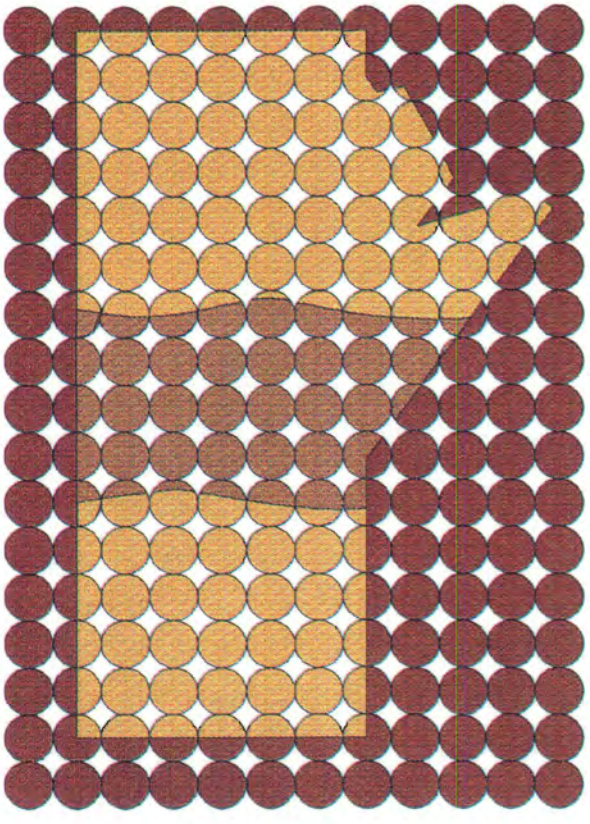


Manitoba Land Resource Unit
Brandon Research Centre
Agriculture and Agri-Food Canada

Soils of the S½ of N½ 3-3-5W Morden, MB

Special Report Series 97-1

Agriculture and Agri-Food Canada Research Branch

This report may be cited as:

Eilers, R.G. and E. St. Jacques. 1997. Soils of S½ of N½ 3-3-5W (Morden, MB). Report prepared for Cereals Research Centre, Winnipeg, by the Manitoba Land Resource Unit, Brandon Research Centre, 17 pp.

Copies of this report are available from:

Manitoba Land Resource Unit
Research Branch, Brandon Research Centre
Agriculture and Agri-Food Canada
Rm 360 Ellis Bldg.
University of Manitoba
Winnipeg, Manitoba
R3T 2N2

Soils of S½ of N½ 3-3-5W (Morden, MB)

Special Report Series 97-1

By

R.G. Eilers and E. St. Jacques

Manitoba Land Resource Unit
Brandon Research Centre
Research Branch
Agriculture and Agri-Food Canada

Acknowledgements

The soils were mapped in the field by E. St. Jacques and D. Swidinsky of the Manitoba Land Resource Unit.

The map was digitized by A. Wadell of the University of Manitoba.

The final maps were produced by G. Lelyk of the Manitoba Land Resource Unit using a PAMAP Geographic Information System.

Site, location and infrared photos were provided by C. Davidson, of the Agri-Food Diversification Research Centre in Morden.

S. Grift of University of Manitoba and W. Fraser, Manitoba Land Resource Unit, reviewed the manuscript.

Introduction

Knowledge of soil variability, extent and quality is essential for the planning, designing and laying out of research plots for tillage treatments, fertility assessments, plant protection investigations and crop variety evaluations. Soil drainage, salinity, and calcareousness, are some of the primary characteristics of soils which can be easily observed in the field. These parameters can significantly influence plant response and crop growth. The area of this study was under consideration for the establishment of long term research plots for cereal crops. Acquisition of information on soil quality and soil variability is considered an important first step in this process.

The objective of this study was to provide very detailed soil information at the field level which could be used to aid in the design of the research plots and in the long term, provide background information for the evaluation of crop performance. The detailed soil inventory was conducted by the Manitoba Land Resource Unit at the request of the Agri-Food Diversification Research Centre in Morden.

Subsequent to the completion of the field work, the site was abandoned for research purposes. As a result, soil samples collected during the field investigation were archived. This report summarizes the results of the field inventory activities and provides selected assessments of land capability and suitability.

Location and Extent

The study area is located immediately to the east of the Morden Research Centre property (Experimental Farm, Fig. 1). It encompasses an area of 70.5 ha covering the south half of both the northwest and northeast quarters of section 3 Township 3 in Range 5 west of the prime meridian.

Agro-ecological Setting

The study area is located on the level deltaic and lacustrine deposits of the Red River Valley. The area is typically flat with slopes varying from level (0 to 0.5%) to nearly level (0.5 to 2.0%). The soils were first mapped at a reconnaissance level (Ellis and Shafer, 1943). In the early 1960's, in response to more intensive agricultural development in the area, the soils were remapped at a scale of 1:20 000 (Smith and Michalyna, 1973). The study area has no defined surface drainage pattern. Surface drainage from snow melt and heavy rains generally flows slowly off the field to the south east. The study site is approximately 300 m above sea level, and has a mean annual temperature of 3.3 °C ranging from 8.7 °C to -2.2 °C mean maximum and mean minimum respectively, with a mean annual frost free period of 125 days. Mean annual precipitation is about 530 mm with about 336 mm occurring during the May 1 to September 30 growing season (Atmospheric Environment Service, 1982).

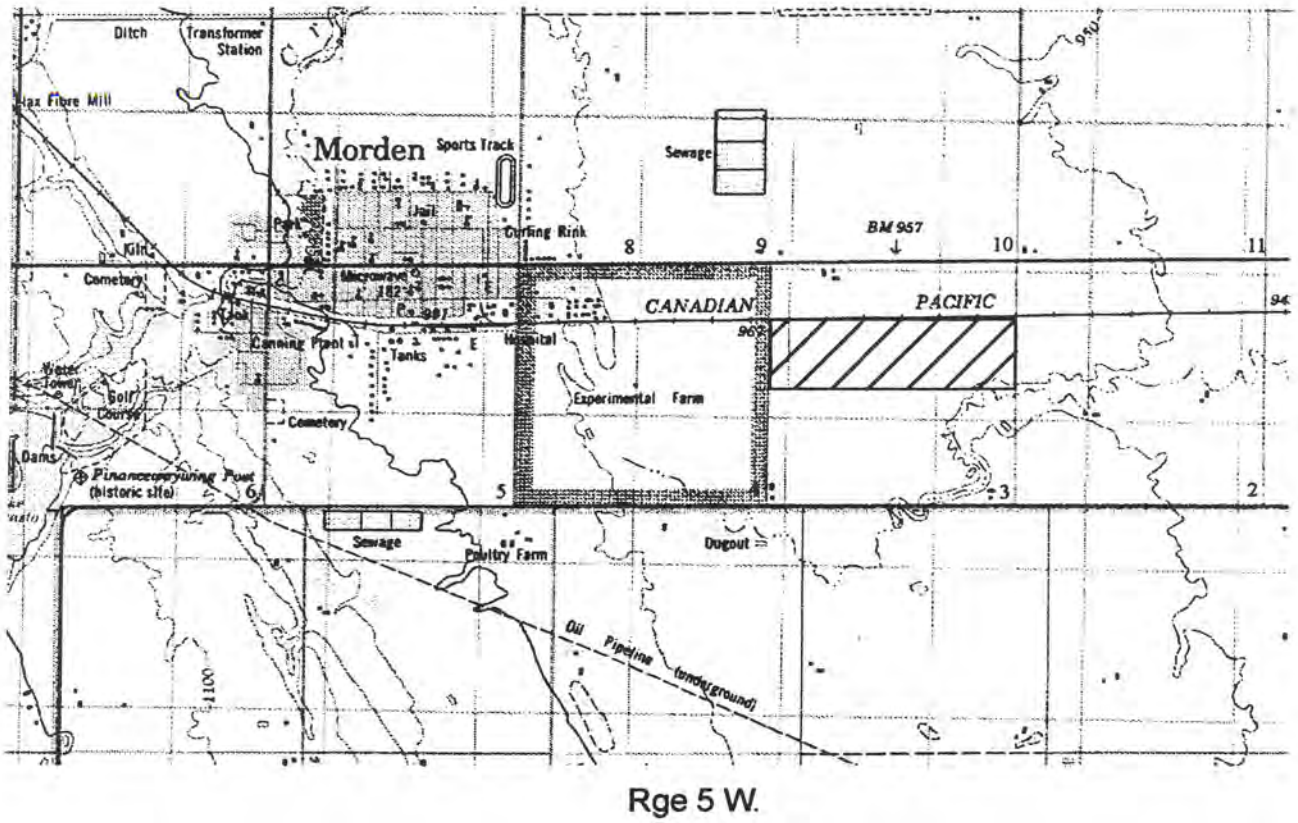


Figure 1. Location of the study area (shown as ///////).

Methodology

Field investigations were conducted Oct. 7-10, 1996. A total of 55 soil inspections were made every 100 m along north-south foot traverses across the field. This grid survey resulted in an average soil inspection density of 1 site per 1.2 ha. Surface and subsurface soil samples were collected using a shovel and hand auger. Soil characteristics observed in the field were recorded on standard field sheets and each soil profile was classified according to standard soil survey procedures (Agriculture Canada, 1987). The location of soil inspection grid points and sampling sites is shown on the soil map in Fig. 2. Five deeper inspections were made to a depth of 3 m using a giddings drill. These deep inspections were made in an east-west transect across the field to investigate the status of subsoil stratigraphy, the presence of subsoil salinity, and the depth to the water table.

Soil Map

The soils were mapped at a scale of 1:5 000 on an air photo base (Fig. 2). The base photo was electronically scanned and expanded to the 1:5 000 scale. Soil boundaries were digitized and then overlaid on the photo base using PAMAP GIS software. The soils are summarized in Table 1.

Soil Map Legend

A general description of each of the soils mapped in this study is provided in Table 2 and a description of the map unit symbology is included in Table 3.

Description of Soils

Twelve different soil series were identified and mapped in this study. However, due to the limited extent of the area surveyed a complete description of each soil is not provided in this report. The reader is referred to the Soils Report D60 (Michalyna et al, 1988) or to the Manitoba Land Resource Unit for a more comprehensive description of any particular soil.

Table 1. Soils series identified and shown on soil map

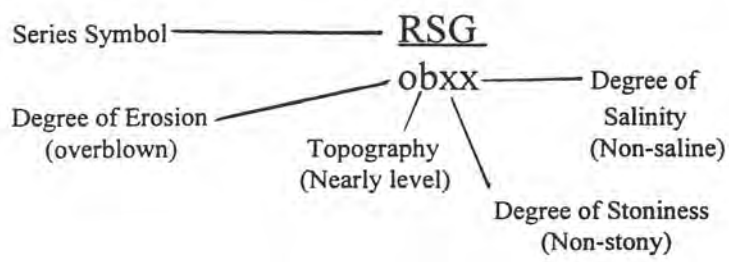
Soil Symbol	Soil Name	Area (ha)
EBG	Edenburg	3.77
EGF	Eigenhof	1.61
GDH	Gnadenthal	2.31
HND	Horndean	8.31
JOD	Jordan	4.84
NBG	Neuenberg	22.06
NWN	Newton Siding	7.64
PME	Plum Coulee	9.44
RGD	Rignold	1.70
RLD	Reinland	1.98
RSG	Rosengart	6.31
WIK	Winkler	0.52
Total		70.49

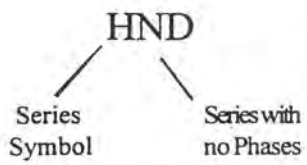
Table 2. **SOIL LEGEND FOR S ½ OF N ½ OF SEC. 3-3-5W**

Soil Symbol	Soil Name	Surface Texture	Soil Drainage	Mode of Deposition	Family Particle Size	Subgroup
EBG	Edenburg	CL	Well	Lacustrine	Fine Loamy/Sandy	O.BL
EGF	Eigenhof	CL	Well	Lacustrine	Fine Loamy	O.BL
GDH	Gnadenthal	L	Imperfect	Lacustrine	Loamy	GLR.BL
HND	Horndean	C	Imperfect	Lacustrine	Clayey/Coarse Loamy	GL.BL
JOD	Jordan	C	Well	Lacustrine	Clayey/Coarse Loamy	O.BL
NBG	Neuenberg	VFSL	Imperfect	Lacustrine	Loamy/Sandy	GLR.BL
NWN	Newton Siding	CL	Imperfect	Lacustrine	Fine Loamy/Sandy	GLR.BL
PME	Plum Coulee	C	Imperfect	Lacustrine	Clayey	GL.BL
RGD	Rignold	L	Imperfect	Lacustrine	Loamy/Clayey	GL.BL
RLD	Reinland	FSL	Imperfect	Lacustrine	Coarse Loamy	GLR.BL
RSG	Rosengart	VFSL	Well	Lacustrine	Loamy/Sandy	O.BL
WIK	Winkler	C	Well	Lacustrine	Clayey	O.BL

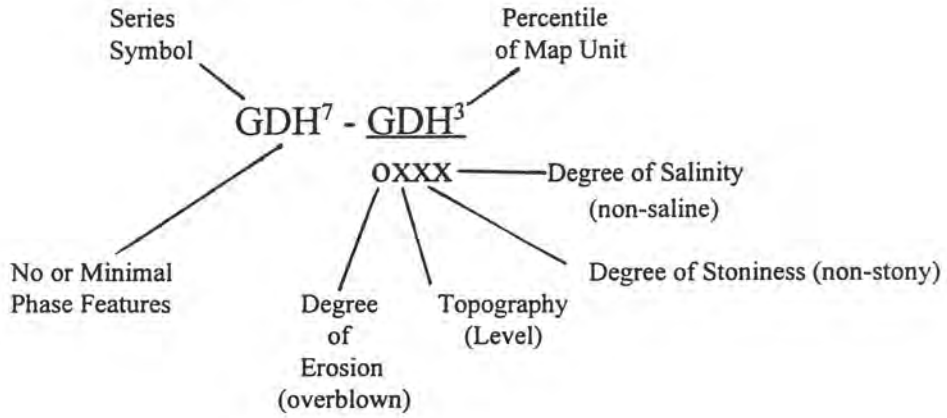
Table 3. **MAP UNIT SYMBOLOGY**

Simple Map Units





Compound Map Units



Phases

Degree of Erosion

x	noneroded or minimal
1	slightly eroded
2	moderately eroded
3	severely eroded
o	overblown

Slope Class

x	0-0.5%	level
b	0.5-2%	nearly level
c	2-5%	very gently sloping
d	5-9%	gently sloping
e	9-15%	moderately sloping
f	15-30%	strongly sloping
g	30-45%	very strongly sloping
h	45-70%	extremely sloping

Stoniness

x	nonstony
1	slightly stony
2	moderately stony
3	very stony
4	exceedingly stony
5	excessively stony

Degree of Salinity
Electrical Conductivity (dS/m)

x	non-saline	0-4
s	weakly saline	4-8
t	moderately saline	8-15
u	strongly saline	15+

Interpretive Maps

Two interpretive maps were made based on evaluations of the soils identified and mapped in the field: an Agriculture Capability map (Canda Land Inventory, Fig. 3) and an Irrigation Suitability map (Fig. 4). Summaries of the different capability and suitability classes are provided in Tables 4, and 5 respectively.

Table 4. Agriculture Capability

Class	ha	% of area
1	30.84	43.7
2	34.56	49.0
3	5.11	7.2
Total	70.51	100.0

Table 5. Irrigation Suitability

Class	ha	% of area
Excellent	6.31	8.9
Good	31.72	44.9
Fair	32.48	46.1
Poor	0	0.0
Total	70.51	100.0

Definitions of the Dryland Agriculture Capability Classes and the Irrigation Suitability Classes are provided in Appendix A and B respectively. More information on the soils of the general area can be obtained from the recent soil report D60 (Michalyna et al, 1988) or from Manitoba Land Resource Unit.

Summary and Recommendations

The results of this soil investigation can be summarized as follows. Although there is considerable variability in the soils as indicated by the fact that 12 soil series were mapped, the actual impact of this variability on crop production should not be significant. In terms of agricultural capability, most of the soils are rated as class 1 or 2 with only minor limitations of drainage (W), salinity (N) and droughtiness (M) to be considered. In terms of irrigation suitability, most of the land is good to fair and some is excellent.

In comparison to the quality of lands in the general area, this field represents a relatively high potential for soil quality and would provide a good resource base on which to conduct detailed research on crop production. The most common soil in this field is Neuenburg. Neuenburg is a very fine sandy loam soil and is common throughout the area. It is typical or representative of good agricultural soils and would provide a good resource base for agricultural plot research.

Bibliography

Agriculture Canada. 1987. The Canadian System of Soil Classification. 2 nd Ed. Expert Committee on Soil Survey. Agric. Can. Pub. 1646. 164 pp.

Anon. 1965, Land Capability Classification for Agriculture. Report No. 2, Canada Land Inventory, Canada Dept. Regional Economic Expansion, Ottawa. 16 pp.

Atmospheric Environmental Service. 1982. Environment Canada.

Ellis J.H. and W.H. Shafer. 1943. Report of Reconnaissance Soil Survey of South Central Manitoba. Report No. 4. Manitoba Soil Survey. Published by Manitoba Department of Agriculture.

Michalyna, W., Glenn Podolsky, and E. St. Jacques. 1988. Soils of the Rural Municipalities of Grey, Dufferin, Roland, Thompson and part of Stanley. Soil Report No. D60. Manitoba Department of Agriculture.

Smith, R. E., and W. Michalyna. 1973. Soils of the Morden-Winkler Area. Soils Report No.18. Manitoba Soil Survey. Published by Manitoba Department of Agriculture.

Working Group on Irrigation Suitability Classification 1987. An irrigation suitability classification system for the Canadian Prairies, Research Branch, Agriculture Canada, LRRC Contribution 87-83.

Appendix A: Agriculture Capability Classes

A general description of each of the agricultural capability classes is as follows:

Class 1 Soils in this class have no important limitations for crop use. The soils have level or gently sloping topography; they are deep, well to imperfectly drained and have moderate water holding capacity. The soils are naturally well supplied with plant nutrients, easily maintained in good tilth and fertility; soils are moderately high to high in productivity for a wide range of cereal and special crops.

Class 2 Soils in this class have moderate limitations that reduce the choice of crops or require moderate conservation practices. The soils have good water holding capacity and are either naturally well supplied with plant nutrients or are highly responsive to inputs of fertilizer. They are moderate to high in productivity for a fairly wide range of crops. The limitations are not severe and good soil management and cropping practices can be applied without serious difficulty.

Class 3 Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices. The limitations in Class 3 are more severe than those in Class 2 and conservation practices are more difficult to apply and maintain. The limitations affect the timing and ease of tillage, planting and harvesting, the choice of crops and maintenance of conservation practices. The limitations include one or more of the following: moderate climatic limitation, erosion, structure or permeability, low fertility, topography, overflow, wetness, low water holding capacity or slowness in release of water to plants, stoniness and depth of soil to consolidated bedrock. Under good management, these soils are fair to moderately high in productivity for a fairly wide range of field crops.

Class 4 Soils in this class have severe limitations that restrict the choice of crops or require special conservation practices or both. These soils have such limitations that they are only suited for a few crops, or the yield for a range of crops may be low, or the risk of crop failure is high. The limitations may seriously affect such farm practices as the timing and ease of tillage, planting and harvesting, and the application and maintenance of conservation practices. These soils are low to medium in productivity for a narrow range of crops but may have high productivity for a specially adapted crop. The limitations include the adverse effects of one or more the following: climate, accumulative undesirable soil characteristics, low fertility, deficiencies in the storage capacity or release of soil moisture to plants, structure or permeability, salinity, erosion, topography, overflow, wetness, stoniness, and depth of soil to consolidated bedrock.

Class 5 Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible. These

soils have such serious soil, climatic or other limitations that they are not capable of use for sustained production of annual field crops. However, they may be improved by the use of farm machinery for the production of native or tame species of perennial forage plants. Feasible improvement practices include clearing of bush, cultivation, seeding, fertilizing and water control.

Some soils in Class 5 can be used for cultivated field crops provided unusually intensive management is used. Some of these soils are also adapted to special crops requiring soil conditions unlike those needed by the common crops.

Class 6 Soils in this class are capable only of producing perennial forage crops and improvement practices are not feasible. Class 6 soils have some natural sustained grazing capacity for farm animals, but have such serious soil, climatic or other limitations as to make impractical the application of improvement practices that can be carried out on Class 5 soils. Soils may be placed in this class because their physical nature prevents the use of farm machinery, or because the soils are not responsive to improvement practices, or because stock watering facilities are inadequate.

Class 7 Soils in this class have no capability for arable culture or permanent pasture because of extremely severe limitations. Bodies of water too small to delineate on the map are included in this class. These soils may or may not have a high capability for forestry, wildlife and recreation.

Appendix B: Irrigation suitability classes

A description of the irrigation suitability classes is as follows:

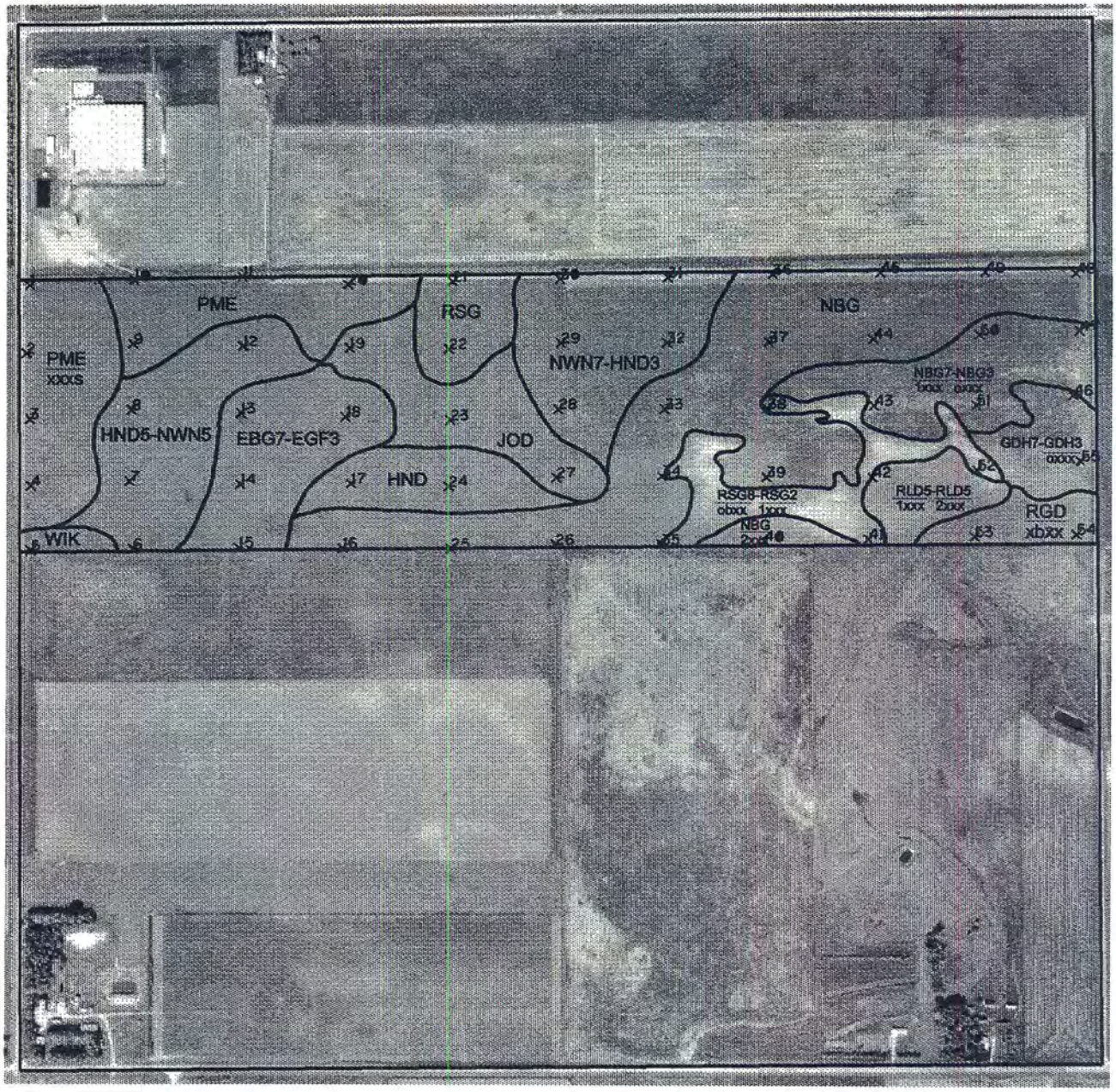
Excellent: Lands in this class have an excellent suitability rating with no significant soil or landscape limitations for irrigation. They are capable of producing a sustained and relatively high yield of a wide range of commercially adapted crops. The soils are typically medium textured, well drained and hold adequate moisture. Harmful accumulations of soluble salts are absent from the soil and topography is level to nearly level.

Good: Lands in this class includes soils and/or landscapes which have only slight limitations for irrigation due to unfavourable characteristics of soils, landscapes or both. The range of crops that can be grown may be limited and greater inputs to development and management may be required.

Fair: Lands in this class have only fair suitability. They have moderate limitations of soil and/or landscape characteristics. These lands may be inferior because of excess

salinity and sodicity, low hydraulic conductivity, low water holding capacity, poor drainage, steep slopes, or erosivity. These limitations reduce the range of crops that may be grown and increase the development and management costs associated with irrigation farming. Management may have to include special conservation techniques to overcome some of these limitations and at the same time mitigate soil degradation.

Poor: Lands in these classes have a poor suitability for irrigation due to severe limitations of soil and/or landscape characteristics. These limitations generally result in land that is unsuitable for sustained irrigation. Some lands may have limited potential when special crops, irrigation systems, and soil and water conservation techniques are available.



Soil Symbol	Soil Name
EBG	Edenburg
EGF	Eigenhof
GDH	Gnadenthal
HND	Horndean
JOD	Jordan
NBG	Neuenberg
NWN	Newton Siding
PME	Plum Coulee
RGD	Rignold
RLD	Reinland
RSG	Rosengart
WIK	Winkler

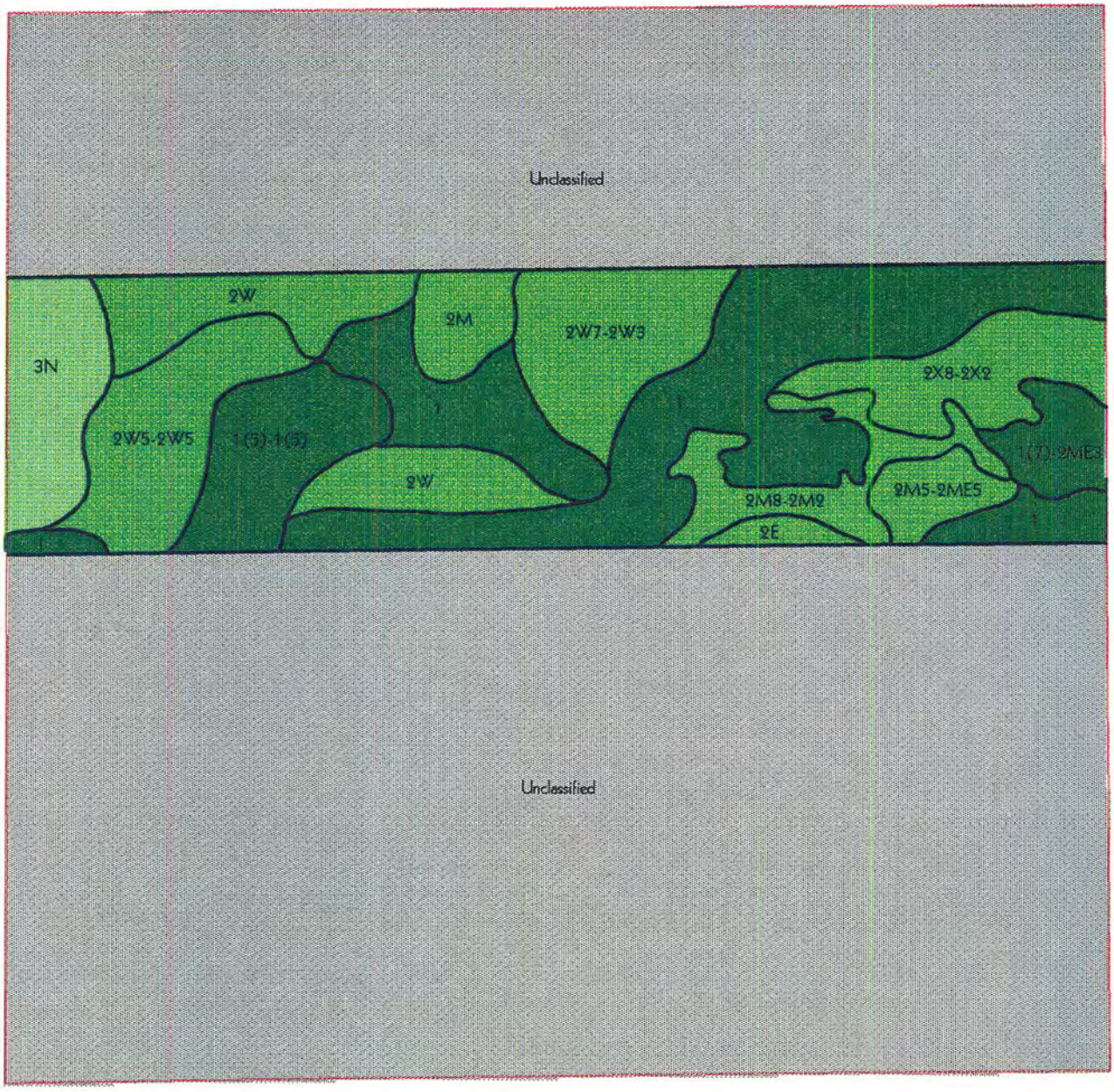
N
W E
S

Scale 1:10 000

x[1] - indicates soil inspection site

Manitoba Land Resource Unit
Brandon Research Centre
December 1996

Figure 2. Soil Map and Field Inspection Sites



Canada Land Inventory Classes

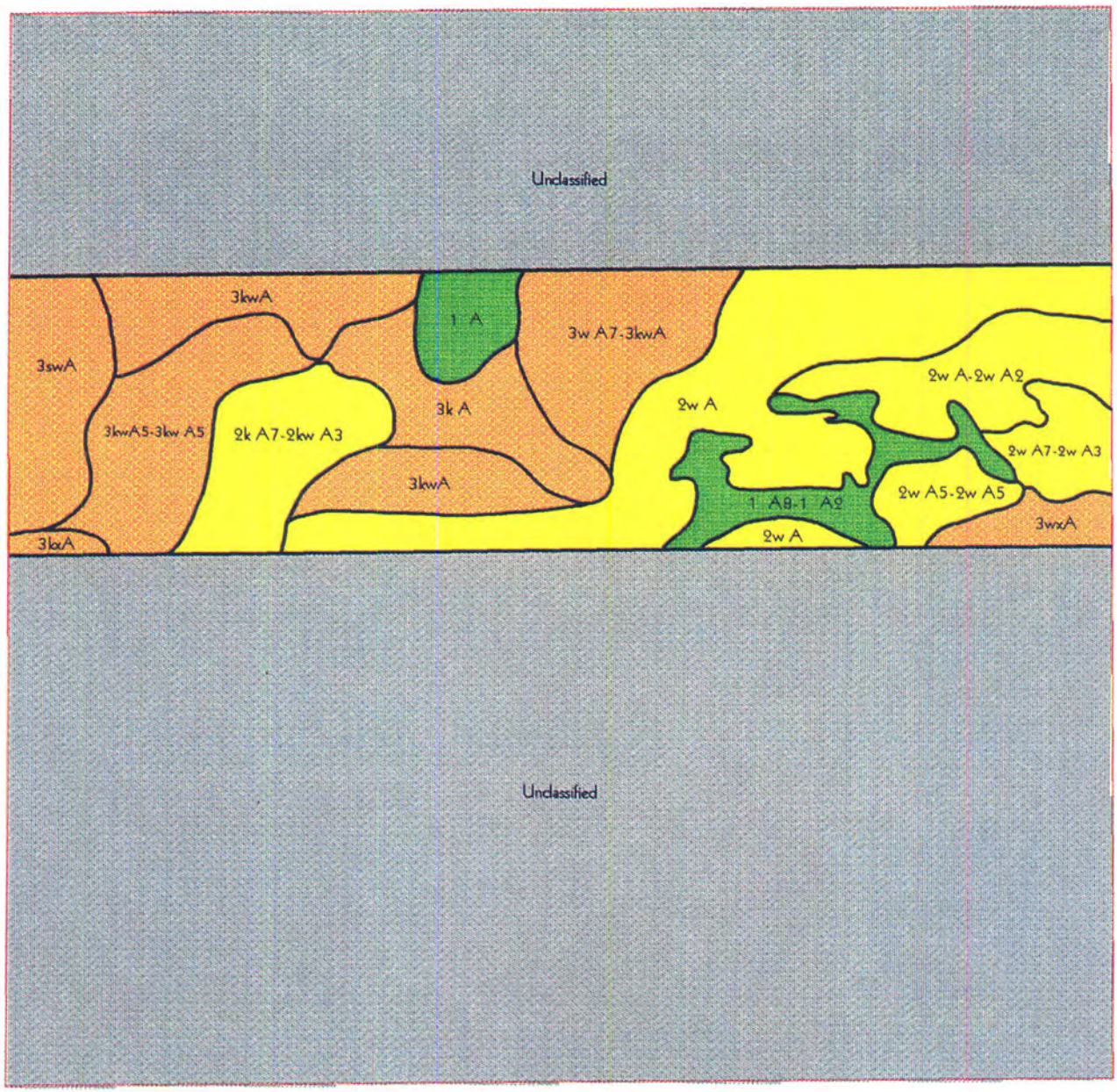
- Class 1
- Class 2
- Class 3
- Class 4
- Class 5
- Class 6
- Class 7
- Water
- Unclassified

N
W E
S

Scale 1:10 000

Manitoba Land Resource Unit
Brandon Research Centre
December 1996

Figure 3. Agriculture Capability



Irrigation Suitability Classes

- Excellent
- Good
- Fair
- Poor
- Organic
- Unclassified
- Water

N
W E
S

Scale 1:10 000

Manitoba Land Resource Unit
Brandon Research Centre
December 1996

Figure 4. Irrigation Suitability