SURFICIAL GEOLOGY COMPILATION MAP SERIES

The Surficial Geology Compilation Map Series (SGCMS) addresses an increasing demand for consistent surficial geology information for applications such as groundwater protection, industrial mineral management, protected lands, basic research, mineral exploration, engineering, and environmental assessment. The SGCMS provides province-wide coverage at scales of 1:500 000, 1:250 000 and a final compilation at 1:1 000 000.

The unit polygons were digitized from paper maps originally published by the Geological Survey of Canada and Manitoba Geological Survey (MGS). In several areas, digital polygons derived from soils mapping were used to fill gaps in the geological mapping. The 1:250 000 scale maps reference the source of the polygons.

Edge-matching of adjoining 1:250 000 scale map sheets is based on data from the Shuttle Radar Topography Mission Digital Elevation Model (SRTM DEM[1]) as interpreted by the MGS. Other polygon inconsistencies were modified in a similar manner. Geology (colour) is draped over a shaded topographic relief map (grey tones) derived from the SRTM DEM.

[1] United States Geological Survey 2002: Shuttle radar topography mission, digital elevation model, Manitoba; United States Geological Survey, URL <ftp://edcsgs9.cr.usgs.gov/pub/data/srtm/>, portions of files N48W88W.hgt.zip through N60W102.hgt.zip, 1.5 Mb (variable), 90 m cell, zipped hgt format [Mar 2003].

LEGEND

Quaternary

- **O** — ORGANIC DEPOSITS: peat, muck; <1–5 m thick; very low relief wetland deposits; commonly in low-lying areas; accumulated in fen, bog, swamp, and marsh settings; in permafrost areas commonly includes permafrost features such as patterned ground and peat palsas
- **Lm** — SHORELINE SEDIMENTS: sand and gravel; 1–2 m thick; beaches; formed by waves at the margins of modern lakes
- **E** — EOLIAN: sand and minor silt; dunes, blowouts and undulating plains; generally overlies deltaic sediments, coarse lacustrine sediments, or glaciofluvial deposits
- **A** — ALLUVIAL SEDIMENTS: sand and gravel, sand, silt, clay, organic detritus; 1–20 m thick; channel and overbank sediments; reworked by existing rivers and deposited primarily as bars
- **Ms** — MARGINAL GLACIOMARINE SEDIMENTS: littoral sand and gravel; 1–10 m thick; beach ridges, spits, bars; formed by waves at the margin of the glacial Tyrrell Sea and present-day Hudson Bay
- **M** — OFFSHORE GLACIOMARINE SEDIMENTS: clay, silt, minor sand; 1–20 m thick; very low relief massive and laminated deposits which are commonly overlain by peat; deposited from suspension in the offshore, deep water of the glacial Tyrrell Sea and present-day Hudson Bay
- **Ls** — MARGINAL GLACIOLACUSTRINE SEDIMENTS: sand and gravel; 1–20 m thick; beach ridges, spits, bars, littoral sand and gravel; formed by waves at the margin of glacial Lake Agassiz and other small proglacial lakes in the extreme northwestern portion of the province
- **Lc** — OFFSHORE GLACIOLACUSTRINE SEDIMENTS: clay, silt, minor sand; 1–20 m thick; low relief massive and laminated deposits; deposited from suspension in offshore, deep water of glacial Lake Agassiz; commonly scoured and homogenized by icebergs
- **Gs** — DISTAL GLACIOFLUVIAL SEDIMENTS: fine sand, minor gravel, thin silt and clay interbeds; 1–75 m thick; subaqueous outwash fans; deposited in glacial Lake Agassiz by meltwater turbidity currents; commonly reshaped by wave erosion and reworked by wind
- **G** — PROXIMAL GLACIOFLUVIAL SEDIMENTS: sand and gravel; 1–20 m thick; complex deposits, belts with single or multiple esker ridges and kames, as well as thin, low-relief deposits; deposited in contact with glacial ice by meltwater

TILL: diamicton; unsorted glacial debris; 1–75 m thick; generally low-relief, commonly streamlined deposits; in Lake Agassiz basin areas, the till can be wave-washed, covered discontinuously by a thin veneer of glaciolacustrine sediments and scoured by icebergs; thicker sequences, primarily in the Hudson Bay Lowland, consist of multiple units of varying texture and provenance

- **Tc** — silt diamicton; largely derived from Phanerozoic carbonate rocks from the Hudson Bay Lowland and deposited by an ice stream emanating from Hudson Bay
- **Tp** — sand diamicton; commonly bouldery, predominantly composed of Precambrian crystalline rocks and deposited by ice emanating from Nunavut

Pre-Quaternary

ROCK: > 75% bedrock outcrop; generally subglacially eroded and unweathered; in areas of permafrost includes frost shattered, angular, monolithic boulder fields (Felsenmeer)

- **Rc** — Paleozoic terrane; carbonate-dominated rocks in areas west of Lake Winnipeg, exposed typically as glacially striated, low-relief surfaces, and along large river valleys in the Hudson Bay Lowland
- **Rp** — Precambrian terrane; intrusive, metasedimentary, and metavolcanic rocks having a glacially scoured irregular surface with high local relief

Scale 1:500 000

Kilometres 0 5 10 20 30 40 50

To aid the reader, a shadow effect has been added to exaggerate the topographic relief.

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Compiled by:
G.L.D. Matile and G.R. Keller
(L. Dredge, Geological Survey of Canada, provided modifications to the following map sheets: 64I, 64J, 64K, 64N, 64O, 64P)

The Quaternary landscape of northern Manitoba

The Precambrian Shield terrane tends to be dominated by discontinuous sediment cover with numerous bedrock outcrops, while the Phanerozoic rock terrane tends to have a thicker sediment cover with limited outcrops. The thickest package of sediment is found in the Hudson Bay Lowland (HBL) where large river sections found along major rivers, such as the Nelson and the Hayes rivers, expose multiple glacial tills and interglacial sediments that date back hundreds of thousands of years to before the last glaciation. In the Precambrian Shield, Quaternary sediments are commonly thick, but discontinuous, rarely infilling the bedrock lows completely. Older sediments, including saprolites, are characteristically preserved in the bedrock lows where they are protected from glacial erosion. Bedrock structure, such as faulting and folding, is commonly visible on the digital elevation model.

The Etawney, Northern Indian and Settee moraines clearly mark the confluence between the Keewatin (to the west) and Labradorean sectors (to the south and east) of the Laurentide ice sheet. Glacial sediments to the west of this morainal system are predominantly noncalcareous and sand-rich and were deposited by glaciers flowing southward, while glacial sediments to the south and east are predominantly calcareous and silt-rich and were deposited by glaciers flowing southeastward. The terrain in the Keewatin sector is strongly streamlined parallel to ice flow by turbulent subglacial meltwater and punctuated by regularly spaced major and tributary eskers composed of sand and gravel.

The Labradorean sector is dominated by landforms that define a major icestream which carried carbonate-rich debris from the HBL to at least as far as The Pas moraine. The retreat of this ice lobe is punctuated by numerous moraines, including The Pas moraine, the Hargrave, the Hudwin, the Cantin Lake, the Bigstone, and the Sipiwesk moraines. There are patches of streamlined landforms (parabolic drumlins), but much of the area is buried by clay which was deposited in the deep water of glacial Lake Agassiz thereby masking the glacial landscape. Drumlinoid ridges in the Labradorean sector of the Laurentide ice sheet, south and west of the HBL tend to contain a large proportion of carbonate glacial debris from the HBL and the resultant dilution of local debris makes them a poor media for till prospecting.

As the glaciers retreated, glacial Lake Agassiz expanded northward, progressively covering the vast majority of northern Manitoba. The probable northern extent of glacial Lake Agassiz is marked by an anomalously large area of littoral sand (light blue on the map face) north of South Indian Lake. The HBL below the upper limit of the Tyrrell Sea is primarily peatland which is interspersed with numerous sandy shoreline features.

Modified from:
Matile, G.L.D. and Keller, G.R. 2006: Surficial Geology Compilation Map Series of Manitoba; Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Surficial Geology Compilation Map Series SG-CMS, 1 DVD-ROM, scale 1:250 000, 1:500 000.

Suggested reference:
Matile, G.L.D. and Keller, G.R. 2006: Surficial geology of northwestern Manitoba; Manitoba Science, Technology, Energy and Mines, Manitoba Geological Survey, Surficial Geology Compilation Map Series, SG-NWMB, scale 1:500 000.

Copies of this map can be obtained from:
Manitoba Science, Technology, Energy and Mines
Manitoba Geological Survey, Publication Sales
360-1395 Ellice Ave.
Winnipeg, MB
R3G 3P2
Canada

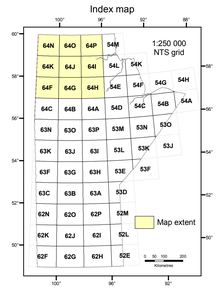
Phone: (204) 945-4154
Toll free: 1-800-223-5215
Email: minesinfo@gov.mb.ca

SURFICIAL GEOLOGY COMPILATION MAP SERIES

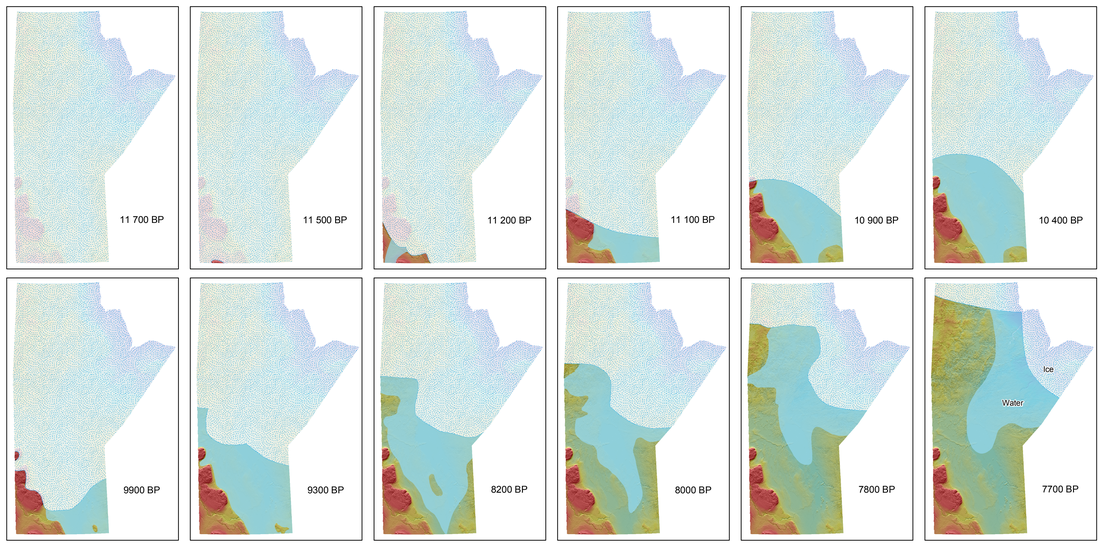
SG-NWMB

Surficial geology of northwestern Manitoba

Index map

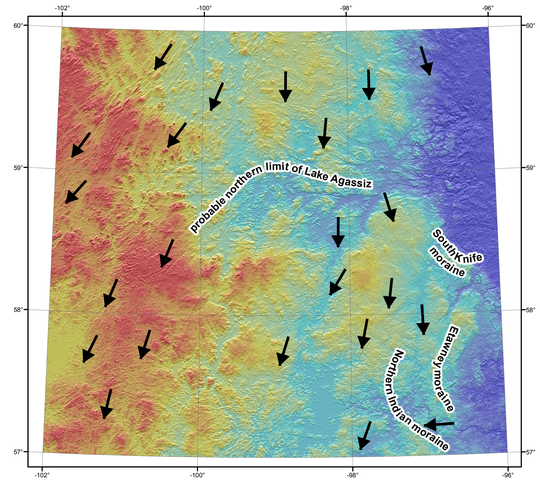


Paleogeographic reconstruction during deglaciation



Thorleifson, L.H. 1996: Review of Lake Agassiz history; *in* Sedimentology, Geomorphology and History of the Central Lake Agassiz Basin; Geological Association of Canada–Mineralogical Association of Canada, Joint Annual Meeting, Winnipeg, Manitoba, May 27-29, 1996, Field Trip Guidebook B2, p. 56-79.

Major landforms and glacial ice flow



Note: Bedrock for entire map extent is of Precambrian age.

This map is available to download free of charge at www.gov.mb.ca/minerals

North American Datum 1983
Universal Transverse Mercator Projection
Zone 14

The approximate mean magnetic declination for the centre of the map is 4° 48' E (2006) decreasing 13.9' annually