Natural Resources Canada — Ressources naturelles Canada

# MARGINAL NOTES

## INTRODUCTION

This 1:250 000 compilation map is one of a series assembled as part of the Western Superior NATMAP project (Figure 1). It synthesizes new mapping, geochronological and geochemical information acquired during the course of the project with existing reconnaissance and detailed sources (Figure 2). An alphanumeric code is used to identify units and provide information on their age, tectonic affinity and assemblage name. Colour is used to group the many rock units into eight basic subdivisions and to identify broad age groupings (*see Figure 3 colour chart of age and rock subdivisions*). Generally, darker colours represent older rock units. Ages are based on U-Pb zircon dates at spot localities, extrapolated through lithological or geochemical means. The tectonic affinity of a supracrustal assemblage or plutonic rock suite is assigned on the basis of its lithological character, whole-rock geochemical classification, geophysical characteristics, and where available, neodymium (Nd) isotopic signature. Supracrustal assemblages are defined principally by their rock types, depositional ages, and geochemical and geophysical characteristics, following the approach outlined in Geology of Ontario (Williams et al., 1992; Ontario Geological Survey 1992a,b). Plutonic suites are the equivalent of supracrustal assemblages in this hierarchy, with designations based on mineralogy (e.g., biotite, hornblende or muscovite-bearing suites), composition (e.g., sanukitoid suite), or structure (e.g., gneissic suite) (Stone, 1998a).

Locations of samples used for magmatic or detrital U-Pb zircon dating and for Nd isotopic analysis are shown on the map and listed in Tables 1 and 2, respectively. This map incorporates interpretation of the magmatic and depositional ages of many different rock types based on this small suite of samples. Consequently, the ages assigned to large areas of the map have been inferred from along-strike lithological correlation, similarity to dated plutons, or cross-cutting relationships between various rock types. Where there is a high level of confidence about the age, a small age range has been assigned to the rock unit, whereas with greater uncertainty, the assigned age range is broader. As well as indicating the confidence level, the width of the age range also serves to identify units and areas where the state of knowledge is less constrained.

Tectonic affinities assigned to individual supracrustal assemblages and plutonic suites (see abbreviated tectonic affinity criteria listed in the legend) are summarized in Figure 4. This map portrays the environment of crystallization for magmatic rocks and deposition for sedimentary rocks based on lithologic character, whole-rock geochemical classification, geophysical characteristics and, where available, neodymium (Nd) isotopic signature.

## REGIONAL GEOLOGY

The West Uchi map area is composed from south to north of three east-trending tectonic domains: English River, Uchi and North Caribou (Figure 5). The English River subprovince comprises highly metamorphosed and migmatized Neoarchean clastic sedimentary rocks intruded by a diverse suite of intermediate to felsic plutons. Weakly metamorphosed equivalents of these metasedimentary rocks overlie Neoarchean volcanic rocks of the adjacent Uchi subprovince.

The Uchi subprovince includes several strands of Mesoarchean and Neoarchean volcanic rocks that comprise the Rice Lake greenstone belt, in Manitoba, and the Red Lake, Bee Lake and Pickle Lake greenstone belts, in Ontario. Mesoarchean volcanic rocks in the Rice Lake belt include mainly komatiites and komatiitic basalts whereas the Neoarchean volcanic rocks are lithologically more diverse and include both tholeiitic and calc-alkaline volcanic rocks.

The granitoid-dominated North Caribou terrane includes an older Mesoarchean suite and a younger (ca. 2.73 Ga) Neoarchean suite. The Mesoarchean rocks comprise a ca. 3.0 Ga granitoid basement complex unconformably overlain by a >2.92 Ga platform/rift succession of quartzite, carbonate, iron formation and komatiite. In Manitoba, the platform/rift succession has been documented along the southern flank of the North Caribou terrane at Wallace Lake, Wanipigow Lake and on the east shore of Lake Winnipeg. The over 850 km long and 350 km wide North Caribou terrane is interpreted to be a Mesoarchean nucleus around which younger assemblages were accreted at ca 2.7 Ga during the Kenoran orogeny.

Three Neoarchean regional deformation events are recognized throughout most of the West Uchi map area. The first regionally widespread event, $D_1$, is thought to have accompanied juxtaposition of the North Caribou terrane and Uchi subprovince (Percival et al., 2001). On the east shore of Lake Winnipeg this event is most prominently recorded in a ca. 2.715 Ga north northwest trending transpressive $D_1$ deformation zone along the contact between these two domains. The ca. 2.70 Ga Kenoran orogeny is largely manifest by [illegible]

### *Calc-alkaline sequence (Drumming Point)*

A 350-1100 m unit of aphyric to plagioclase-phyric, pillowed to massive basaltic andesite and andesite flows (Mbi32ca) with rare amygdules, radial pipe vesicles and synvolcanic dykes overlies the tholeiitic Gray Point volcaniclastic rocks. Most of the flows are pillowed with only rare massive types. Pillowed flows on small islands east of Black Island are commonly strongly foliated, and many of the flows have been tectonized, with lensoid lithons in which strongly flattened pillows are preserved.

Quartz diorite to gabbro sills within the northern part of this sequence have similar geochemical features to the volcanic rocks. A U-Pb zircon age of 2715 Ma from a quartz diorite (Table 1, No. 1; Krogh et al., 1974) is interpreted as a good approximation of the age of calc-alkaline volcanism. The sequence is capped by up to 1000 m of feldspathic wacke and associated siltstone, chert, and mafic mudstone (Mbi32sv). A sample of feldspathic wacke collected for detrital zircon studies contained no zircon.

Basaltic andesite and andesite of the Drumming Point sequence fall in the arc field on Th-Zr-Nb plots (Bailes and Percival, 2000a) and display Hf/Th ratios < 3 (1.3 and 2.4) indicative of calc-alkalic affinity (Wood, 1980). On multi-element plots, they display negative Nb anomalies relative to Th, La and Ce, a feature typical of modern subduction-related and crustally contaminated volcanic rocks.

### Gem and Bee assemblages (ca. 2.72 Ga)

The Gem and Bee assemblages occur southeast of the Wadhope - Stormy Lake area. Their relationship to the rocks of the Bidou assemblage is only weakly established. They were originally postulated to be younger than the Bidou assemblage based on structural evidence (Weber, 1971) and a U-Pb age of 2722 Ma (Table 1, No. 40, W.D. Davis, unpublished, 1994) for a proximal vent facies rhyolite supports this interpretation as does a U-Pb age of 2718 (Table 1, No. 41) on felsic rocks of the Anderson formation in the Bee assemblage (Rogers, 2001). These ages show that at least parts of the Gem and Bee assemblages are approximately 10 million years younger than the ca. 2.73 Ga felsic volcanic rocks of the Bidou assemblage. They are similar in age and geochemical character to the Black Island assemblage on the eastern shore of Lake Winnipeg. Although they have been correlated in the past with 2745-2735 Ma volcanic rocks of the Confederation assemblage, they differ significantly in age and geochemical attributes.

## NEOARCHEAN SEDIMENTARY ASSEMBLAGES

Neoarchean sedimentary assemblages in the West Uchi map area include both marine and fluvial-alluvial sedimentary sequences and their more highly metamorphosed equivalents. The latter dominate the English River and Manigotagan assemblages of the English River subprovince. Similar, but less metamorphosed sedimentary rocks occur conformably and unconformably above volcanic rocks of the Uchi subprovince (Edmunds, Hole River, Siderock, San Antonio). Detrital zircon populations in these sedimentary and metasedimentary assemblages indicate that they were deposited between 2715 and 2703 Ma, at approximately the time of Kenoran orogenic activity, which has been interpreted to be responsible for tectonic amalgamation of the North Caribou, Uchi and English River subprovinces of the West Uchi map area. Some of the sedimentary rocks along the Uchi-North Caribou boundary are located in fault lozenges along this contact and have locally been demonstrated to be synchronous with deformation and to overlap the domain boundary and adjacent units (Percival et al., 2002)

### Edmunds assemblage (< 2704 Ma)

The Edmunds assemblage (Fed31md,wk,sm,co) consists of thin-bedded turbidites composed of greywacke, siltstone, mudstone and minor conglomerate. Unlike similar rocks in the Bidou assemblage, the Edmunds assemblage contains abundant detrital quartz (Campbell, 1971). With the exception of local dioritic, possibly lamprophyric, dykes and sills, no plutonic rocks cut the assemblage. Campbell suggested that these sediments could be less highly metamorphosed equivalents of paragneisses of the Manigotagan and English River assemblages and that they may be separated from the Bidou assemblage by a major fault and not be part of a structurally intact section. The thickness of the Edmunds assemblage rocks is unknown. They grade from greenschist facies in the north to middle almandine amphibolite facies in the south.

Unpublished U-Pb geochronological studies of detrital zircons collected from the Edmunds assemblage south of the Manigotagan River (Table 1, No. 34) and in the vicinity of Gem Lake (Table 1, No. 35) indicate the presence of at least three populations of zircon [illegible]

## REFERENCES

[illegible]

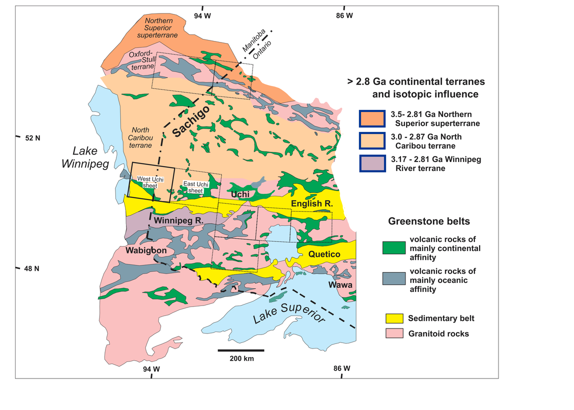


Figure 1. Tectonic map of the Superior Province showing locations of 1:250 000 scale NATMAP sheets.

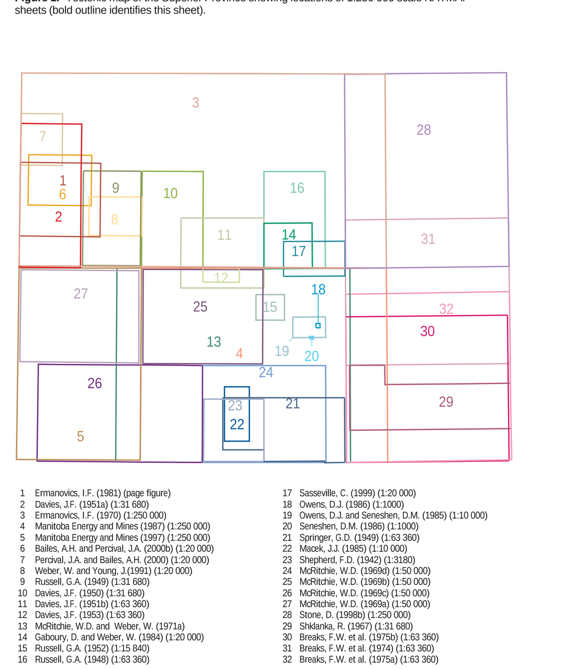


Figure 2. Sources used in the compilation, keyed to reference list.

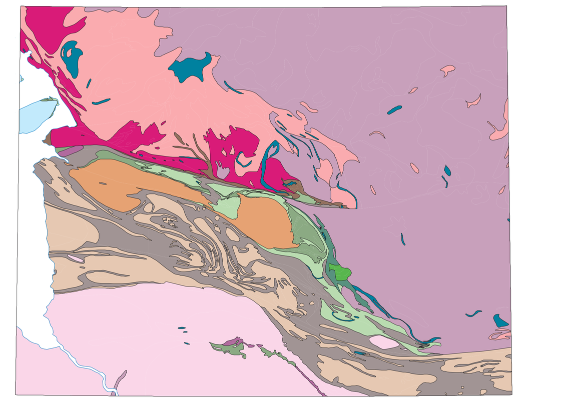


Figure 4. Tectonic affinities assigned to volcanic and sedimentary assemblages and plutonic suites.

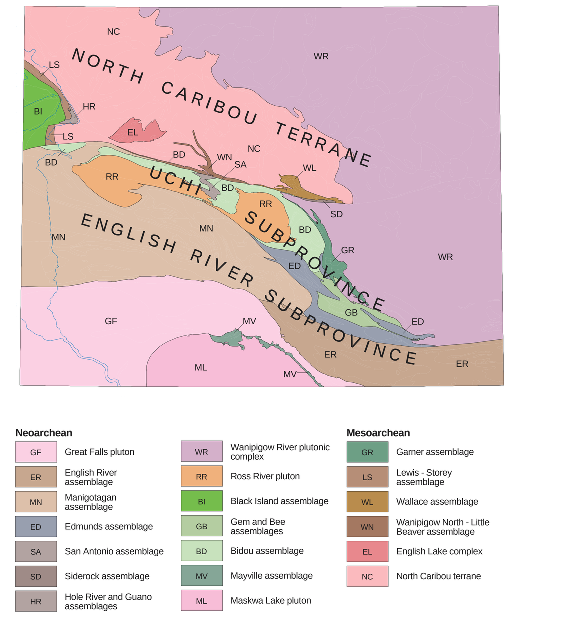


Figure 5. Major litho-tectonic elements of the West Uchi map area.

Table 1. U-Pb age data for volcanic, sedimentary and plutonic units of the West Uchi area.

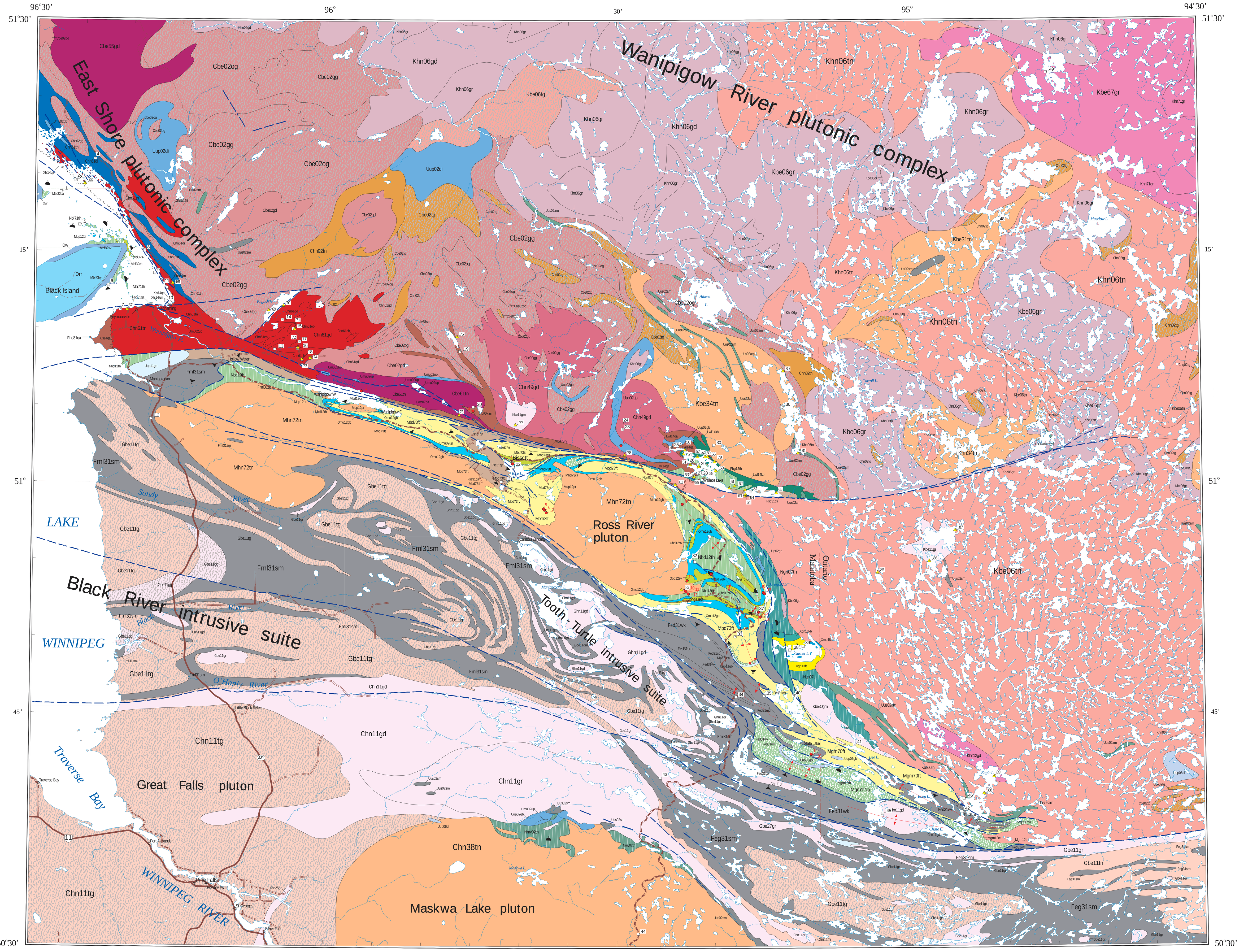
[illegible]

Table 2. Sm-Nd isotopic data.

[illegible]

MGS — Ontario — GEOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA

**NATMAP**
**CARTNAT**
Canada's National Geoscience Mapping Program
Le Programme national de cartographie géoscientifique du Canada





WESTERN SUPERIOR NATMAP COMPILATION SERIES

MGS OPEN FILE REPORT OF2003-1
OGS PRELIMINARY MAP P.3461
GSC OPEN FILE 1522

GEOLOGY AND TECTONOSTRATIGRAPHIC ASSEMBLAGES

# WEST UCHI MAP AREA

MANITOBA / ONTARIO

Scale 1:250 000 / Echelle 1/250 000

Kilometres 5 0 5 10 15 20 Kilometres

Universal Transverse Mercator Projection
North American Datum 1983
© Her Majesty the Queen in Right of Canada 2003

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983
© Sa majesté la Reine du chef du Canada 2003

*This map was produced by the Manitoba Geological Survey, 2003. Any errors, omissions or additional geological information would be welcomed by the survey.*

*Digital base map from data compiled by Geomatics Canada.*

*Mean magnetic declination 2003, 2° 54' E, decreasing 5.7' annually. Readings vary from 4° 1' in the SW corner to 1° 46' in the NE corner of the map.*

## LEGEND

ORDOVICIAN

ARCHEAN (UNSUBDIVIDED)

[illegible]

## SYMBOLS

Pattern denotes [illegible]
Geological contact
Unconformity
Antiform
Synform
Fault
Shear Zone
Stratigraphic [illegible]
Startigraphic [illegible]
1 U- Pb geochronology
51 Nd- Sm isotope
3 Past gold producer

## PAST GOLD PRODUCERS

[illegible]

## EXPLANATION OF LEGEND CODE

[illegible]

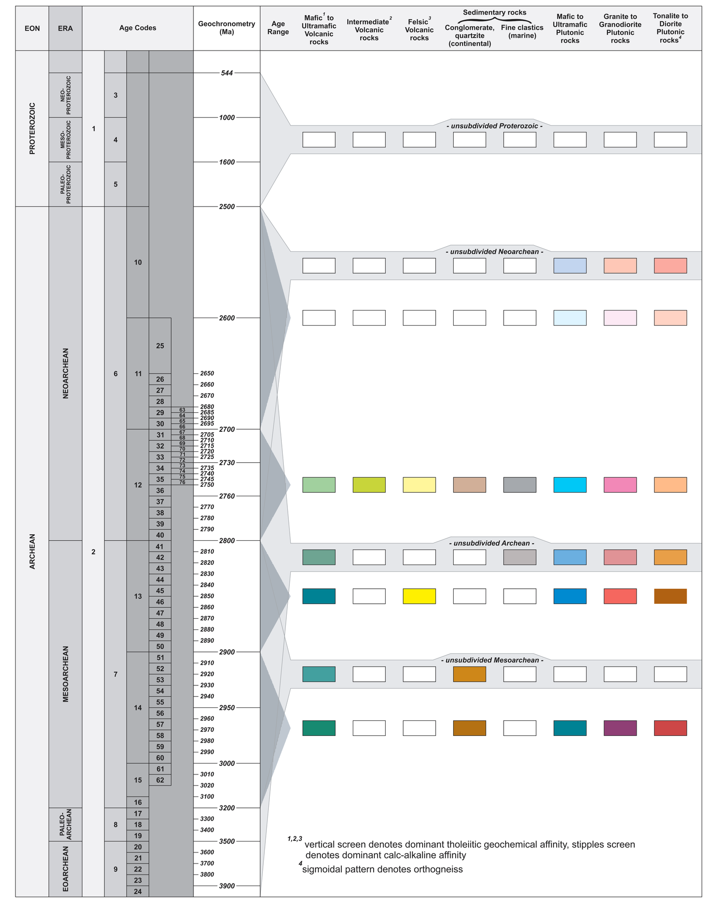


Figure 3. Colour chart of age and rock subdivisions.

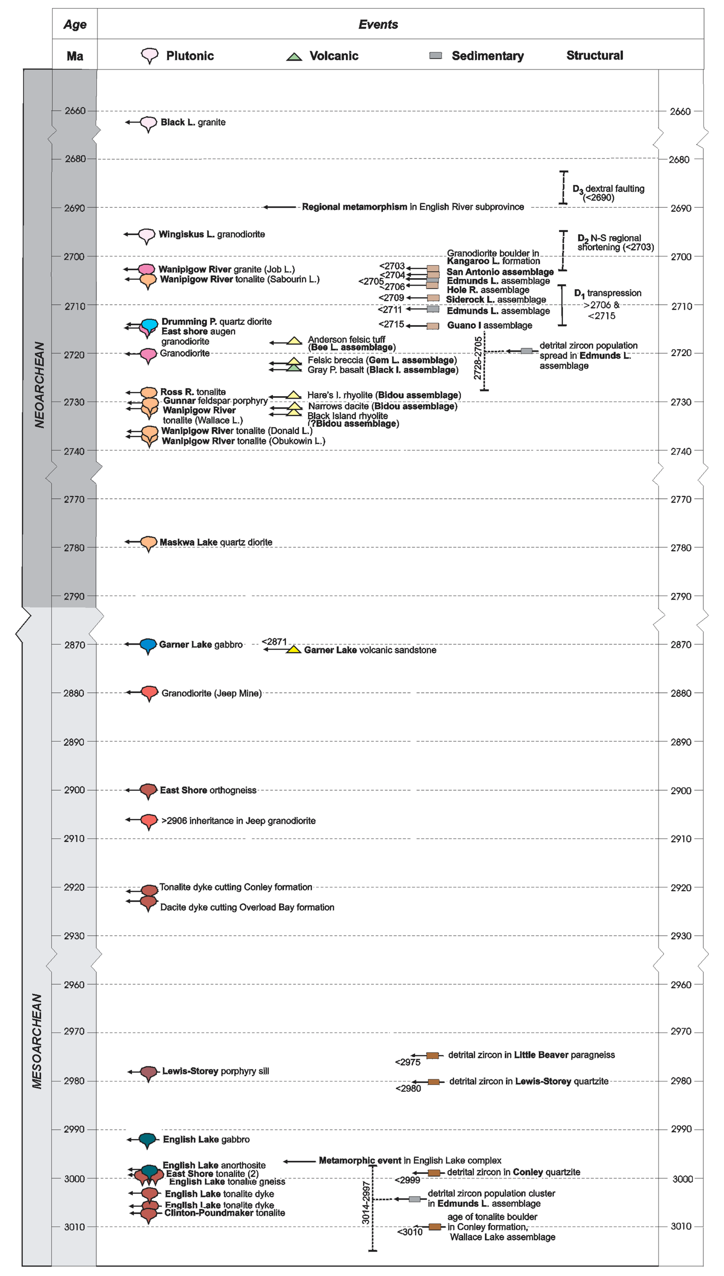


Table 3. Geochonological summary illustrating the age of major depositional, intrusive and deformational events.

Manitoba Geological Survey

OPEN FILE OF2003-1

OPEN FILE
DOSSIER PUBLIC
1522
GEOLOGICAL SURVEY OF CANADA
COMMISSION GEOLOGIQUE DU CANADA
2003

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2003: Geology and tectonostratigraphic assemblages, West Uchi map area, Manitoba and Ontario; Manitoba Geological Survey, Open File OF2003-1; Geological Survey of Canada, Open File 1522, Ontario Geological Survey, Preliminary Map P.3461, 1:250 000 scale with marginal notes.

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