

Ni-Cu-PGEs

Nickel-Copper-PGE Mineralization, Exploration and Mining in Ontario

Nickel is an important metal used in the manufacture of high-strength alloys, aerospace components, the chemical and food processing industries, and construction. It is the most important mineral commodity in Ontario, in terms of the value of annual production. Nickel production in 2010 totalled 50,700,573 kilograms valued at nearly \$1.142 billion, an increase of 15% in production and 52% in value from 2009. Total historic nickel production from Ontario is valued at more than \$117 billion (in 2005\$).

In addition, 7,206,105 grams of platinum group elements (PGE) valued at approximately \$190 million were recovered as by-products from nickel-copper mining operations in the Sudbury area and from primary PGE mining at the Lac des Iles Mine near Thunder Bay, which resumed production in the second quarter of 2010. Total historic PGE production in Ontario is valued at nearly \$20 billion (in 2005\$).

The last several years have seen an increasing demand for nickel in the Asian markets, with a 20 per cent annual growth rate until the global slowdown in late 2008. This expansion led to record commodity prices; doubling of exploration expenditures in the search for base metals, development of new concepts to guide exploration; the discovery of a new mining camp at McFauld's Lake in the James Bay Lowlands; discoveries in the historic Sudbury mining camp and the development of previously uneconomic nickel deposits. The price of nickel has more than doubled since its low point in late 2008.

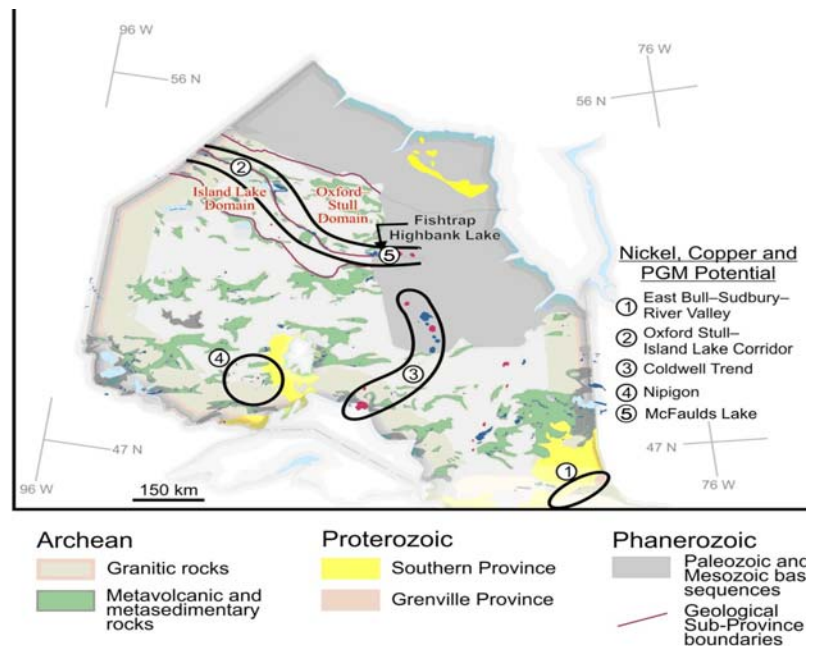
Nickel ores are commonly associated with copper and/or cobalt. By-products also include gold, silver, platinum group elements, and sulphur products. Nickel-copper-PGE deposits types are invariably associated with mafic intrusive or mafic volcanic rocks. A simplified classification based on information from Eckstrand, 1984 and Naldrett, 1981, is as follows:

Layered mafic intrusives	1a. Layered mafic intrusive [Ni-Cu] (e.g. Sudbury – producing mines)
	1b. Layered mafic intrusive [PGE] (e.g. Lac des Iles – producing mine)
	1.c. Altered mafic intrusive [Ni-Cu] (e.g. Timmins – Montcalm deposit)
Mafic volcanic (komatiitic)	2. Extrusive-hosted [Ni-Cu] (e.g. Timmins - Redstone Mine)

Areas in northern Ontario with exploration potential for copper-nickel and platinum group elements are highlighted on the map at the right.

The names and locations of the companies that produce these commodities in Ontario and the locations of their operations are indicated on the map on the back of this page.

In addition, there is potential for economic deposits of copper-nickel and PGEs in the Grenville Province in south-eastern Ontario, where current exploration activity in the area is focused on differentiated mafic intrusive units known to host historical nickel and copper sulphide showings.



Ontario Nickel, Copper, PGE Mines

Xstrata plc

1. Fraser
2. Nickel Rim South

Quadra FNX Mining Ltd.

3. Podolsky
4. McCreedy West

Vale

5. Copper Cliff North
6. Copper Cliff South
7. Creighton
8. Garson
9. McCreedy East/Coleman
10. Stobie

Liberty Mines Inc.

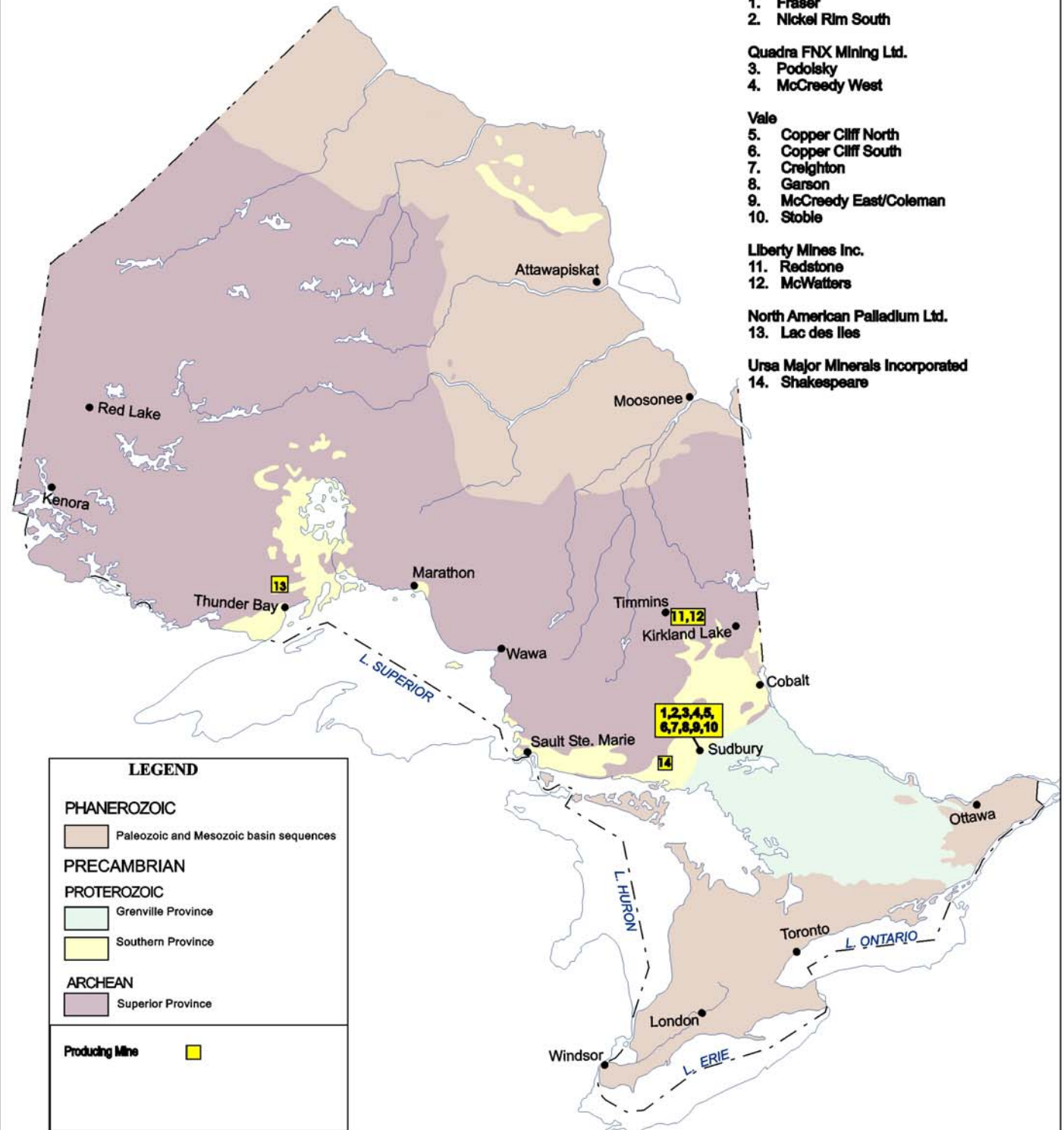
11. Redstone
12. McWatters

North American Palladium Ltd.

13. Lac des Iles

Ursa Major Minerals Incorporated

14. Shakespeare



LEGEND

- PHANEROZOIC**
 Paleozoic and Mesozoic basin sequences
- PRECAMBRIAN**
- PROTEROZOIC**
 Grenville Province
 Southern Province
- ARCHEAN**
 Superior Province
- Producing Mine**