehabilitation Administration. Areas may vary from previous maps due to differences in analytical procedures.



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