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Rural Municipality of Grahamdale


Information Bulletin 99-21

Soils and Terrain

An introduction
to the land resource

Land Resource Unit
Brandon Research Centre



Canada 

Rural Municipality of Grahamdale

Information Bulletin 99-21

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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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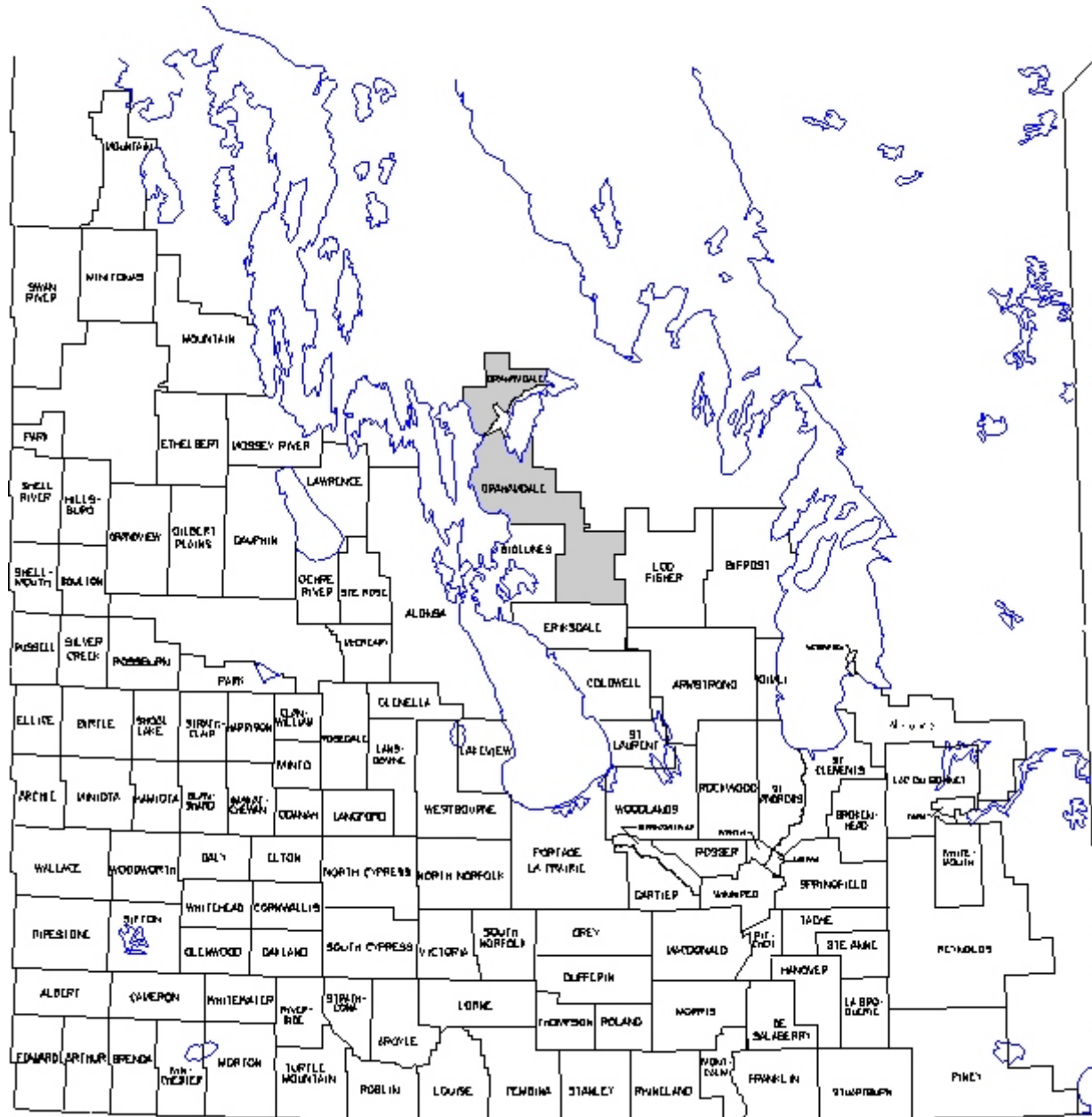


Figure 1. Rural municipalities of southern Manitoba.

INTRODUCTION

The location of the Rural Municipality of Grahamdale 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.

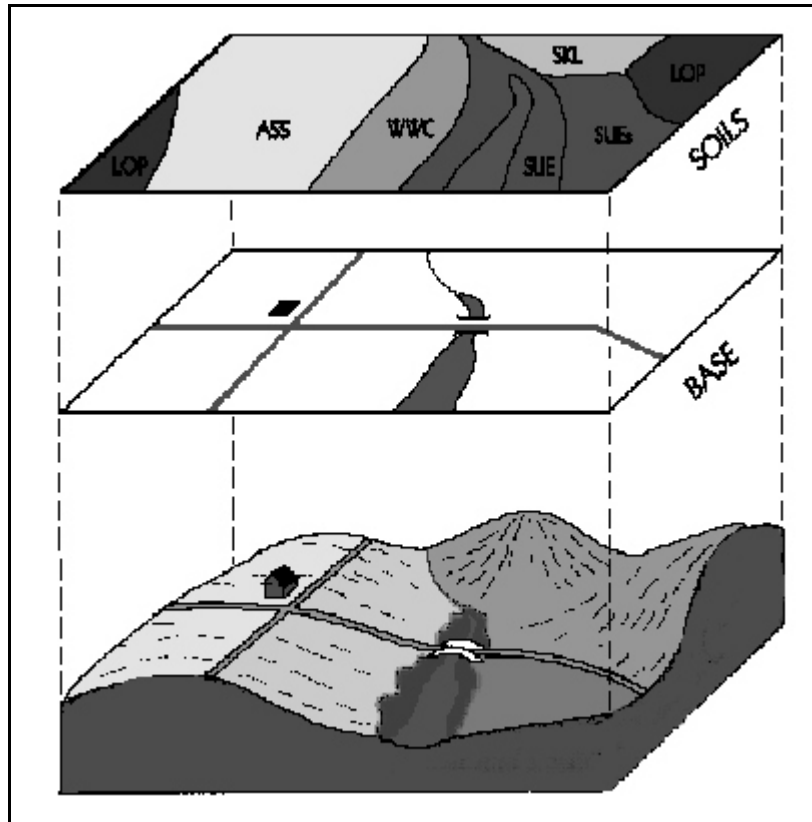


Figure 2. Soil and Base Map data.

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 Grahamdale covers an area of 246219 ha (approximately 26.7 townships) in the central Interlake district of southern Manitoba. The Fairford Indian Reserve located along the Fairford River divides the municipality into two sections (page 3). Moosehorn is the largest population and service centre with smaller concentrations of people in Gypsumville and Steeprock. Most of the municipality is sparsely populated although the density of rural population is slightly greater on the Fairford Indian Reserve.

The climate in the area can be related to weather data from Ashern located about 5 kilometres west of the municipality and Gypsumville situated in the northern part of the area. The mean annual temperature at Ashern is 1.1°C and the mean annual precipitation is 483 mm (Environment Canada, 1993). The average frost-free period at Gypsumville is 101 days and degree-days above 5°C accumulated from May to September average 1442 (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 falls between 250 mm and 200 mm. The estimated effective growing degree-days accumulated from May to September range from 1400 in the south to about 1300 in the north (Agronomic Interpretations Working Group, 1995). These parameters provide an indication of moisture and heat energy available for crop growth and are generally adequate to support a wide range of crops adapted to western Canada.

Physiographically, the municipality is located in the Interlake Plain and the Lake St. Martin Lowland (Canada-Manitoba Soil Survey, 1980). Elevation of the land surface ranges from 292 metres above sea level (m asl) in the area south of Lake St. Martin to an average of about 248 m asl throughout the remainder of the municipality. The land surface is characterized by a low ridge and swale topographic pattern in which local relief is generally under 3 metres and the dominant slopes are less than 2 percent. Slightly rougher

terrain with up to 5 percent slope occurs over nearly one-third of the area (page 9). Drainage through the municipality is provided by the Fairford River flowing from Lake Manitoba to Lake St. Martin and the Dauphin River to Lake Winnipeg. The land surface slopes gently toward Lake Manitoba and Lake St. Martin at a rate of about 0.8 m/km or 4 ft/mi. Surface drainage is poorly developed over much of the area as there are very few continuous waterways. Runoff from the ridges collects in adjoining swales or in larger swamps and peatlands and gradually infiltrates to the groundwater or evaporates over time. As a result, many areas in the municipality are characterized by high groundwater levels. Drainage in part of the Gypsumville area has been enhanced by a network of ditches to assist in removal of surface waters for agricultural purposes.

Soil materials in the municipality were deposited during the last glaciation and during the time of glacial Lake Agassiz. The Interlake Plain is a gently undulating to ridged area of extremely calcareous, very stony, waterworked, loamy glacial till. In contrast, the Lake St. Martin Lowland is a level to very gently undulating area of shallow clayey to loamy lacustrine sediments and clayey glacial till (page 11). The low ridge and swale topography throughout much of the area results in a complex drainage pattern of imperfectly, very poorly and well drained soils (page 13).

Soils in the municipality have been mapped at a reconnaissance level and published at a 1:126 720 scale in the soil survey reports for the Grahamdale area (Mills et al., 1971) and the Red Rose area (Smith et al., 1975) and at a 1:100 000 scale for the Fisher-Teulon area (Pratt et al., 1961). According to the Canadian System of Soil Classification (Expert Committee on Soil Survey, 1998), the dominant soils are Dark Gray Chernozems in imperfectly drained sites (Inwood series) occurring in close association with Humic Gleysol soils (Meleb series) in poorly drained sites and Eutric Brunisols (Fairford series) in better drained portions of the landscape. Clayey textured Dark Gray Chernozems and Humic Gleysol soils occur in the Gypsumville and Homebrook areas (page 11).

Major management considerations are related to stoniness, topographic pattern, wetness and shallow organic soils (page 15). The high lime glacial till soils are dominantly very stony to exceedingly stony whereas the clay till soils are moderately stony. Several areas at slightly higher elevation are underlain by limestone rock at shallow depths and are usually excessively stony and bouldery. Seasonal high water tables (at 1 to 2 metres) and saturated soils are common. Excess wetness associated with the swales and depressions in the landscape is difficult to drain as the ridge pattern tends to be oriented perpendicular to the slope of the land surface (page 15). Soils throughout the municipality are generally non-saline.

Zero percent of the soils are rated in **Class 3** for agricultural capability due primarily to stoniness and 11 percent of the area is affected by excessive stoniness and rockiness (**Class 5** and **7**). Small pockets of clayey and loamy lacustrine soils in the Gypsumville, Lake St. Martin and Homebrook areas are rated in **Class 2** and **3**. Just over 12 percent of the soils are placed in **Class 6**, primarily due to wetness. The organic soils covering 10 percent of the area have very limited capability for agriculture in their native state (page 17). The irrigation suitability of soils in this municipality is dominantly **Fair** (65 percent) and **Poor** (22 percent). The organic soils are not rated for irrigation (page 19).

One of the issues currently receiving considerable attention is the sustainability of agricultural practices and their potential impact on the soil and groundwater environment. To assist in highlighting this concern to land planners and agricultural producers, an assessment of potential environmental impact (EI) under irrigation is shown on page 21. Seventy-four percent of the soils are estimated to have a **Low** potential risk for adverse impact on the environment under irrigation whereas soils underlain by limestone bedrock at shallow depths are considered to have a **High** potential risk. This EI map is intended to be used in association with the irrigation suitability map.

Another issue of concern to producers, soil conservationists and land use specialists is soil erosion caused by agricultural cropping and tillage practices. Areas with potential for water erosion are

shown on page 23. About 93 percent of the land in the municipality is at a **Negligible** risk of degradation due to water erosion. A few local areas with slightly steeper slopes are estimated to have a **Low** to **Moderate** potential for erosion by water. Current management practices for cultivated soils focus on maintaining sufficient crop residues on the soil surface to adequately protect the soils from both wind and water erosion.

The dominant land use in the RM of Grahamdale is agriculture consisting mainly of ranching and feedlot enterprises for raising cattle. An assessment of the status of land use in 1995, obtained through analysis of satellite imagery, showed annual crops occupying just over 3 percent and forage crops nearly 2 percent of the land area. A high percentage of land held in farms remains in grassland and woodland. Grassland areas covering 32 percent and woodland areas covering 44 percent of the municipality provide wildlife habitat as well as limited forage and grazing capacity. Scattered wetland areas cover about 15 percent of the land base and provide habitat for wildlife as well as native hay production in dry years. Various non-agricultural uses such as infrastructure for urban areas, transportation and recreation occupy nearly 2 percent of the municipality (page 25)

The majority of soils in the RM of Grahamdale have moderately severe to very severe limitations for arable agriculture. Stony conditions on many of the till soils may be improved by stone clearing enabling cultivation on an annual basis. Till soils characterized by excessive stones and cobbles are best managed as native pasture. A major portion of the municipality has low relief and a dominance of imperfectly and poorly drained soils which are frequently saturated and subject to surface ponding, particularly during spring runoff or following heavy rains. The ridge and swale topography characteristic of much of the area impedes wide scale drainage improvement. Where the land pattern permits, improvement and maintenance of water management infrastructure is required to reduce surface ponding while maintaining adequate soil moisture for crop growth.

DERIVED AND INTERPRETIVE MAPS

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

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

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

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

Derived Maps

Slope

Generalized Soil

Drainage

Management Considerations

Interpretative Maps

Agricultural Capability

Irrigation Suitability

Potential Environmental Impact

Water Erosion Risk

Land Use

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

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

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

Slope Map.

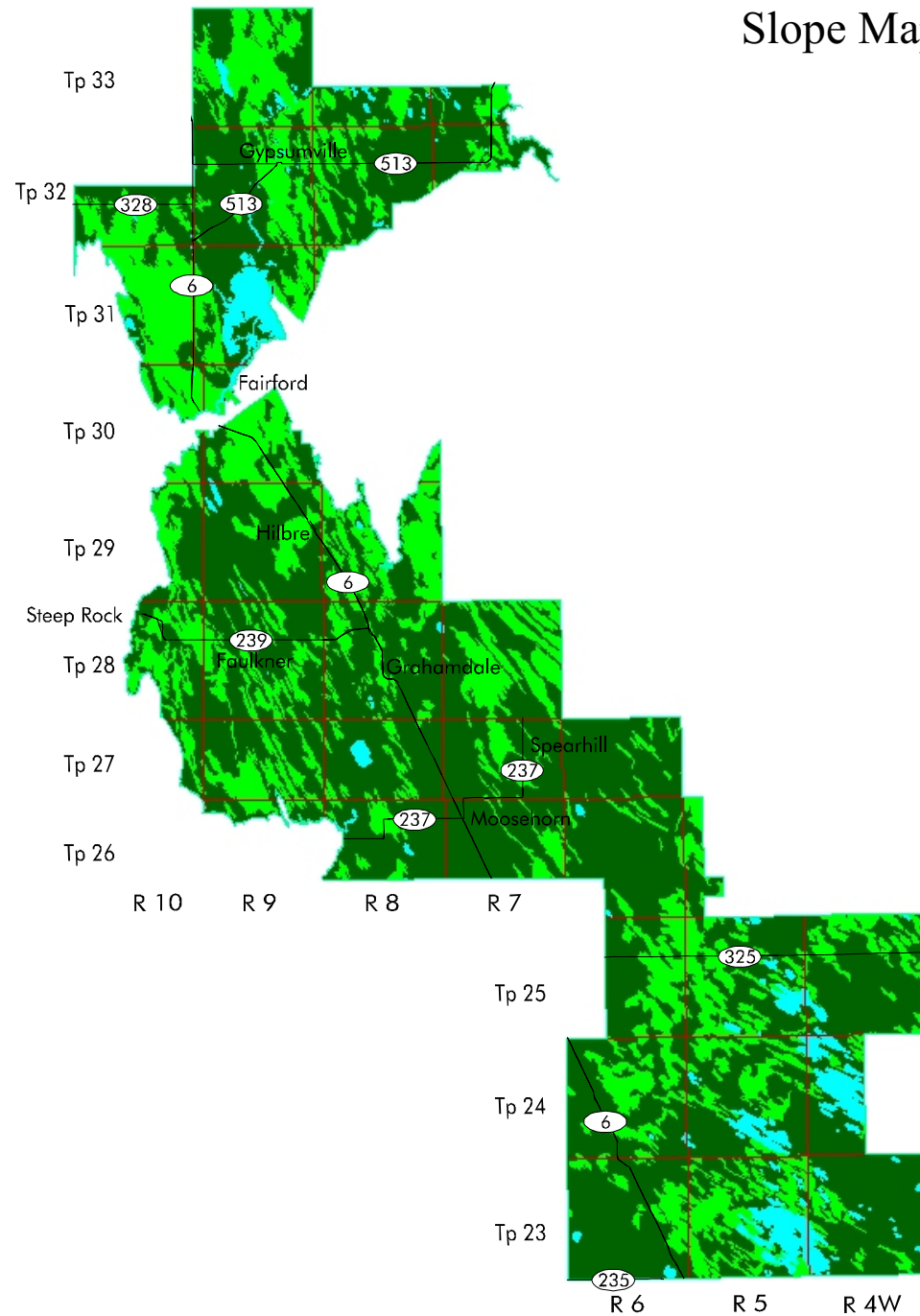
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area,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

Table 1. Slope Classes¹

Slope Class	Area (ha)	Percent of RM
0 - 2 %	162106	65.8
2 - 5 %	76884	31.2
5 - 9 %	0	0.0
9 - 15 %	0	0.0
15 - 30 %	0	0.0
> 30 %	0	0.0
Unclassified	113	0.0
Water	7116	2.9
Total	246219	100.0

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

Slope Map



Slope Classes



Scale



(Km.)

Universal Transverse Mercator
(NAD27) ProjectionLand Resource Unit
Brandon Research Centre
October 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.

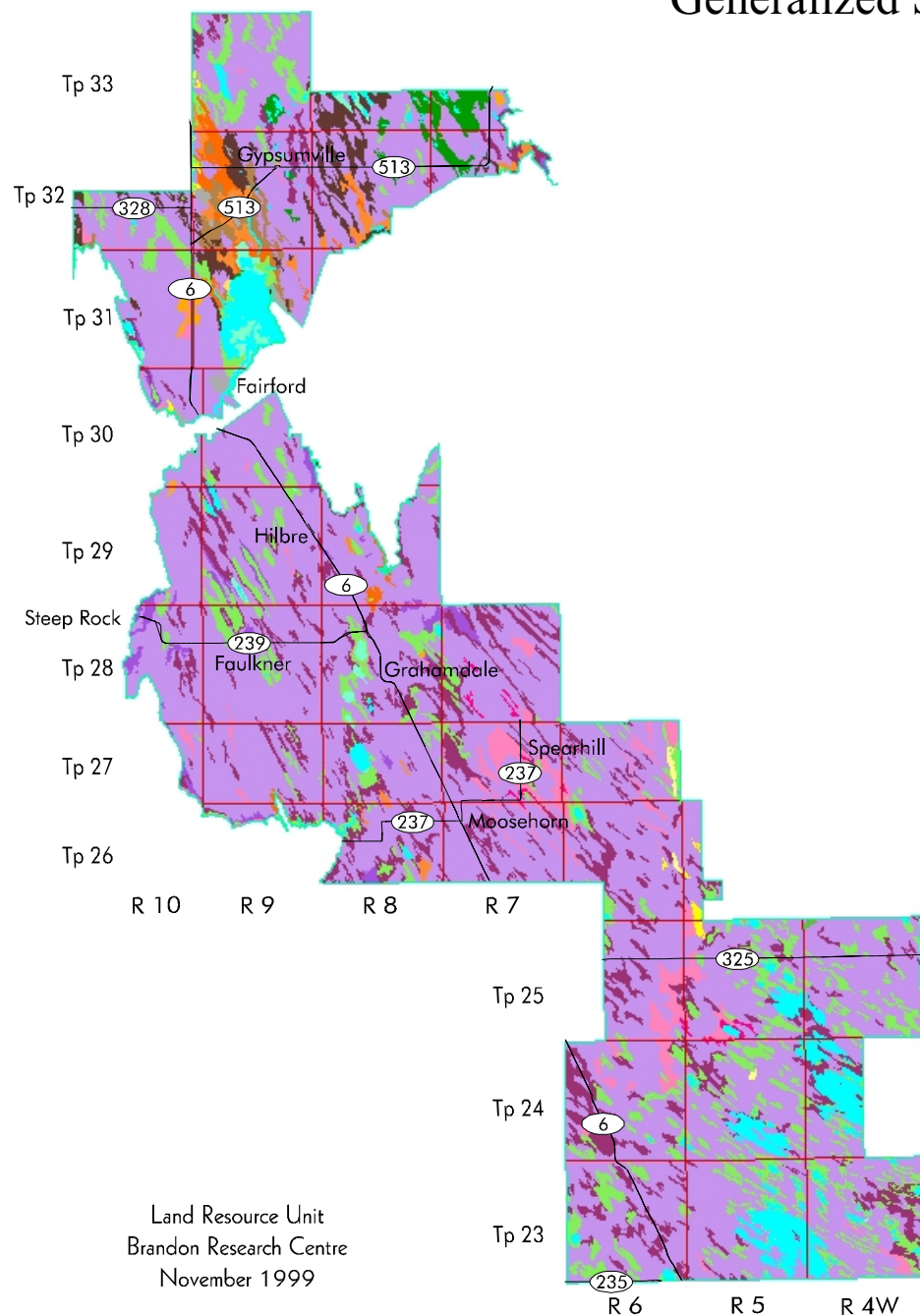
More detailed maps showing the dominant and subdominant soils in each polygon can also be produced at larger map scales.

Table 2. Generalized Soil Groups¹

Soil Groups	Area (ha)	Percent of RM
Limestone Bedrock	651	0.3
Shallow Organic Forest Peat	2374	1.0
Clayey Lacustrine	715	0.3
(Luvisols and Dark Gray Chernozems)		
Highly Calcareous Loamy Till (Gleysols)	23537	9.6
Extremely Calcareous Loamy Till	2671	1.1
(Black Chernozems)		
Extremely Calcareous Loamy Till	164420	66.8
(Brunisols and Dark Gray Chernozems)		
Marsh	1921	0.8
Clayey Lacustrine (Gleysols)	4535	1.8
Loamy Lacustrine (Gleysols)	1886	0.8
Deep Organic Fen Peat	64	0.0
Shallow Organic Fen Peat	23291	9.5
Sandy Lacustrine (Gleysols)	426	0.2
Clayey Lacustrine (Black Chernozems)	1927	0.8
Loamy Lacustrine	2215	0.9
Sandy Loam Lacustrine	39	0.0
Variable Textured Alluvium (Regosols)	74	0.0
Sandy Lacustrine	247	0.1
Sand and Gravel (Gleysols)	563	0.2
Sand and Gravel	7238	2.9
Salt Flats	195	0.1
Water	7116	2.9
Unclassified	113	0.0
Total	246219	100.0

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

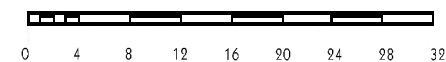
Generalized Soil Map



Soil Associations



Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

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.

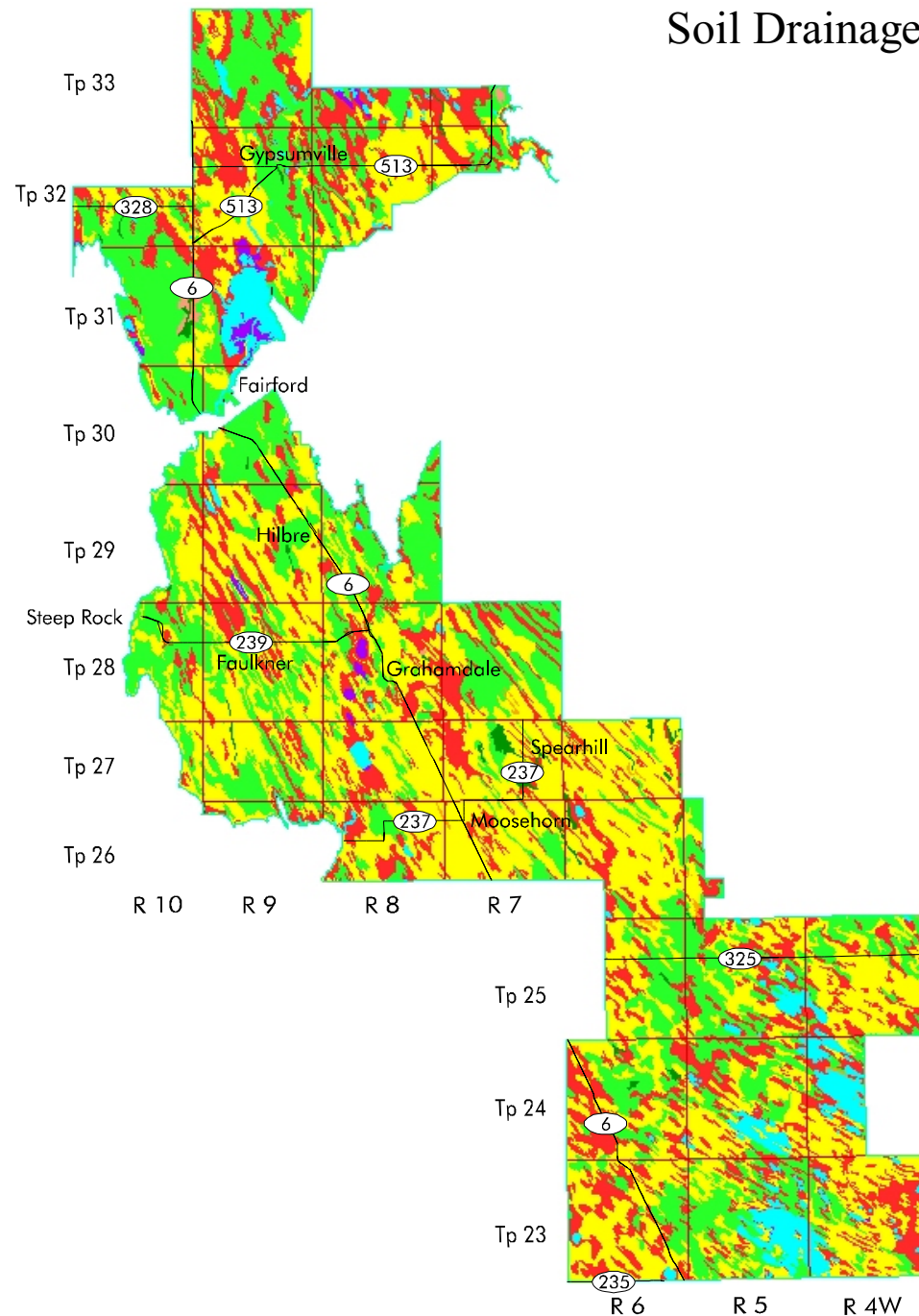
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes¹

Drainage Class	Area (ha)	Percent of RM
Very Poor	56349	22.9
Poor	522	0.2
Poor, drained	0	0.0
Imperfect	102408	41.6
Well	75572	30.7
Rapid	1567	0.6
Rock	651	0.3
Marsh	1921	0.8
Unclassified	113	0.0
Water	7116	2.9
Total	246219	100.0

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

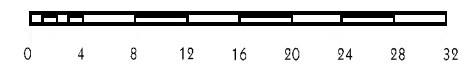
Soil Drainage Map



Drainage Classes

	Rapid
	Well
	Imperfect
	Poor, drained
	Poor
	Very poor
	Rock
	Unclassified
	Marsh
	Water

Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
October 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.

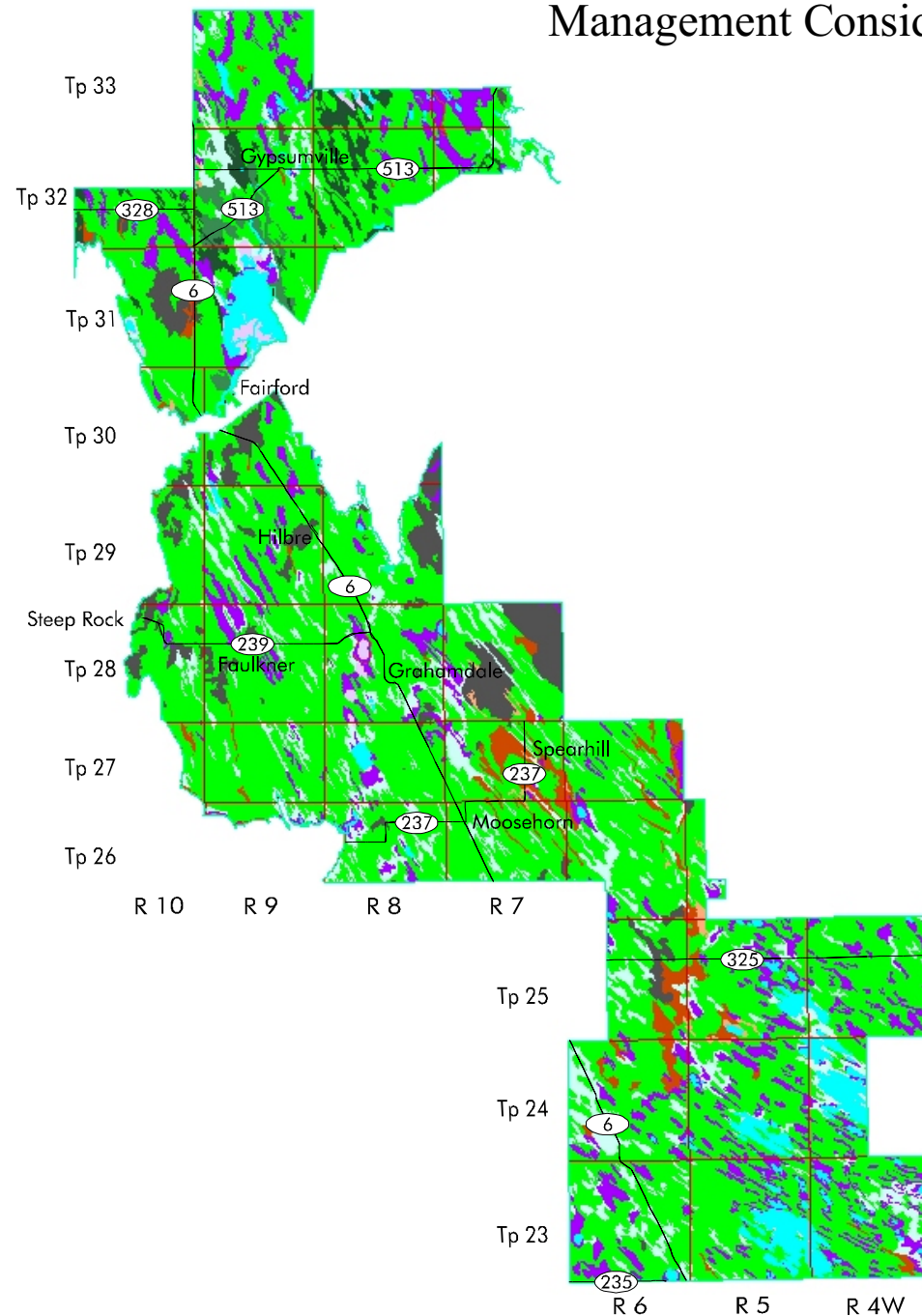
R = Bedrock - soil landscapes that have **shallow depth to bedrock (< 50 cm) and/or exposed bedrock** which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 4. Management Considerations¹

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	2643	1.1
Fine Texture and Wetness	4535	1.8
Fine Texture and Topography	0	0.0
Medium Texture	157730	64.1
Coarse Texture	7485	3.0
Coarse Texture and Wetness	989	0.4
Coarse Texture and Topography	0	0.0
Topography	0	0.0
Bedrock	12845	5.2
Wetness	25114	10.2
Organic	25729	10.4
Marsh	1921	0.8
Unclassified	113	0.0
Water	7116	2.9
Total	246219	100.0

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

Management Considerations Map



Land Resource Characteristics



Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
October 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 modifiers include structure and/or permeability (D), erosion (E), inundation (I), moisture limitation (M), salinity (N), stoniness (P), consolidated bedrock (R), topography (T), excess water (W) and cumulative minor adverse characteristics (X).

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

Table 5. Agricultural Capability¹

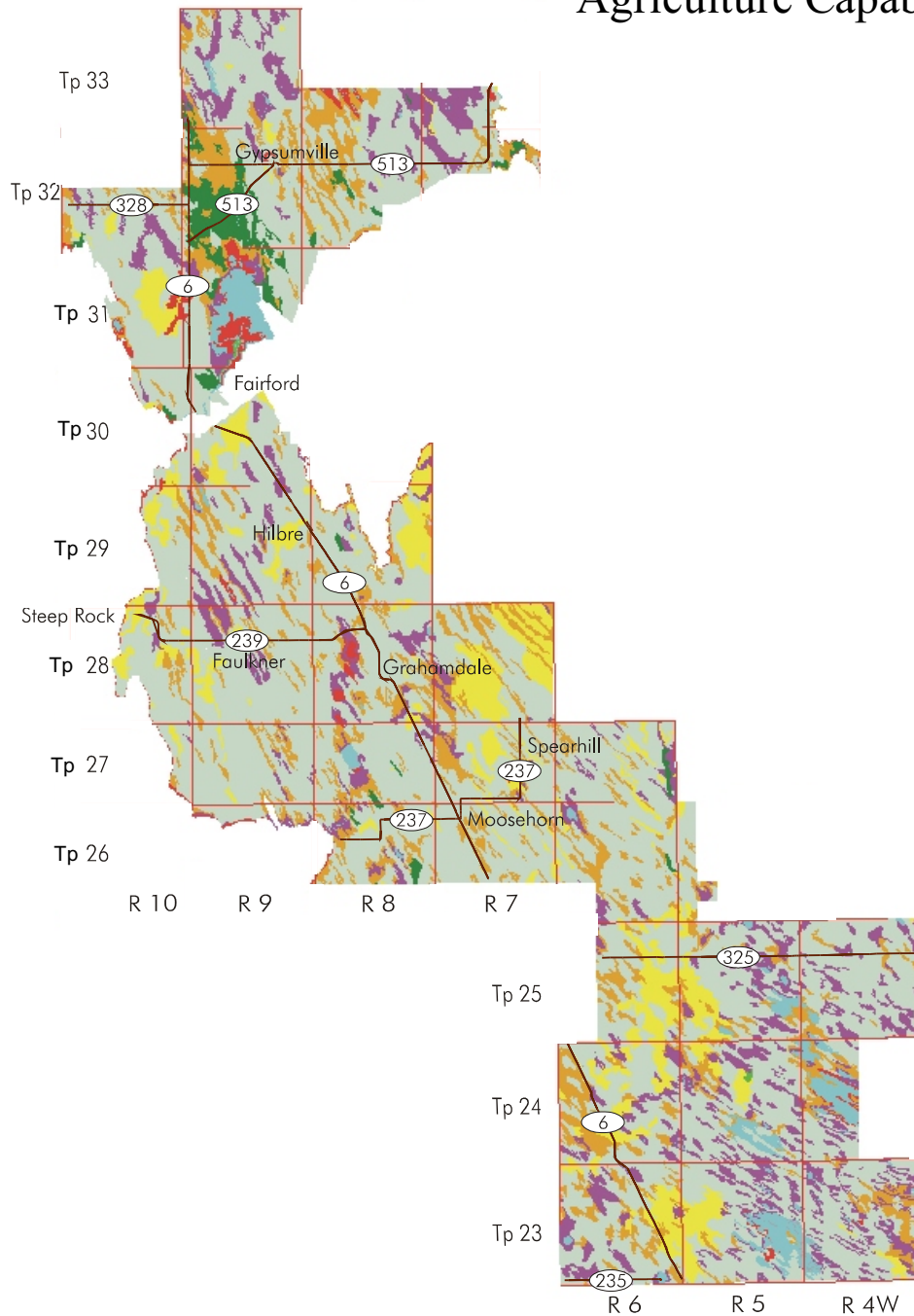
Class Subclass	Area (ha)	Percent of RM
2	4728	1.9
2M	246	0.1
2TD	340	0.1
2W	1850	0.8
2WP	2292	0.9
3	113	0.0
3I	74	0.0
3M	40	0.0

Table 5. Agricultural Capability¹(cont.)

Class Subclass	Area (ha)	Percent of RM
4	151912	61.7
4DP	150290	61.1
4M	1264	0.5
4N	357	0.1
5	22098	9.0
5M	5168	2.1
5P	14626	5.9
5RP	1977	0.8
5W	327	0.1
6	30643	12.5
6P	61	0.0
6W	30582	12.4
7	3566	1.4
7M	801	0.3
7N	195	0.1
7R	652	0.3
7W	1917	0.8
Unclassified	112	0.0
Water	7148	2.9
Organic	25716	10.5
Total	246036	100.0

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

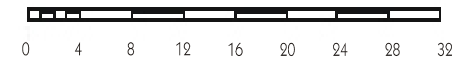
Agriculture Capability Map



Canada Land Inventory



Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
November 1999

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.

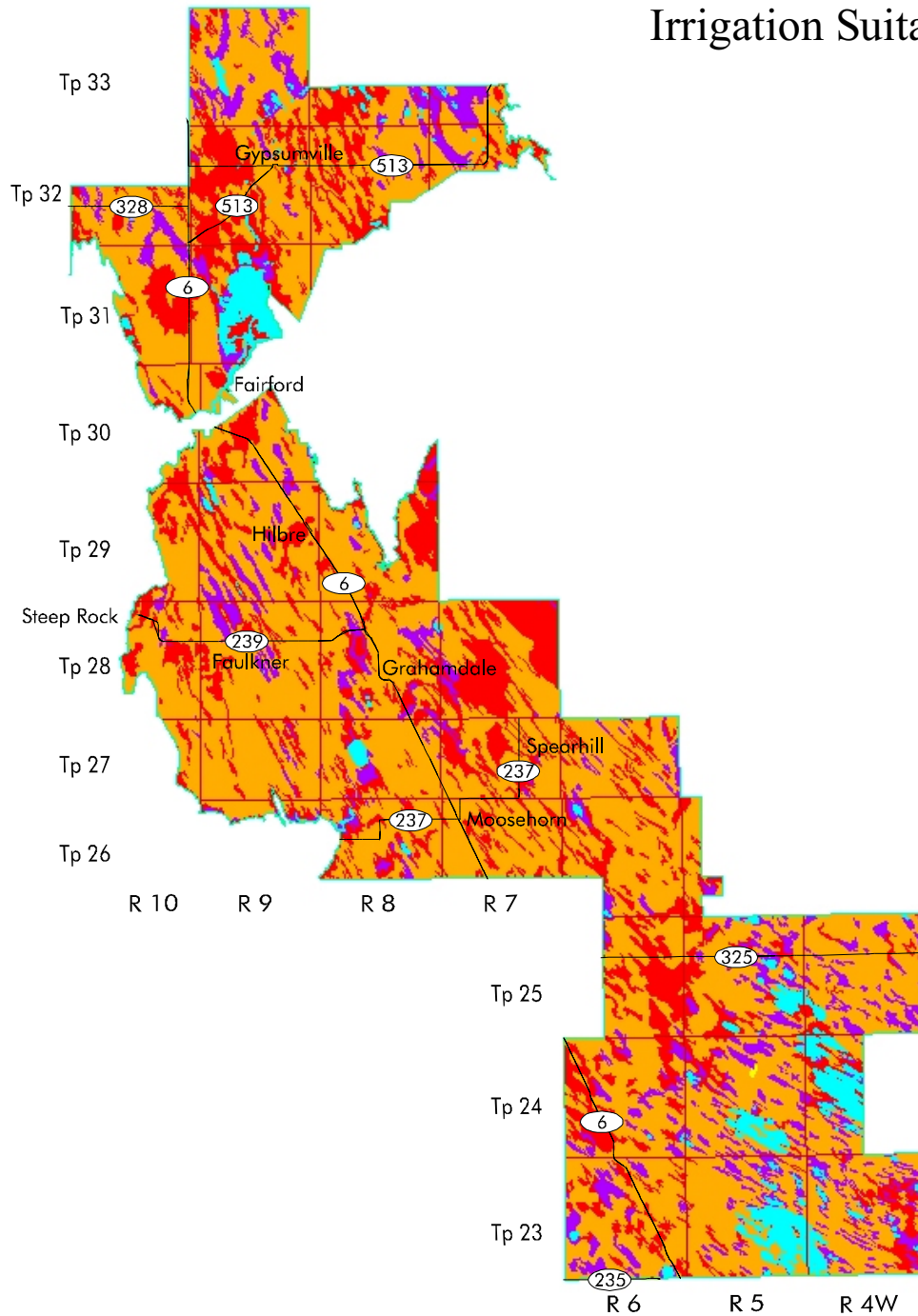
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 6. Irrigation Suitability¹

Class	Area (ha)	Percent of RM
Excellent	0	0.0
Good	39	0.0
Fair	158835	64.5
Poor	54387	22.1
Organic	25729	10.4
Unclassified	113	0.0
Water	7116	2.9
Total	246219	100.0

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

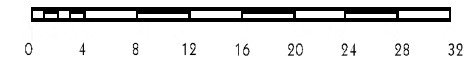
Irrigation Suitability Map



Irrigation Suitability Classes



Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
December 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.

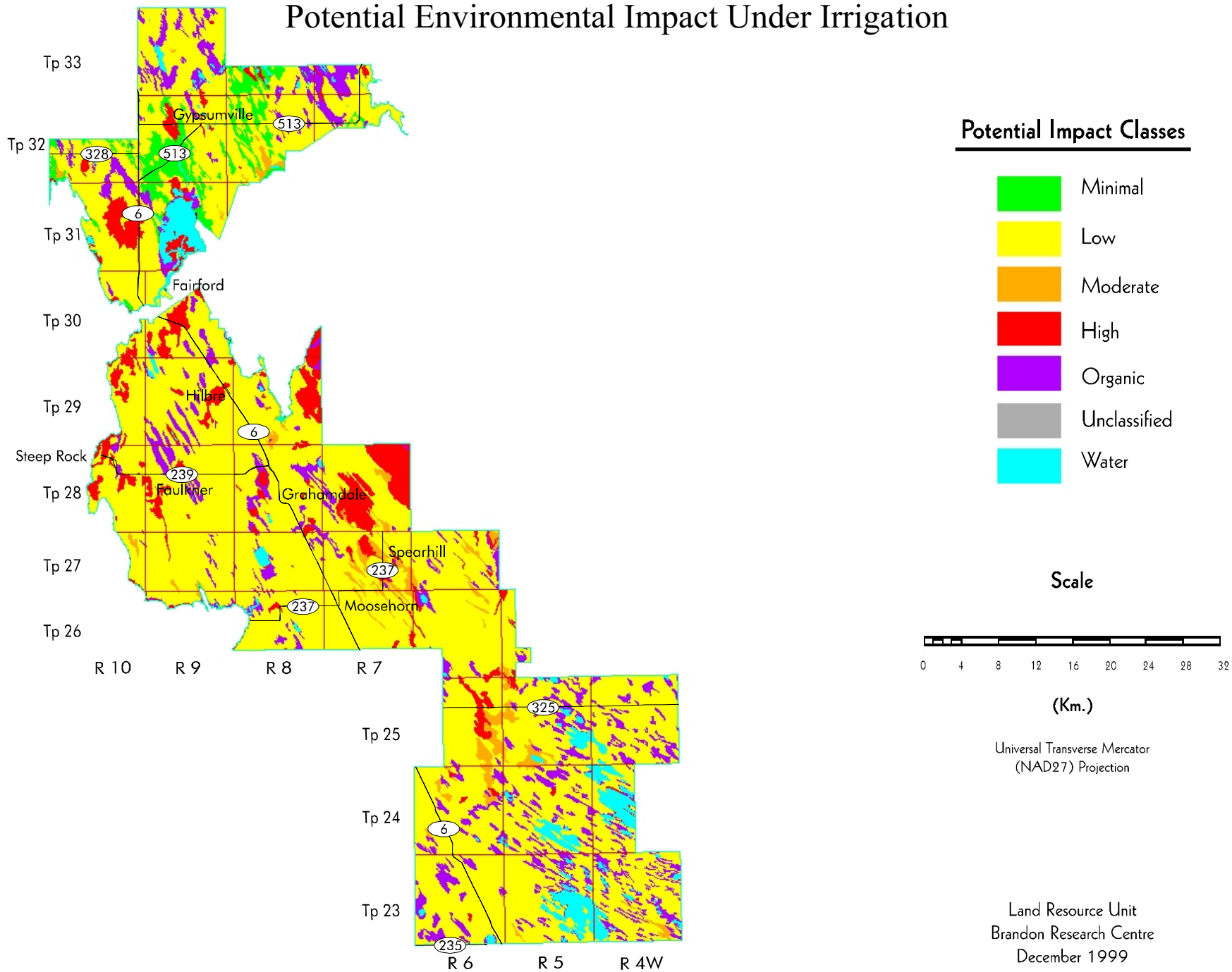
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Potential Environmental Impact Under Irrigation¹

Class	Area (ha)	Percent of RM
Minimal	7101	2.9
Low	181905	73.9
Moderate	6261	2.5
High	18018	7.3
Organic	25706	10.4
Unclassified	113	0.0
Water	7116	2.9
Total	246219	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

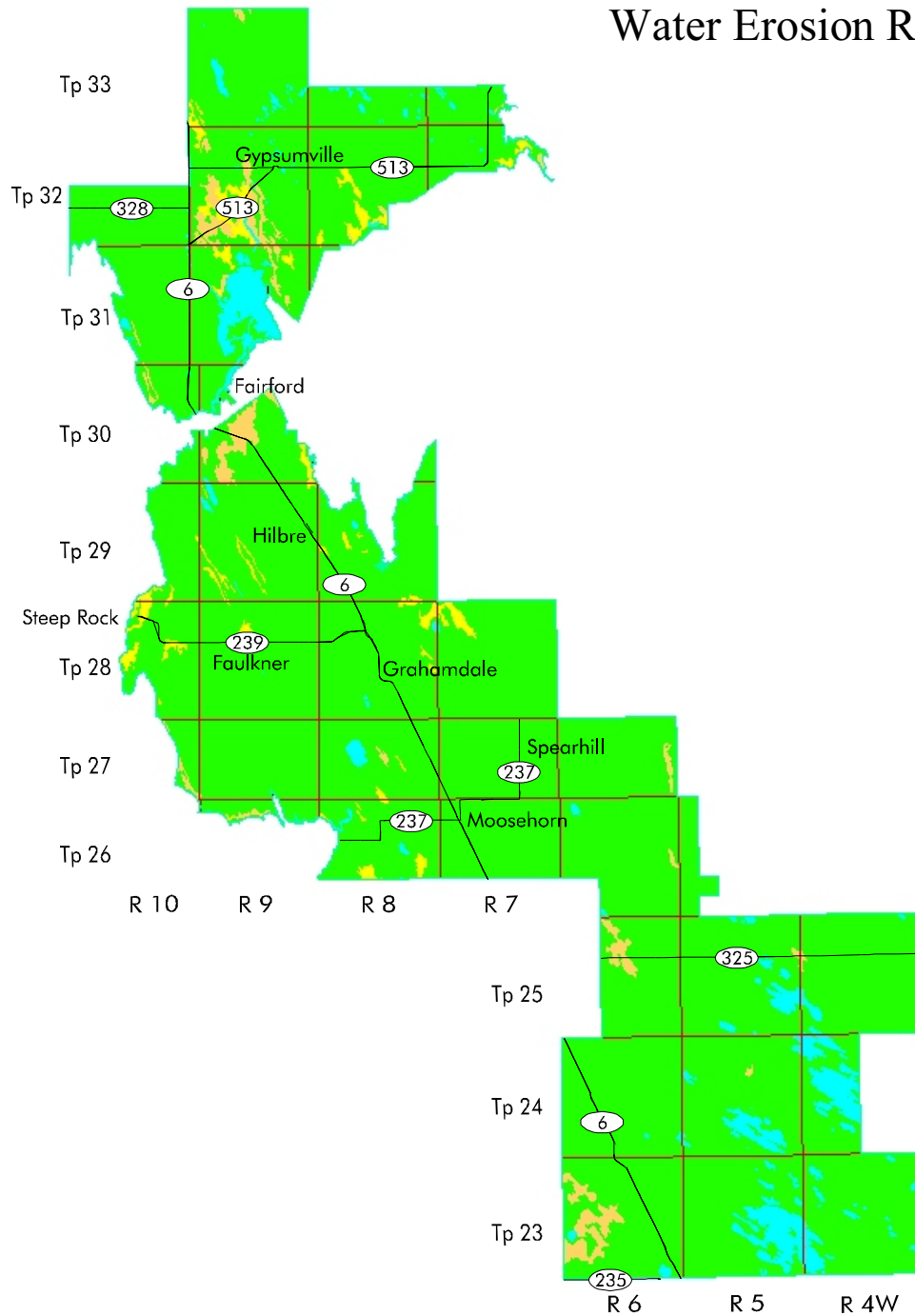
Cropping and residue management practices will significantly reduce this risk depending on crop rotation program, soil type, and landscape features.

Table 8. Water Erosion Risk¹

Class	Area (ha)	Percent of RM
Negligible	228843	92.9
Low	5770	2.3
Moderate	4377	1.8
High	0	0.0
Severe	0	0.0
Unclassified	113	0.0
Water	7116	2.9
Total	246219	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



Scale



(Km.)

Universal Transverse Mercator
(NAD27) Projection

Land Resource Unit
Brandon Research Centre
October 1999

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.

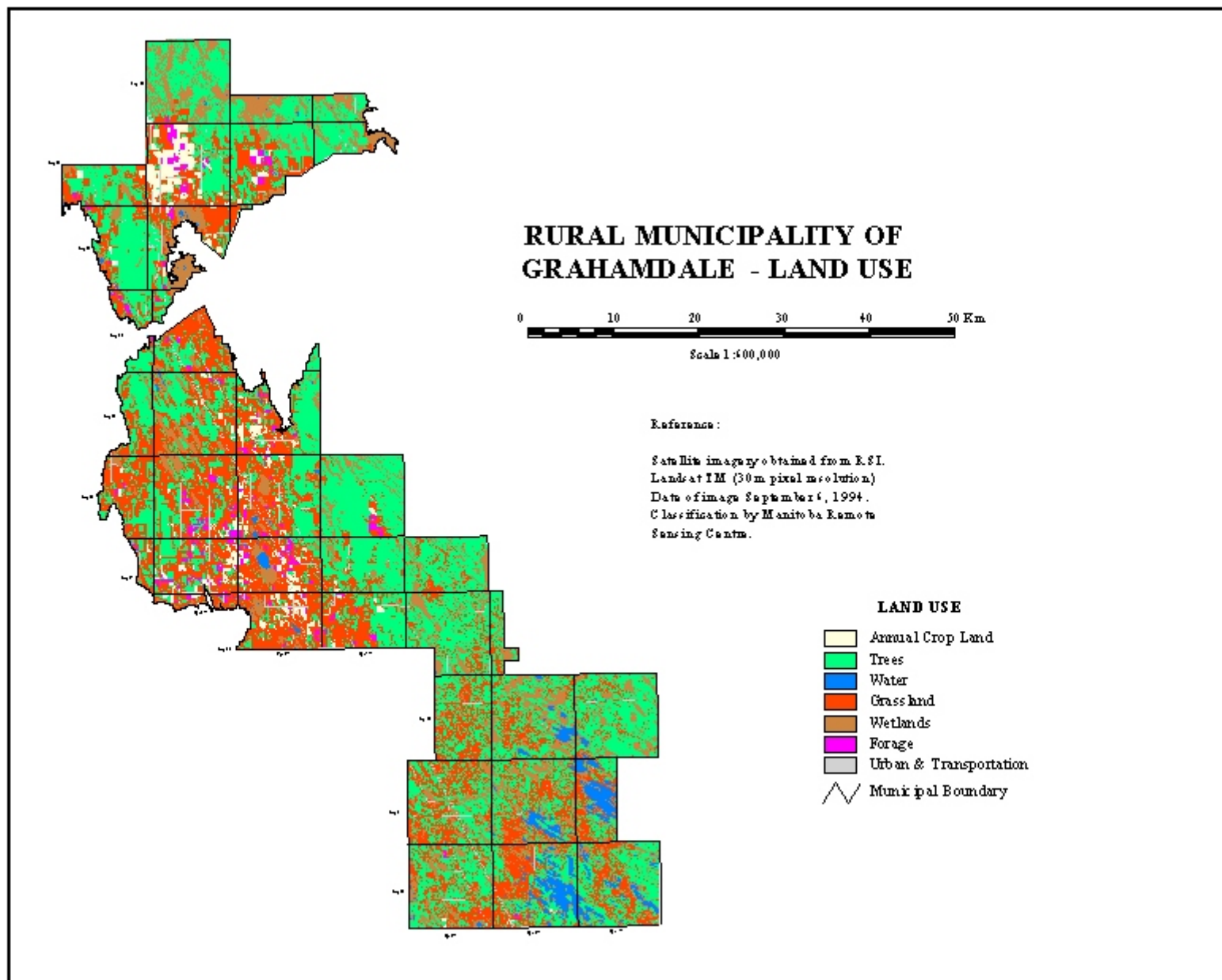
Water - open water - lakes, rivers streams, ponds, and lagoons.

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

Table 9. Land Use¹

Class	Area (ha)	Percent of RM
Annual Crop Land	7485	3.1
Forage	4286	1.8
Grasslands	77454	31.7
Trees	108456	44.4
Wetlands	35615	14.6
Water	6856	2.8
Urban and transportation	4201	1.7
Undifferentiated	11	0.0
Total	244364	100.0

¹ Land use information (1995) and map supplied by Prairie Farm Rehabilitation Administration. Areas may vary from previous maps due to differences in analytical procedures.



REFERENCES

- Agronomic Interpretations Working Group. 1995. Land Suitability Rating System for Agricultural Crops: 1. Spring-seeded Small Grains. Edited by W.W. Pettapiece. Tech. Bull. 1995-6E. Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada, Ottawa. 90 pages, 2 maps.
- Ash, G.H.B. 1991. An Agroclimatic Risk Assessment of Southern Manitoba and Southeastern Saskatchewan. M.A. Thesis. Department of Geography, University of Manitoba, Winnipeg.
- Canada Land Inventory. 1965. Soil Capability Classification for Agriculture. Canada Land Inventory Report No. 2. ARDA, Dept. of Forestry, Canada, Ottawa.
- Canada-Manitoba Soil Survey. 1980. Physiographic Regions of Manitoba. Ellis Bldg., University of Manitoba, Winnipeg. Revised. Unpublished Report.
- Canada-Manitoba Soil Survey. 1979. Ecological Regions and Subregions in Manitoba. Ellis Bldg., University of Manitoba, Winnipeg. Revised. Unpublished Report.
- Environment Canada. 1982. Canadian Climatic Normals 1951-1980. Frost, Vol. 6; Atmospheric Environment, Downsview, Ontario.
- Environment Canada. 1993. Canadian Climatic Normals 1961-1990. Prairie Provinces. Atmospheric Environment, Downsview, Ontario.
- Irrigation Suitability Classification Working Group. 1987. An Irrigation Suitability Classification System for the Canadian Prairies. LRRC contribution no. 87-83, Land Resource Research Centre, Research Branch, Agriculture Canada, Ottawa.
- Land Resource Unit. 1999. Soil and Terrain Classification System Manual. In preparation. Ellis Bldg. University of Manitoba. Winnipeg.
- MacDonald, K.B., and Valentine, K.W.G. 1992. CanSIS Manual 1 CanSIS/NSDB: A General Description. Land Resource Division, Centre for Land and Biological Resources Research, Research Branch, Agriculture Canada, Ottawa.
- Mills, G.F., Smith, R.E. 1971. Soils of the Grahamdale Area. Soils Report No. 16. Manitoba Soil Survey. Winnipeg. 132 pp and 1 map.
- Pratt, L.E. Ehrlich, W.A., LeClaire, F.P., Barr, J.A. 1961 Report of Detailed-Reconnaissance Soil Survey of Fisher and Teulon Map Sheet Areas. Soils Report No. 12. Manitoba Soil Survey. Winnipeg. 80 pp and 2 maps.
- Smith, R.E., Tarnocai, C., Mills, G.F. 1975. Soils of the Red Rose - Washow Bay Area. Soils Report No. 19. Manitoba Soil Survey. Winnipeg. 156 pp and 2 maps.
- Soil Classification Working Group. 1998. The Canadian System of Soil Classification. Third Edition. Publ. No. 1646. Research Branch, Agriculture and Agri-Food Canada.
- Wischmeier, W.H. and Smith, D.D. 1965. Predicting Rainfall-erosion Loss from Cropland East of the Rocky Mountains. U.S. Department of Agriculture, Agriculture Handbook No. 282, U.S. Government Printing Office, Washington, D.C.