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Rural Municipality of Russell

Information Bulletin 98-1

Soils and Terrain

An introduction
to the land resource

Land Resource Unit
Brandon Research Centre



Canada

Rural Municipality of Russell

Information Bulletin 98-1

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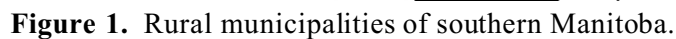
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The location of the Rural Municipality of Russell is shown in Figure 1. A brief overview of the database information, and general environmental conditions for the municipality are presented. A set of maps derived from the data for typical agricultural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

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

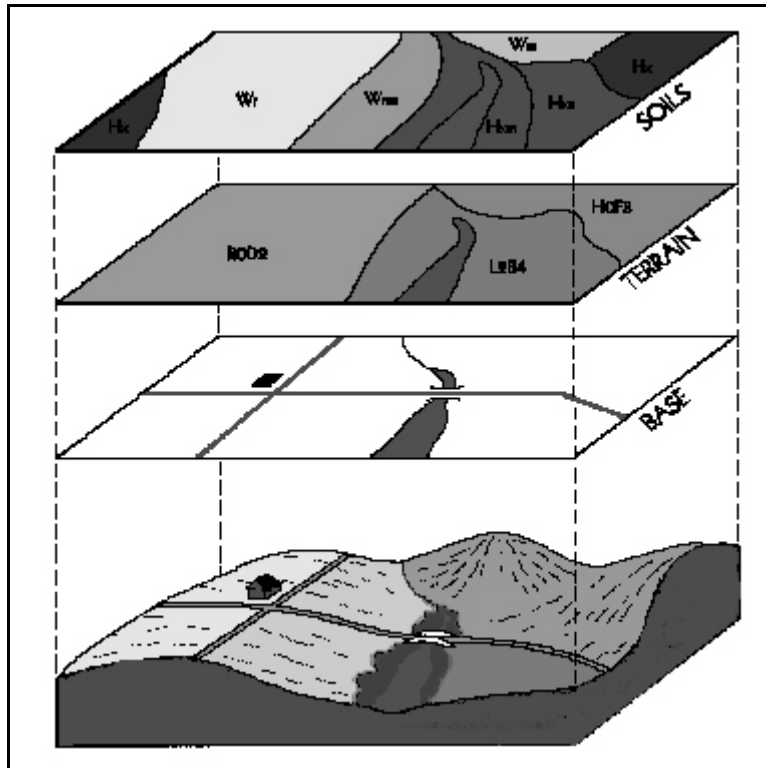


Figure 2. Soil, Terrain and Base Map data. compiled and analysed in two distinct layers as shown in Figure 2.

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.

Terrain Layer

A separate terrain layer was produced for municipalities for which only reconnaissance scale soil map coverage was available. This was compiled by aerial photo-interpretation techniques, using recent 1:50 000 scale stereo airphoto coverage. The terrain information was transferred from the photographs onto the standard RM base and digitized in the GIS. Where the soil and terrain boundaries coincided, such as along prominent escarpments and eroded stream channels, the new terrain line was used for both layers. The terrain line, delineated from modern airphoto interpretation, was considered more positionally accurate than the same boundary portrayed on the historical reconnaissance soil map. Each digital terrain polygon was assigned the following legend characteristics:

Surface form	Wetland size
Slope	Erosional modifiers
Slope length	Extent of eroded knolls
Percent wetlands	

The four legend characteristics on the left are considered differentiating, that is, a change in any of these classes defines a new polygon.

Soil Layer

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, reconnaissance soil map polygons were related to soil drainage, surface texture, and other soil properties to produce various interpretive maps.

SOIL AND TERRAIN OVERVIEW

The Rural Municipality (RM) of Russell covers an area of 6 townships (approximately 58 177 hectares) of land in western Manitoba (page 3). The Towns of Russell and Binscarth are the largest population and service centres in the municipality.

The climate in the municipality can be related to the weather data from Russell. The mean annual temperature at Russell is 1.1 °C and the mean annual precipitation is 484 mm (Environment Canada, 1993). The average frost-free period is 104 days and degree-days above 5 °C average 1450 (Ash, 1991). The calculated seasonal moisture deficit for the period between May and September for the area is 200 to 250 mm. The estimated effective growing degree days (EGDD) above 5 °C accumulated from date of seeding to the date of the first fall frost is 1200 to 1300 (Agronomic Interpretations Working Group, 1995). These parameters provide an indication of length of growing season and the moisture and heat energy available for crop growth. This climate is considered sufficient for production of small grain and cool-season oilseed crops.

Physiographically, the RM of Russell is located entirely in the Saskatchewan Plain with the Newdale Plain subsection occupying the eastern half of the RM and the St. Lazare Plain occurring to the west along the Manitoba-Saskatchewan boundary (Canada-Manitoba Soil Survey, 1980). Elevations decrease from 563 metres above sea level (m asl) in the northeast corner to 397 m asl in the south where the Assiniboine River flows from the municipality. The land surface in the municipality varies from near level and undulating to hummocky. The St. Lazare Plain is characterized by level to very gently undulating terrain with local relief less than 3 m and slopes under 5 percent (page 9). Average relief in the Newdale Plain varies from 3 to 8 m and slopes range from 5 to 9 percent. Greatest local relief occurs adjacent to the prominent glacial meltwater channel containing the Assiniboine River. The depth of this valley is 75 to 90 m with slopes commonly exceeding 30 percent along the valley walls and in the eroded channels draining to the Assiniboine River.

The soil materials in this RM consist primarily of loamy textured glacial till deposits. An extensive area of water-worked glacial till with local patches of sand and gravel often covered by overlays occur to the west of the Assiniboine River. The deep ravines and gullies associated with this meltwater channel are characterized by stream eroded glacial till and in places shale rock mantled with till, colluvium and slump debris (page 11).

Soils in the municipality have been mapped at a reconnaissance map scale of 1:126 720 and published in the soil survey report for the Rossburn and Virden Map Sheet Areas (Ehrlich et al., 1956). Detailed soil studies at a 1:20 000 scale are available for the area adjacent to the towns of Russell and Binscarth (Michalyna, 1985). According to the Canadian System of Soil Classification (Expert Committee on Soil Survey, 1987), soils in the municipality are classified as dominantly Black Chernozems of the Newdale and Marrinhurst associations. Regosolic soils of the Assiniboine Complex and Eroded Slopes Complex and Solonchic soils of the Benton Association occur within the Assiniboine River valley. The Newdale soils west of the Assiniboine Valley have been modified by glacial meltwaters leaving an erosion surface of coarse sediments, gravel and stones. Local areas of poorly drained soils (Gleysols) are common in depressional areas of the landscape (page 11). A more detailed and complete description of the type, distribution and textural variability of soils in the municipality is provided in the published soil surveys for the area.

Surface drainage of hummocky and rolling terrain in the municipality is well developed as the majority of soils are well drained with minor areas of imperfect drainage on lower slopes. Surface runoff collects in poorly drained depressional areas, some of which contain shallow ponds and small lakes. Level areas of sand and gravel deposits and steeply sloping soils are dominantly rapidly drained. Surface drainage of the RM is facilitated by tributary streams of Silver, Smith and Conjuring Creeks which eventually flow to the deeply cut valley of the Assiniboine River (page 13).

Major management considerations are related to topography and coarse texture (page 15). Excessively wet soils are very minor in extent. Shale bedrock outcrops along the east side of the Assiniboine valley and is close to the surface of the Newdale rolling soils. Although variably stony soils occur throughout the area, very stony conditions are of particular concern in the area west of the Assiniboine Valley where modification by stream erosion has resulted in coarse sand and gravels and in many places very stony soils at the surface. Scattered areas of salinity are most common in areas of Newdale modified soils west of the Assiniboine River. These saline areas usually occur in association with imperfectly and poorly drained soils in lower slopes and depressions in the landscape.

Approximately 22 percent of the land in the RM is rated as **Class 2** and 44 percent is rated as **Class 3** for agriculture capability (page 17). Nearly three quarters of the land area is rated **Good to Fair** for irrigation suitability (page 19). Topography, droughtiness and stoniness are the main limitations for agriculture capability. Well drained sandy and gravelly soils in level landscapes are rated as **Class 5** for agriculture and **Poor** for irrigation. Steeply sloping land is rated in **Class 6** for agriculture and **Poor** for irrigation. Poor drainage affects some 7 percent of the soils in the RM which are rated in **Class 5** for agriculture capability and **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 **Low to Moderate** risk of degradation. However, areas of deep sandy and gravelly soils and steeply sloping soils are rated as having a **High** potential (about 28 percent of the land area) for impact on the environment 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 37 percent of the land in the RM is at **Severe** risk of degradation and an additional 10 percent of the area has a **High** risk.. Nearly 37 percent of the land in the RM is considered to have a **Moderate** risk of water erosion. The risk of water erosion is **Negligible** in areas of level sand and gravel soils. Management practices for land in annual crop focus primarily on maintaining adequate crop residues to provide sufficient surface cover. However, adequate protection of the steeper sloping lands most at risk to water erosion may require a shift in land use away from annual cultivation to production of perennial forages and pasture or permanent tree cover.

An assessment of the status of land use in the RM of Russell in 1995 was obtained through analysis of satellite imagery. It showed that about 49 percent of the land in the RM is in annual cropland and an additional 29 percent of the area is in grassland. Most of the wooded areas (12.2 percent) occur on steeper sloping lands. Production of perennial forages occurs on 3.7 percent of the area. Natural wetlands constitute nearly 2 percent of the RM and small water bodies cover 1.4 percent of the area. Various non-agricultural uses such as recreation and infrastructure for urban areas and transportation occupy 3 percent of the municipality (page 25).

While the majority of the soils in the RM of Russell 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 steeper slopes. This includes leaving adequate crop residues on the surface to provide sufficient trash cover during the early spring period. 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.

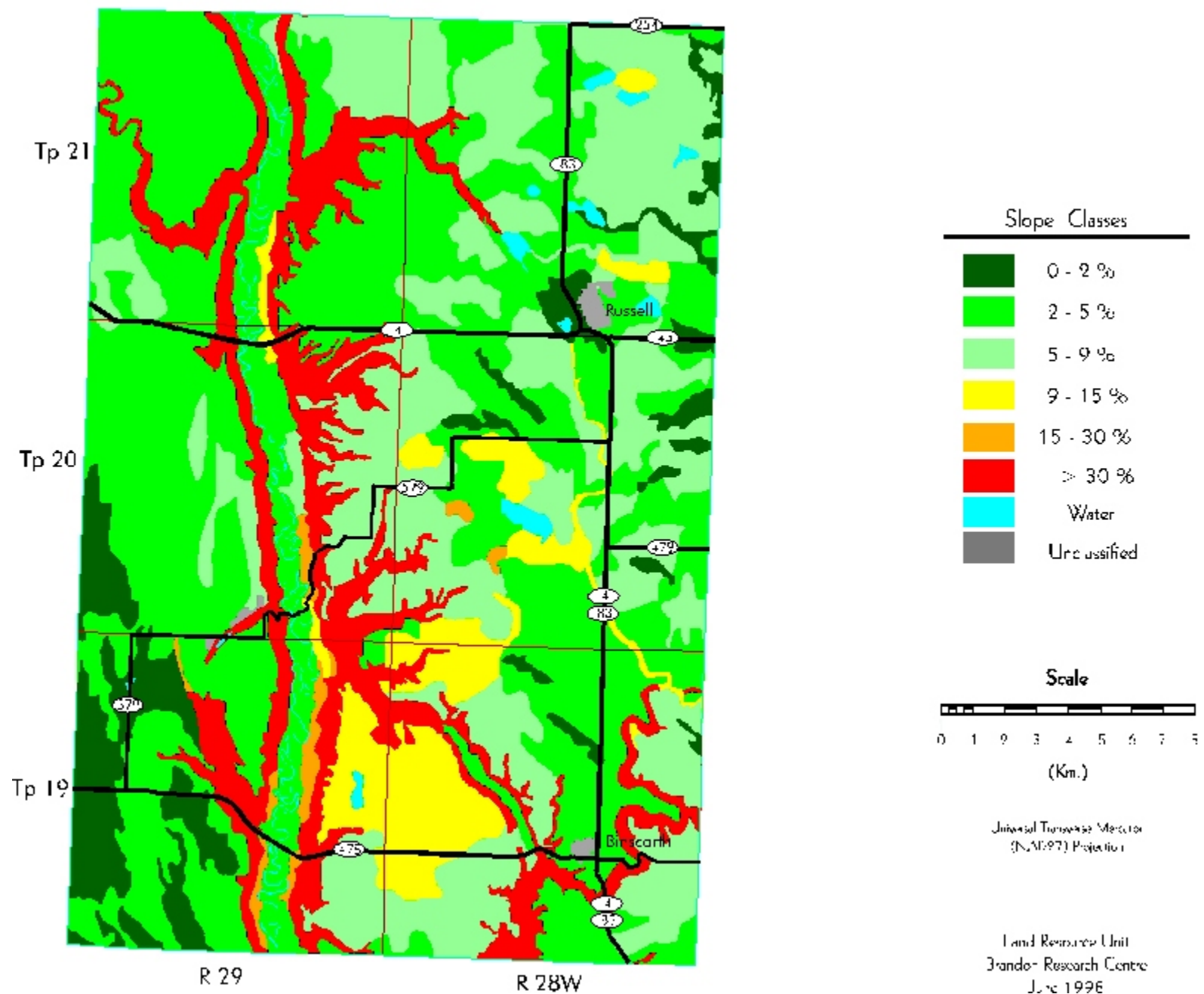
Slope describes the steepness of the landscape surface. The slope classes shown on this map are derived from the digital soil and terrain layer database. Specific colours are used to indicate the dominant slope class for each polygon in the RM. Additional slope classes may occur in each polygon area,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

Table 1. Slope Classes¹

Slope Class	Area (ha)	Percent of RM
0 - 2 %	4064	7.0
2 - 5 %	25138	43.2
5 - 9 %	15755	27.1
9 - 15 %	3990	6.9
15 - 30 %	528	0.9
> 30 %	7819	13.4
Unclassified	209	0.4
Water	673	1.2
Total	58177	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.

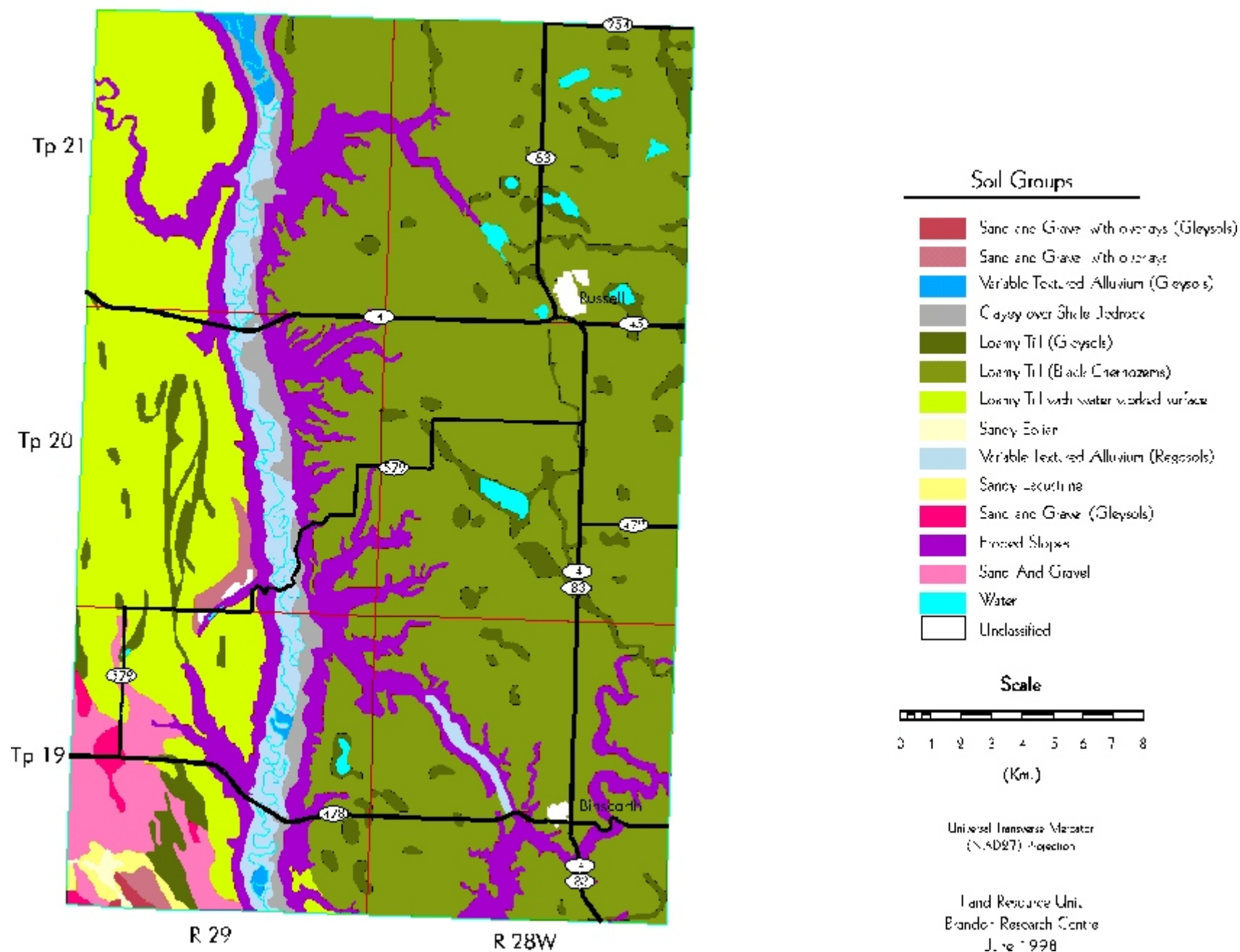
More detailed maps showing the dominant and subdominant soils in each polygon can also be produced at larger map scales.

Table 2. Generalized Soil Groups¹

Soil Groups	Area (ha)	Percent of RM
Sand and Gravel with overlays (Gleysols)	9	0.0
Sand and Gravel with overlays	209	0.4
Variable Textured Alluvium (Gleysols)	249	0.4
Clay over Shale Bedrock	1075	1.8
Loamy Till (Gleysols)	3613	6.2
Loamy Till (Black Chernozem)	29790	51.2
Loamy Till with water worked surfaces	10253	17.6
Sandy Eolian	99	0.2
Variable Textured Alluvium (Regosols)	1948	3.3
Sandy Lacustrine	222	0.4
Sand and Gravel (Gleysols)	293	0.5
Eroded Slopes	7685	13.2
Sand and Gravel	1849	3.2
Water	673	1.2
Unclassified	209	0.4
Total	58177	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.

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.

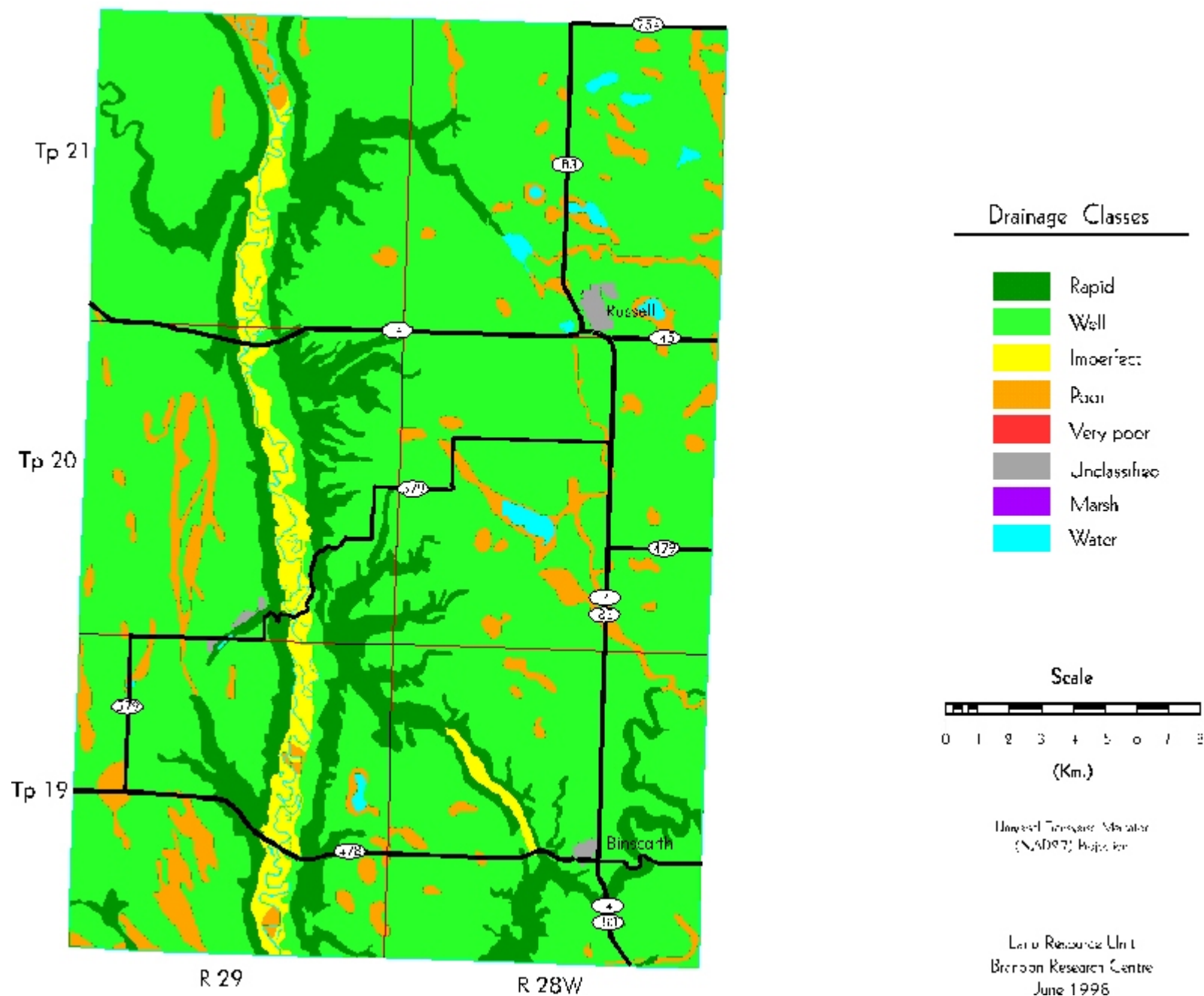
Drainage classification is based on the dominant soil series within each individual soil polygon.

Table 3. Drainage Classes¹

Drainage Class	Area (ha)	Percent of RM
Very Poor	0	0.0
Poor	4164	7.2
Imperfect	1948	3.3
Well	43398	74.6
Rapid	7784	13.4
Marsh	0	0.0
Unclassified	209	0.4
Water	673	1.2
Total	58177	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.

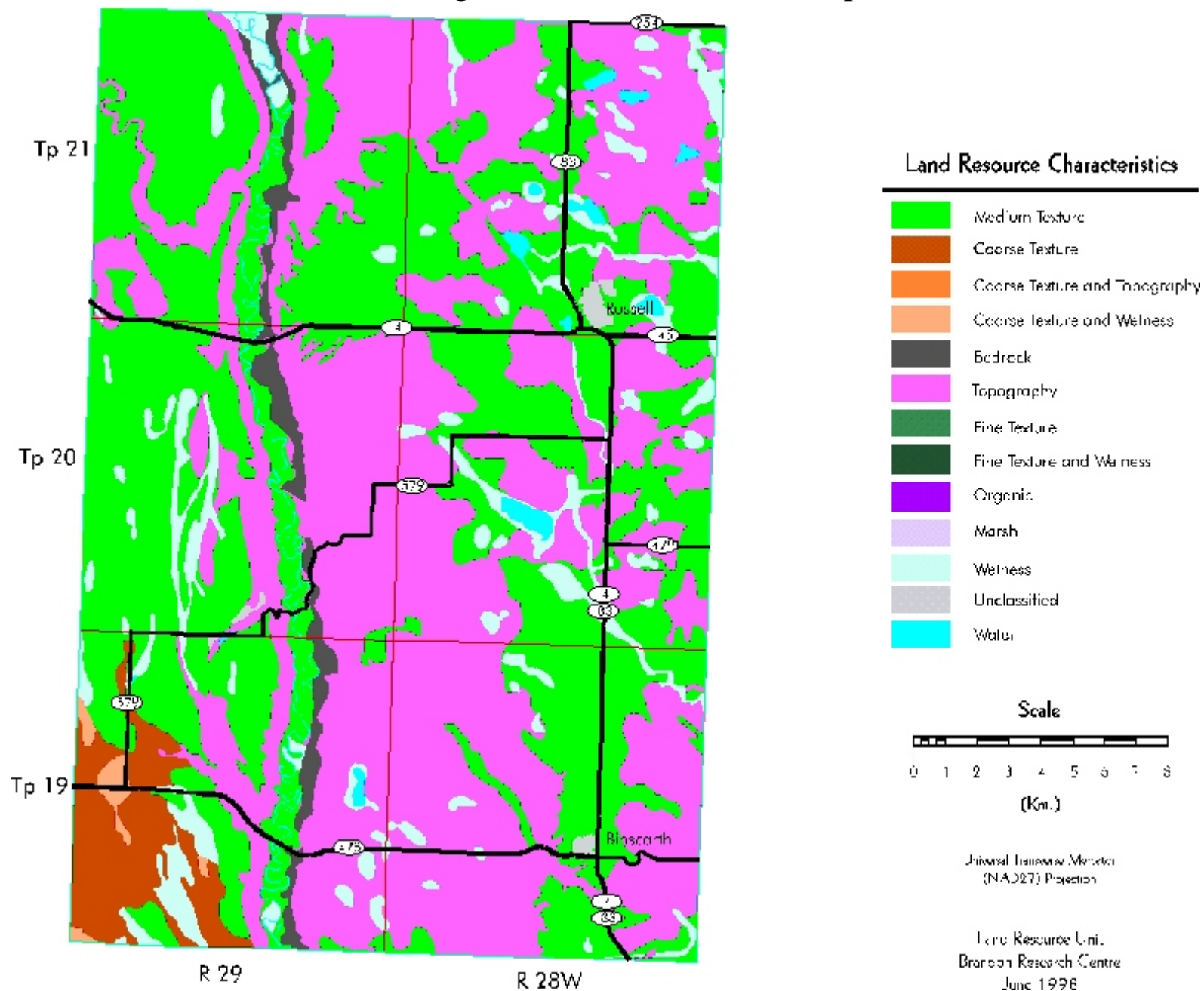
R = Bedrock - soil landscapes that have **shallow depth to bedrock (< 50 cm) and/or exposed bedrock** which may prevent the use of some or all tillage practices as well as the range of potential crops. They require special cropping and management practices to sustain agricultural production.

Table 4. Management Considerations¹

Land Resource Characteristics	Area (ha)	Percent of RM
Fine Texture	0	0.0
Fine Texture and Wetness	0	0.0
Fine Texture and Topography	0	0.0
Medium Texture	23592	40.6
Coarse Texture	2169	3.7
Coarse Texture and Wetness	293	0.5
Coarse Texture and Topography	0	0.0
Topography	26294	45.2
Bedrock	1075	1.8
Wetness	3871	6.7
Organic	0	0.0
Marsh	0	0.0
Unclassified	209	0.4
Water	673	1.2
Total	58177	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 6. Agricultural Capability¹

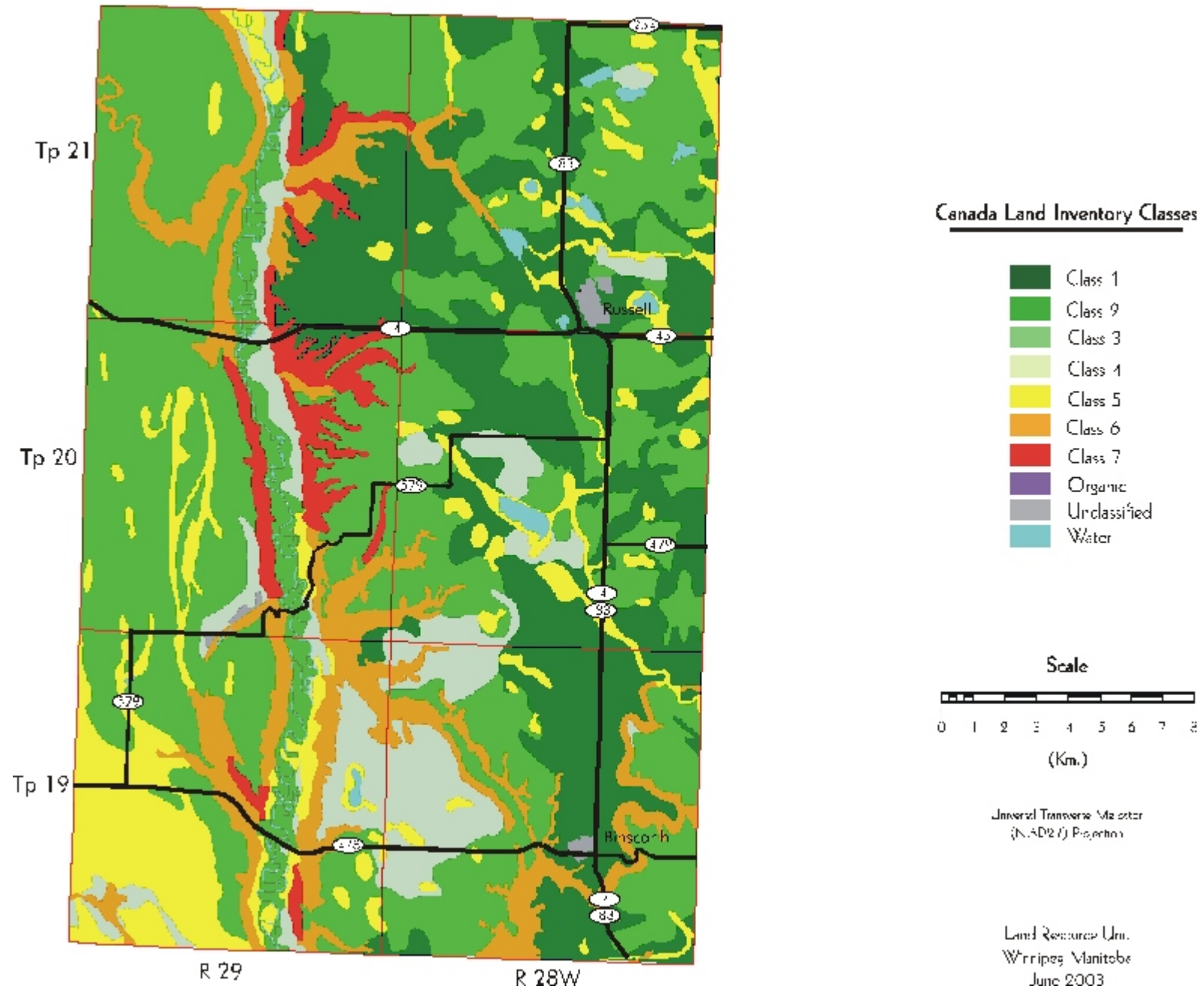
Class Subclass	Area (ha)	Percent of RM
2	12521	21.5
2T	11552	19.8
2X	969	1.7
3	25772	44.2
3	37	0.1
3I	1712	2.9
3M	9294	16.0
3MT	830	1.4
3T	13899	23.9

Table 5. Agricultural Capability¹(cont)

Class Subclass	Area (ha)	Percent of RM
4	4611	7.9
4	39	0.1
4M	432	0.7
4R	620	1.1
4RT	177	0.3
4T	3343	5.7
5	6533	11.2
5	642	1.1
5M	1845	3.2
5T	363	0.6
5W	3443	5.9
5WI	240	0.4
6	5945	10.2
6	103	0.2
6M	99	0.2
6T	5743	9.9
7	1989	3.4
7T	1989	3.4
Unclassified	210	0.4
Water	677	1.2
Total	58258	100.0

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

Agriculture Capability Map



Irrigation Suitability Map.

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

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

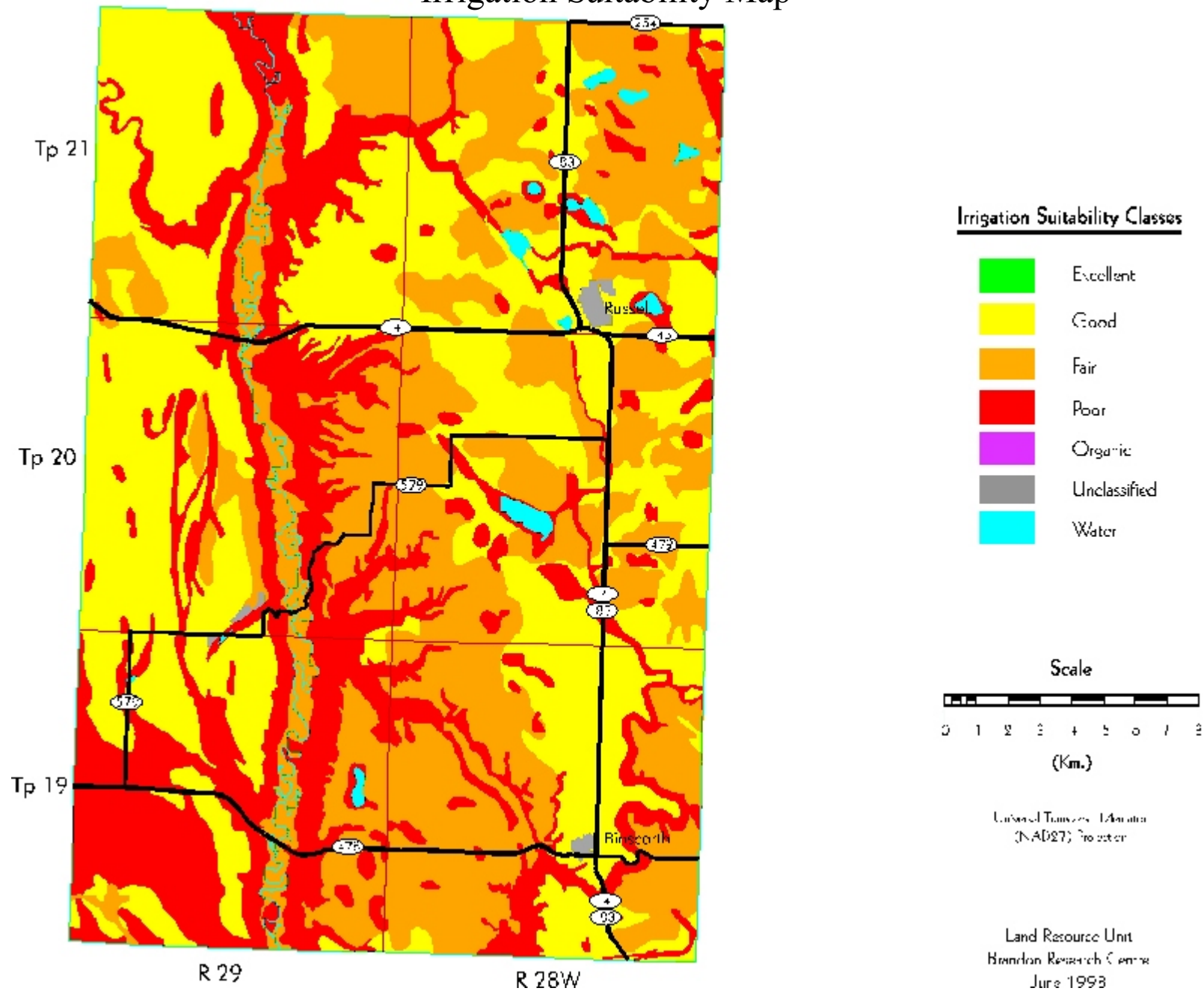
This generalized interpretive map is based on the dominant soil series for each soil polygon, in combination with the dominant slope class. The nature of the subclass limitations and the classification of subdominant components is not shown at this generalized map scale.

Table 6. Irrigation Suitability¹

Class	Area (ha)	Percent of RM
Excellent	0	0.0
Good	22103	38.0
Fair	20043	34.5
Poor	15149	26.0
Organic	0	0.0
Unclassified	209	0.4
Water	673	1.2
Total	58177	100.0

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

Irrigation Suitability Map



Potential Environmental Impact Under Irrigation Map.

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

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

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

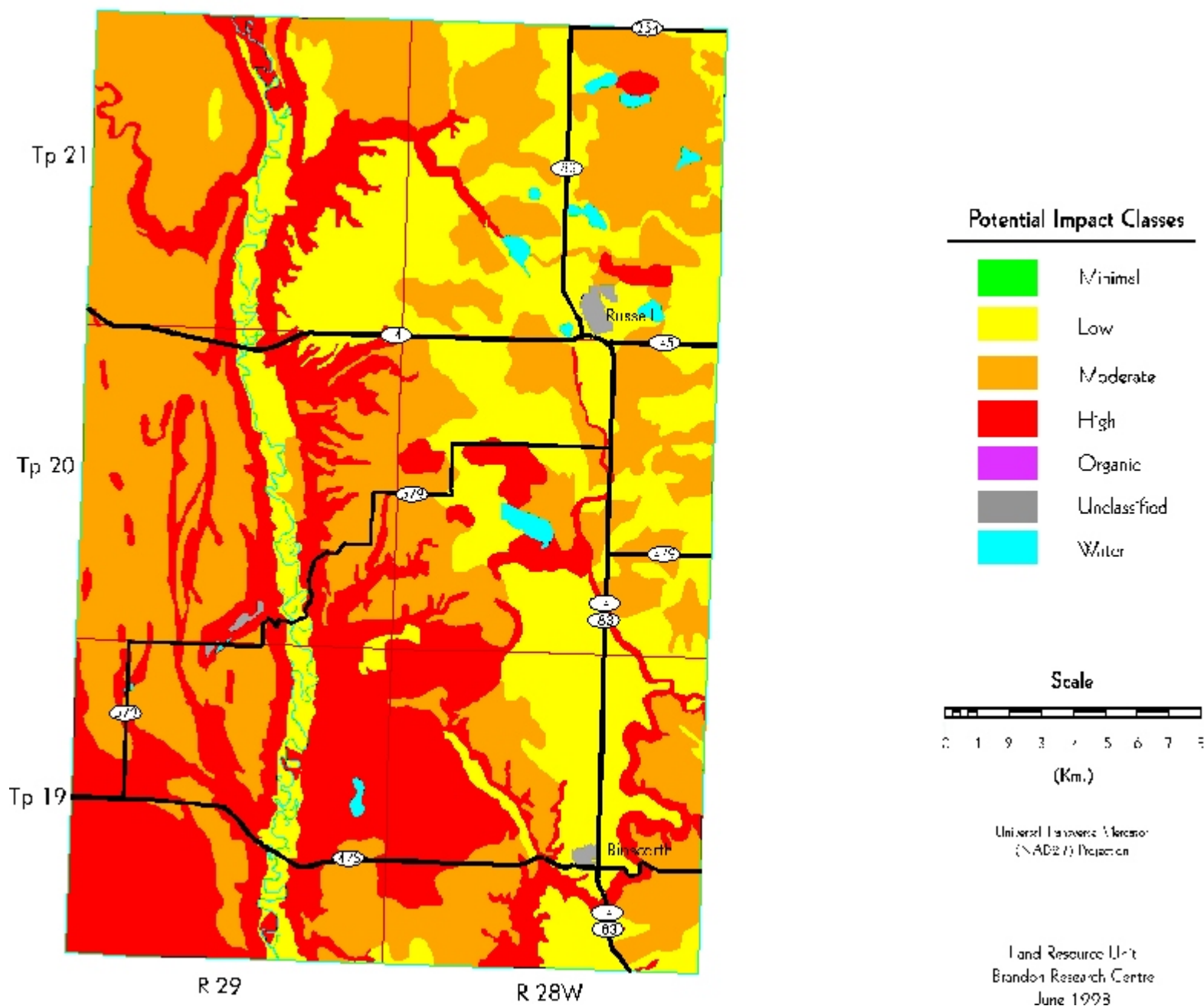
This generalized interpretive map is based on the dominant soil series and slope class for each soil polygon. The nature of the subclass limitations, and the classification of subdominant components is not shown at this generalized map scale.

Table 7. Potential Environmental Impact Under Irrigation¹

Class	Area (ha)	Percent of RM
Minimal	0	0.0
Low	15946	27.4
Moderate	24907	42.8
High	16442	28.3
Organic	0	0.0
Unclassified	209	0.4
Water	673	1.2
Total	58177	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, 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

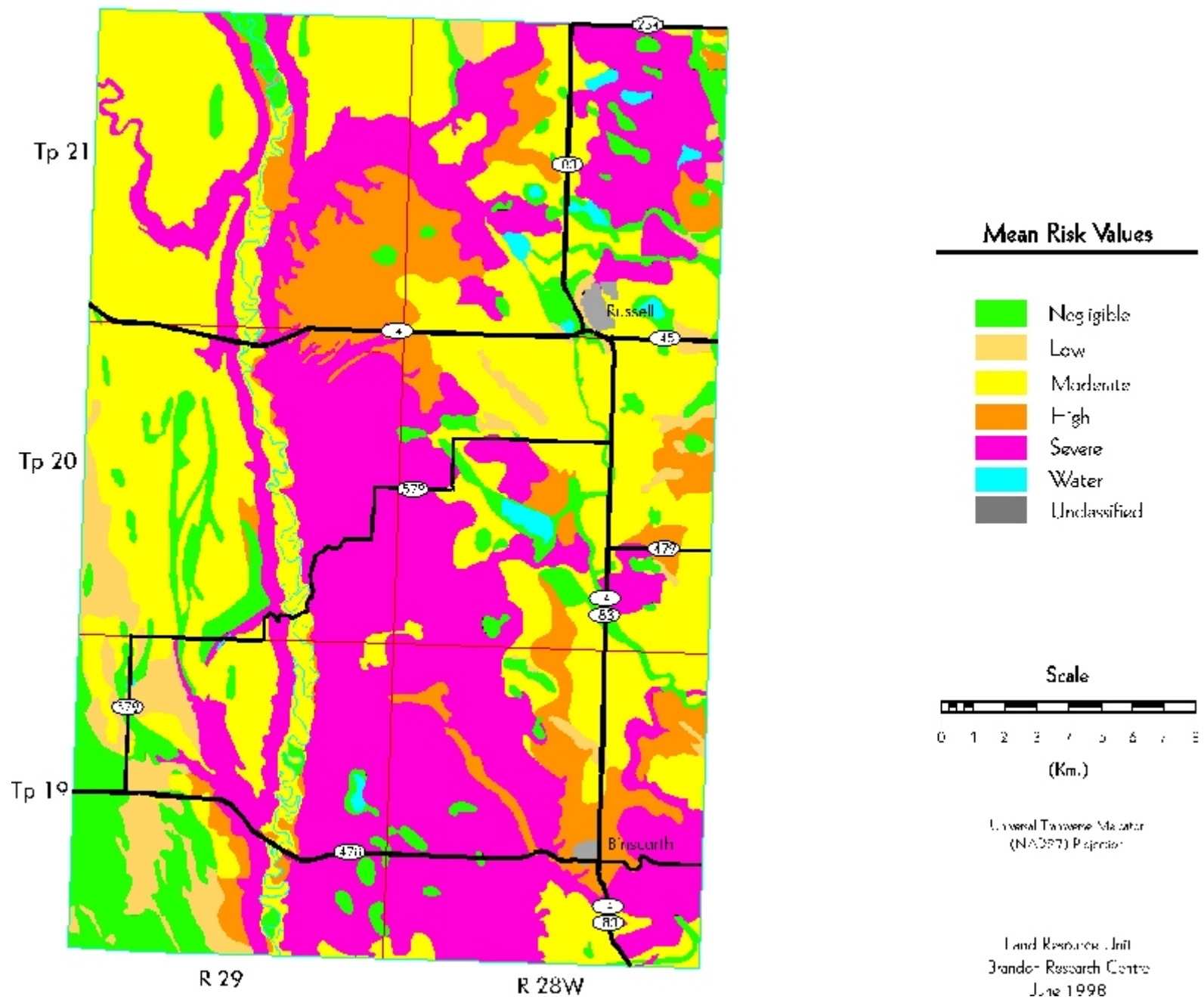
Cropping and residue management practices will significantly reduce this risk depending on crop rotation program, soil type, and landscape features.

Table 8. Water Erosion Risk¹

Class	Area (ha)	Percent of RM
Negligible	5908	10.2
Low	2818	4.8
Moderate	21255	36.5
High	5906	10.2
Severe	21407	36.8
Unclassified	209	0.4
Water	673	1.2
Total	58177	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.

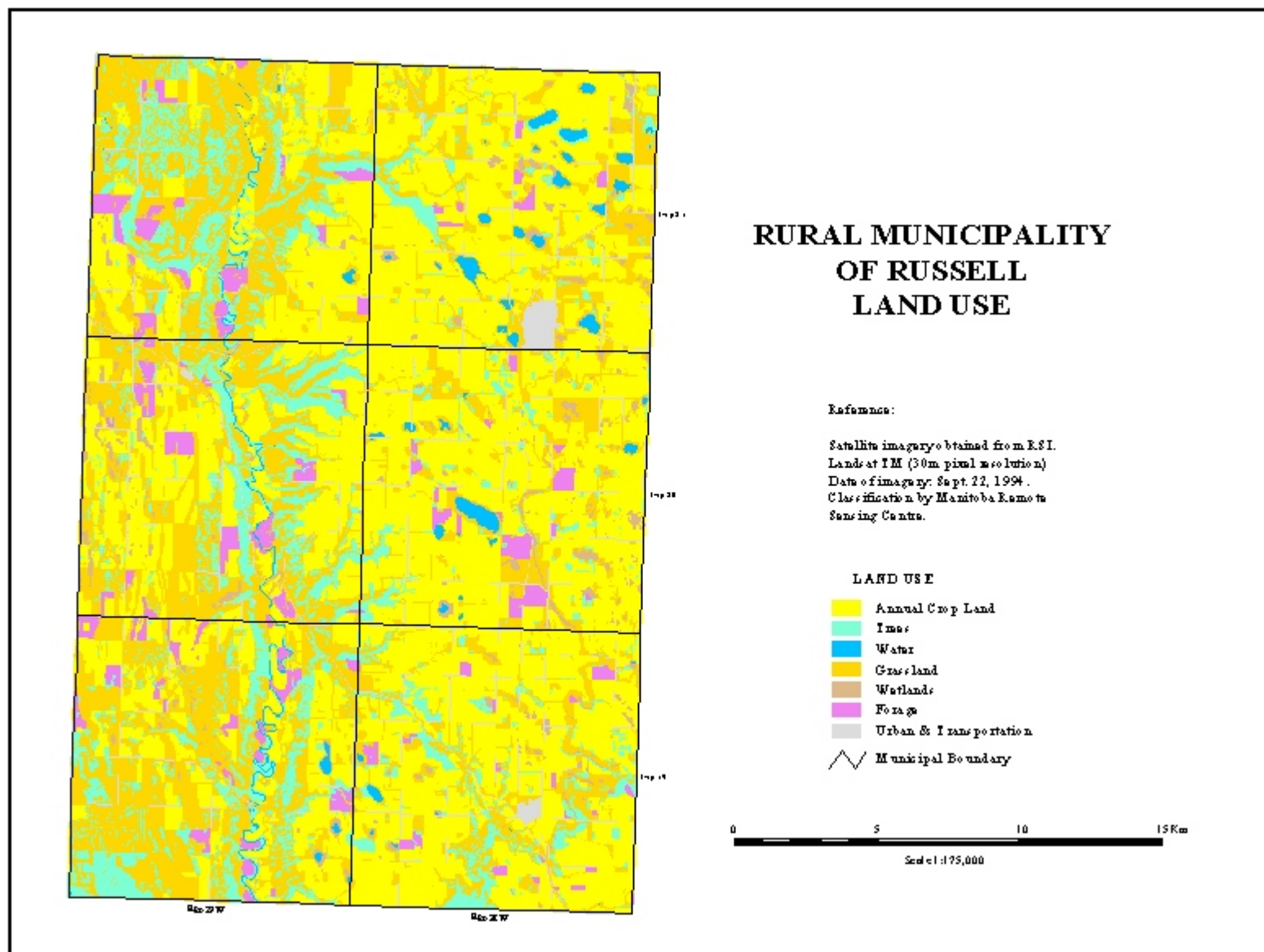
Water - open water - lakes, rivers streams, ponds, and lagoons.

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

Table 9. Land Use¹

Class	Area (ha)	Percent of RM
Annual Crop Land	28588	48.7
Forage	2165	3.7
Grasslands	17063	29.1
Trees	7136	12.2
Wetlands	1122	1.9
Water	820	1.4
Urban and Transportation	1760	3.0
Total	58654	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.

Ehrlich, W.A., Pratt, L.E. and Poyser, E.A. 1956 Report of Reconnaissance Soil Survey of Rossburn and Virden Map Sheet Areas. Soils Report No. 6. Manitoba Soil Survey. Published by Manitoba Dept. of Agriculture. 121pp and 2 maps.

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.

Expert Committee on Soil Survey. 1987. The Canadian System of Soil Classification. Second Edition. Publ. No. 1646. Research Branch, Agriculture Canada.

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. 1998. 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.

Michalyna, W. 1984. Soils of the Binscarth and Russell Areas. Report No. D54. Canada-Manitoba Soil Survey. Winnipeg.

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.