Uranium

Manitoba is home to world-class deposits and high mineral potential in extensive underexplored terrains.
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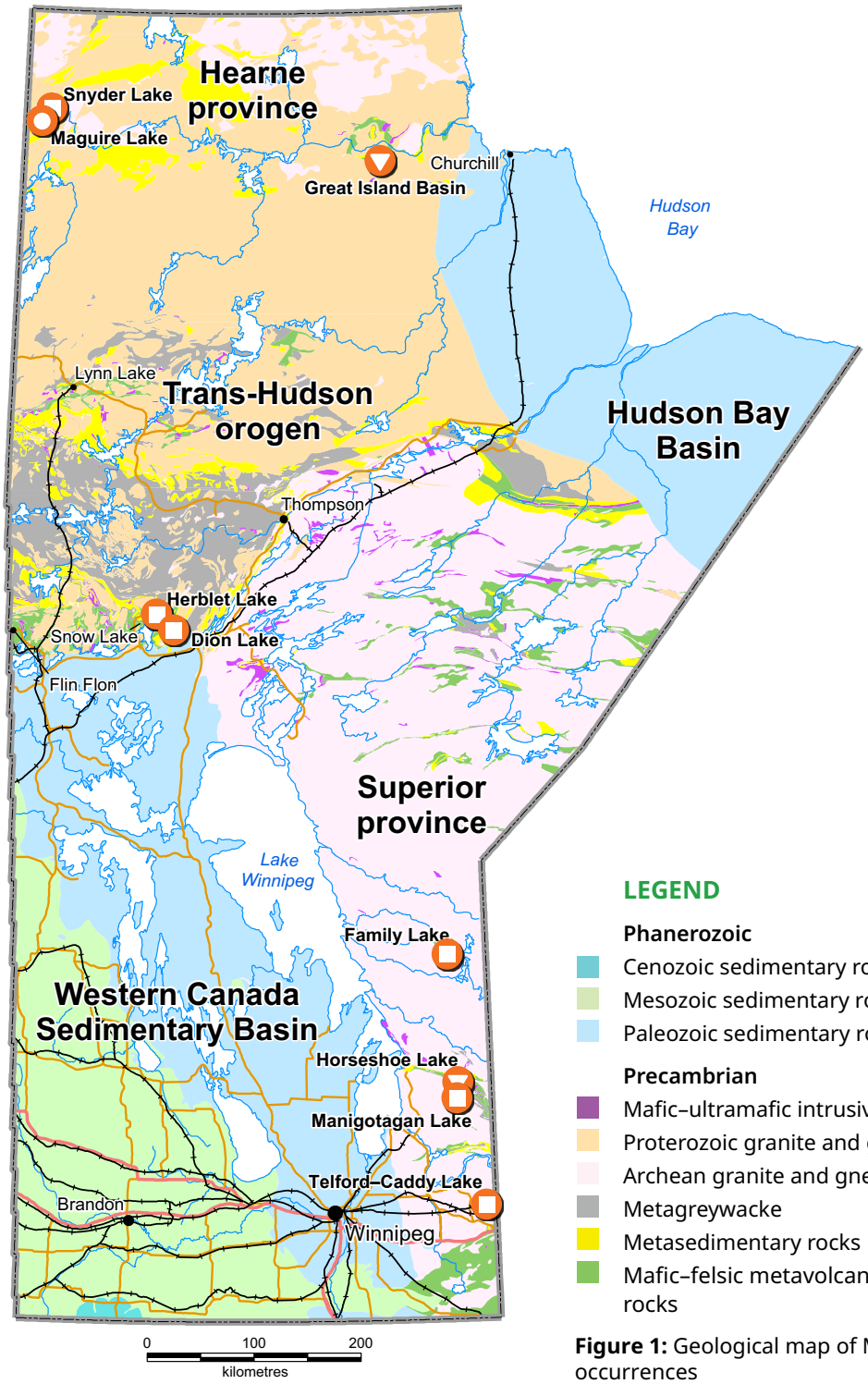
Manitoba

URANIUM is used as fuel to generate electricity in nuclear power plants and is also used in medical and military applications; in its depleted form, it is used in applications requiring materials of high density and hardness. Because of its unique chemical properties, economic deposits of uranium were formed in a broad spectrum of geodynamic settings through geological time, in part controlled by changes in the oxygen content of the atmosphere.

IN MANITOBA, rocks ranging in age from Archean to Paleoproterozoic have potential to host a number of different types of uranium deposits related to sedimentary, diagenetic-hydrothermal, metamorphic and magmatic processes – examples are highlighted in this brochure.

The **MANITOBA GEOLOGICAL SURVEY** is committed through thematic geoscience studies and mapping at the district scale to improve the understanding of uranium metallogeny in the province.



Basement-hosted Unconformity-related Deposits

All uranium production in Canada presently occurs from high-grade deposits in the Athabasca Basin of Saskatchewan. Deposits are hosted in the local basement or by sedimentary rocks of the Athabasca Group just above the basal unconformity. Major deposits occur along regional structural trends in the basement and high-grade mineralization has been discovered as much as 800 m beneath the unconformity. Research suggests that the Athabasca Basin was buried to depths of 5–7 km during peak diagenesis and subsequent uranium precipitation, implying that it once covered a much larger area. Hence, potential for high-grade, basement-hosted uranium deposits may extend well beyond the present limits of the basin. In northwestern Manitoba, reactivated structures along the highly prospective boundary between the Wollaston and Mudjatik domains represent key exploration targets. Work at Maguire Lake in Manitoba corroborates this model, with outcrop and boulder grab samples having uranium grades up to 9.5% and 65% U_3O_8, respectively. Such high uranium grades are only known to occur in unconformity-related deposits.

LEGEND

Phanerozoic
- Cenozoic sedimentary rocks
- Mesozoic sedimentary rocks
- Paleozoic sedimentary rocks

Precambrian
- Mafic–ultramafic intrusive rocks
- Proterozoic granite and gneiss
- Archean granite and gneiss
- Metagreywacke
- Metasedimentary rocks
- Mafic–felsic metavolcanic rocks

URANIUM OCCURRENCES
- Unconformity-related
- Paleoplacer
- Leucogranite/pegmatite

Figure 1: Geological map of Manitoba showing locations of uranium occurrences

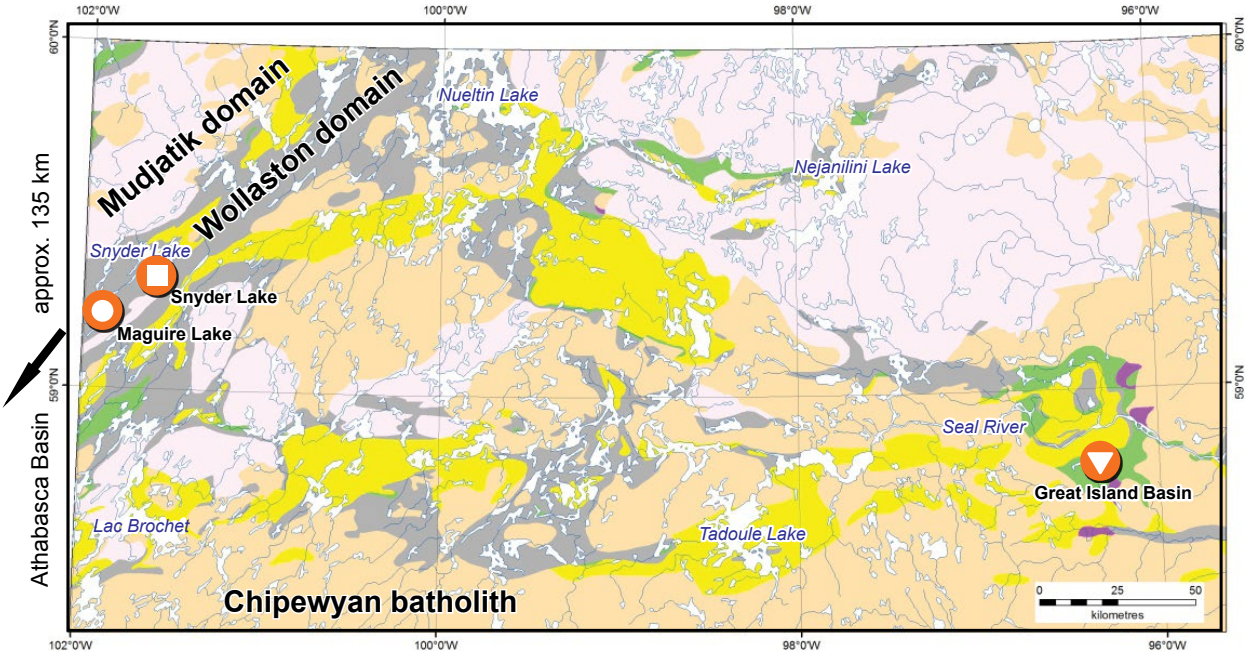


Figure 2: Geological map of the Wollaston–Mudjatik extension into northwestern Manitoba

Paleoplacer Deposits

Uranium- and gold-bearing quartz-pebble conglomerates such as those of the Huronian Supergroup in the Blind River–Elliot Lake district, Ontario and the Witwatersrand Basin, South Africa make up approximately six per cent of the world's known uranium resources. The typical grades of these deposits are low (<0.15% U_3O_8), but they are often of large tonnage and contain significant gold as byproduct. Detrital grains of uraninite and gold were concentrated in alluvial fans and braided streams by sedimentary processes prior to the rise of atmospheric oxygen. In Manitoba, both the Hearne and Superior provinces may potentially host this deposit type. Occurrences of this type are found in the Great Island area of the Hearne province and in the Rice Lake area of the Superior province, where uranium and gold occur in quartz-pebble conglomerates that unconformably overlie Archean volcanic rocks.

Igneous Deposits

Uranium preferentially enters and remains in the melt phase during partial melting and magmatic differentiation, resulting in its accumulation in a variety of late fractionated magmas. Of particular interest are granitic rocks formed by melting of uranium-rich crustal sediments: such melts produced the uraniferous granitoid pluton that hosts the world-class Rössing deposit in Namibia, Africa. In Manitoba, extensive thermotectonism during the Archean and Paleoproterozoic resulted in varying degrees of partial melting and local pegmatite emplacement. Examples of uraniferous pegmatite and leucogranite are found at Snyder Lake in the Wollaston domain, Dion and Herblet lakes in the Flin Flon domain, in the Telford–Caddy Lake area of the Winnipeg River domain and at Manigotagan Lake in the English River domain.

Figure 3: Uranium- and gold-bearing quartz-pebble conglomerate from the Great Island Basin

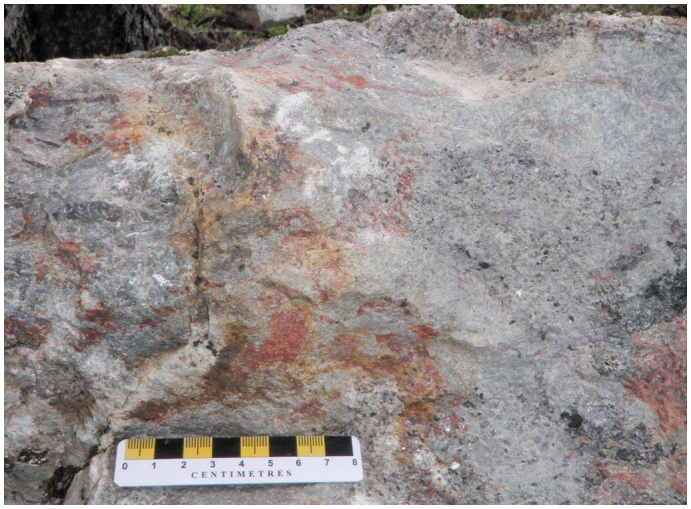


Figure 4: Uraninite-bearing pegmatite from 'Pitchblende ridge' near Snyder Lake, northwestern Manitoba

Figure 5: Examples of structurally controlled clay alteration and iron oxide staining in outcrops near Snyder Lake, northwestern Manitoba

Mining, Oil and Gas Industry Overview

- $3.4 billion in estimated value of production, a 45% increase since 2021
- $1.7 billion in real value added, accounting for approximately 2.6 per cent of the province's real GDP and 4.3 per cent of all domestic merchandise exports
- Direct employment of approximately 3480 people, with an additional 2035 individuals employed by sector support activities
- 2023 estimated mineral exploration and deposit appraisal spending intentions at $163.8 million
- 225 new wells drilled in 2022

Source: Natural Resources Canada

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