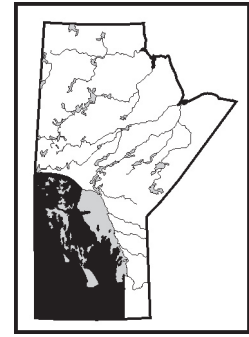


## Summary of investigations for the Sedimentary and Industrial Minerals Section by R.K. Bezys



Bezys, R.K. 2005: Summary of investigations for the Sedimentary and Industrial Minerals Section; *in* Report of Activities 2005, Manitoba Industry, Economic Development and Mines, Manitoba Geological Survey, p. 176–178.

### Summary

The Sedimentary and Industrial Minerals Section engaged in limited fieldwork in 2005, although numerous office-based projects continue or were initiated. Some projects, such as the Williston Basin TGI (Targeted Geoscience Initiative) project, are in their final year of completion, while others, such as the Phanerozoic lineament study, have just begun. Limited progress has been made on the 3-D coverage of the Quaternary geology of Manitoba and the surficial geology compilation of Manitoba. Municipal mapping of aggregate resources continues.

Staff has also been responsible for responding to numerous requests for information on industrial minerals and other deposits, as well as leading field trips. Staff also conducted field and office resource assessments in support of the Protected Areas Initiative.

### Introduction

The main focus of work for office-based projects in the Sedimentary and Industrial Minerals (SIMs) Section included

- Williston Basin TGI project;
- Phanerozoic lineament study;
- 3-D geology project; and
- surficial geology compilation of Manitoba.

Limited progress was made on the 3-D geology of the southern Phanerozoic terrane of Manitoba and the surficial geology compilation of Manitoba. The SIM Section has also received numerous requests for information on various industrial minerals and other deposits in Manitoba. These include the Precambrian in southeastern Manitoba, the Paleozoic in southern Manitoba and the Cenozoic in southwestern Manitoba. The aggregate deposits in the Rural Municipalities of Riverside and Turtle Mountain were mapped this summer (Groom, GS-21, this volume). Also, as part of the Protected Areas Initiative, the White-mouth Bog in southeastern Manitoba was evaluated.

### *Targeted Geoscience Initiative II – Williston Basin architecture and hydrocarbon potential*

This project undertook a multidisciplinary, coordinated geoscientific study aimed at characterizing and understanding basin architecture and hydrocarbon potential in the Williston Basin, from southwestern Manitoba to southeastern Saskatchewan. The project is in its final year of study, which will involve new work

that builds on established scientific leadership, cooperation and expertise amongst federal and provincial government agencies and universities. The result will be a seamless 3-D geological model of Paleozoic and Mesozoic rocks, from basement to outcrop, in Manitoba and Saskatchewan, in a geographic area extending from the northern and eastern outcrop edge to the international border, and west to lat 106°. A major objective is to enhance our understanding of the basin's hydrocarbon and mineral potential.

Progress in the last year includes a web-based publication of the Lower Paleozoic maps (structure and isopach) and bibliography, which can be viewed at [www.willistontgi.com](http://www.willistontgi.com). This release is the first step in reaching the goal of finalizing this project. In order to better understand potential and proven hydrocarbon reservoir architecture, gOcad®, a 3-D geographic information system, will be used to map in three dimensions the entire stratigraphic package. Figure GS-22-1 depicts the current 3-D surfaces from the Precambrian up to the Silurian Interlake Group under a transparent topography for the TGI study area.

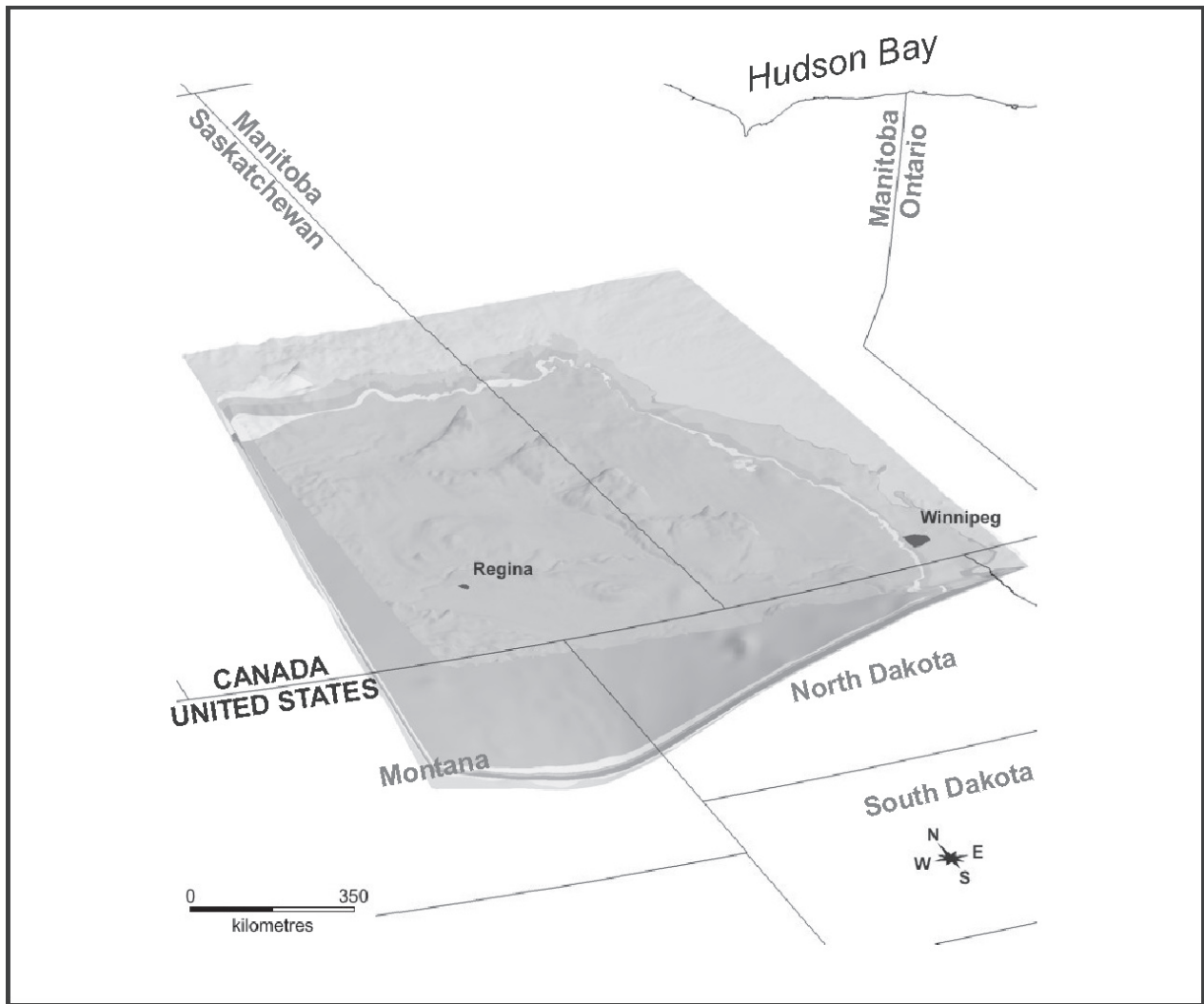
The Williston Basin project has eight principal tasks:

- geoscience knowledge inventory
- regional geological mapping
- geophysical investigations
- regional hydrogeology studies
- lineation studies based on remotely sensed imagery
- hydrocarbon assessment
- 3-D gOcad® geological modelling
- final report

Completion of the project is expected by April 2006.

### *Phanerozoic lineament study*

A new project to compile a database of Phanerozoic structural information for the Western Canada Sedimentary Basin has been initiated in cooperation with the Alberta and Saskatchewan geological surveys. The objective of the project will be to document structures that may have localized hydrocarbon and metal-bearing fluids in traps within the Phanerozoic stratigraphic package. All published structural information will be compiled in a common format and subsequently merged into a joint database.



**Figure GS-22-1:** The current 3-D surfaces are depicted from Precambrian up to the Silurian Interlake Group under a transparent topography for the TGI study area. Vertical exaggeration is 100 times.

### ***The 3-D and surficial geology of Manitoba projects***

The 3-D Quaternary geology project, for an area of approximately 200 by 550 km in southeastern Manitoba and the Lake Winnipeg basin region, was completed in 2004. In addition, an inventory of Tertiary buried valley aquifers in Manitoba was compiled in cooperation with Manitoba Water Stewardship. This information was presented in September 2005 at GeoSask 2005 [Canadian Geotechnical Conference and IAH-CNC (International Association of Hydrogeologists – Canadian National Chapter) Groundwater Specialty Conference] in Saskatoon, Saskatchewan.

Cooperative work with geologists from the University of Minnesota is underway to produce a 3-D geological model of groundwater-bearing strata in the Fargo-Moorhead region. An extension of the Fargo model northward, together with the Manitoba 3-D model, will become an international 3-D geological model of the Red River valley. Still in the proposal stage is a study involving the

University of Manitoba, Department of Engineering, and the Manitoba Geological Survey on the the Assiniboine Delta aquifer, located between Portage la Prairie and Brandon.

The most recent publication release from the 3-D geology project is a red-blue anaglyph of the digital elevation model (DEM) of Manitoba. This map (Morin et al., 2005) was released in September 2005 and includes 3-D glasses to enable the viewer to see the anaglyph in three dimensions.

Twenty of fifty-four 1:250 000 NTS map sheets have been completed for the surficial geology compilation of Manitoba. One 1:500 000 and sixteen 1:250 000 maps were released in 2004.

### **Economic considerations**

Exploration for prospective hydrocarbon reservoirs and mineral resources in the Williston Basin is usually led

by small Canadian companies, which rely on government and universities for development of advanced modelling techniques of basins. Large regional syntheses, such as the Williston Basin TGI and lineament compilation projects, are the framework upon which subsequent exploration will be based. It is hoped that further hydrocarbon exploration and mineral exploration will be conducted in southwestern Manitoba as a result of these compilations and advancements.

Surficial and 3-D geological mapping is required for effective land-use planning, and hydrocarbon, groundwater and industrial minerals development.

Three-dimensional models can be used to model groundwater flow patterns and to assess climate change scenarios with respect to impacts on groundwater systems.

### **References**

- Morin, P., Matile, G.L.D. and Keller, G.R. 2005: 3-D topography of Manitoba; Manitoba Industry, Economic Development and Mines, Manitoba Geological Survey, Geoscientific Map MAP2005-3, scale 1:1 000 000.