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

Learn more at www.manitoba.ca/minerals
URANIUM is used as fuel to generate electricity in nuclear power plants and is also used in medical and military applications. 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. New 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 northwest Manitoba, reactivated structures along the highly prospective boundary between the Wollaston and Mudjatik domains represent key exploration targets. Recent work at Maguire Lake in Manitoba corroborates this model, with outcrop and boulder grab samples having uranium grades up to 9.5% and 65% U₃O₈, 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**
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, northwest 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 6% of the world’s known uranium resource. The typical grades of these deposits are low (<0.15% U₃O₈), but they are often of large tonnage and contain significant gold as by-product. 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.

Exploration projects:
- Palisade Global Investments Ltd./CanAlaska Uranium Ltd.: Wollaston domain (unconformity-related)
- East Resource Inc.: Wollaston domain (unconformity-related)
Manitoba Sector Profile – Mining and Petroleum (2017)

- Largest primary resource industry of Manitoba's economy
- $2.5 billion in total value of production (preliminary estimate), up 17% from previous year
- Accounts for approximately 3.3% of the province's nominal GDP (basic prices) and 2.5% of international exports of goods
- Direct employment of approximately 6,200 people
- Estimated $537.5 million in capital expenditures on development
- 2018 exploration expenditures forecast of $54.7 million, up 42% from 2017
- 240 new wells drilled in 2017, up 196% from previous year

Contact Information
Manitoba Growth, Enterprise and Trade, Resource Development Division
360-1395 Ellice Avenue, Winnipeg, Manitoba, R3G 3P2
Phone: 204-945-1119; toll free 1-800-223-5215
Email: minesinfo@gov.mb.ca