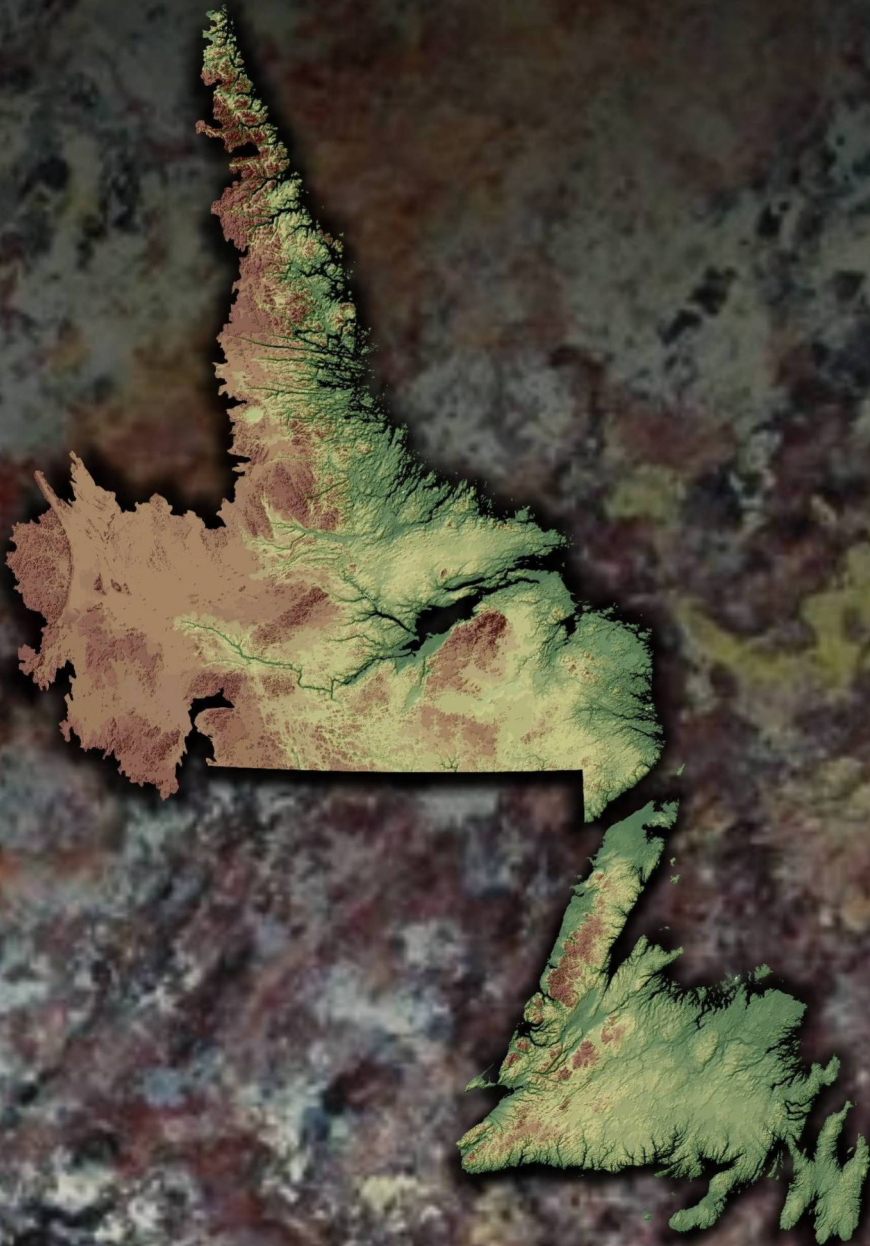


MINERAL COMMODITIES OF  
NEWFOUNDLAND AND LABRADOR

# URANIUM



# Mineral Commodities of Newfoundland and Labrador

# Uranium

## Foreword

This is the fifth in a series of summary publications covering the principal mineral commodities of the Province. Their purpose is to act as a source of initial information for explorationists and to provide a bridge to the detailed repository of information that is contained in the maps and reports of the provincial and federal geological surveys, as well as in numerous exploration-assessment reports. The information contained in this series is accessible via the internet at the Geological Survey of Newfoundland and Labrador website: <http://www.nr.gov.nl.ca/mines&en/geosurvey/>

## Publications in the Series

Zinc and Lead (Number 1, 2000, revised 2008)  
Nickel (Number 2, 2000, revised 2005, 2008)  
Copper (Number 3, 2000, revised 2005, 2007)

Gold (Number 4, 2005, reprinted 2008)  
Uranium (Number 5, 2009)

## Additional Sources of Information

Further information is available in the publications of the geological surveys of Newfoundland and Labrador and Canada. The Geological Survey of Newfoundland and Labrador also holds a considerable inventory of exploration-assessment files available for onsite inspection at its St. John's headquarters and for download via the Geological Survey of Newfoundland and Labrador website: <http://www.nr.gov.nl.ca/mines&en/geosurvey/>. Descriptions of individual mineral occurrences are available through the provincial Mineral Occurrence Database System (MODS), which is accessible from the Survey's website. Up-to-date overviews of mining developments and exploration activity targeting uranium are available on-line at <http://www.nr.gov.nl.ca/mines&en/>

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Compiled by A. Kerr and G.W. Sparkes, 2009

Front Cover: High-grade uranium mineralization in sheared felsic volcanic rocks at the Michelin deposit; yellow areas (top right) are secondary uranium minerals (uranophane).

## Introduction

The discovery of uranium, near Makkovik, in eastern Labrador more than fifty years ago led to intense exploration, during which time, several uranium deposits were discovered. In the late 1970s, development plans for two of these deposits faltered, due to the collapse of global uranium prices and concerns about the environmental impact from mining.

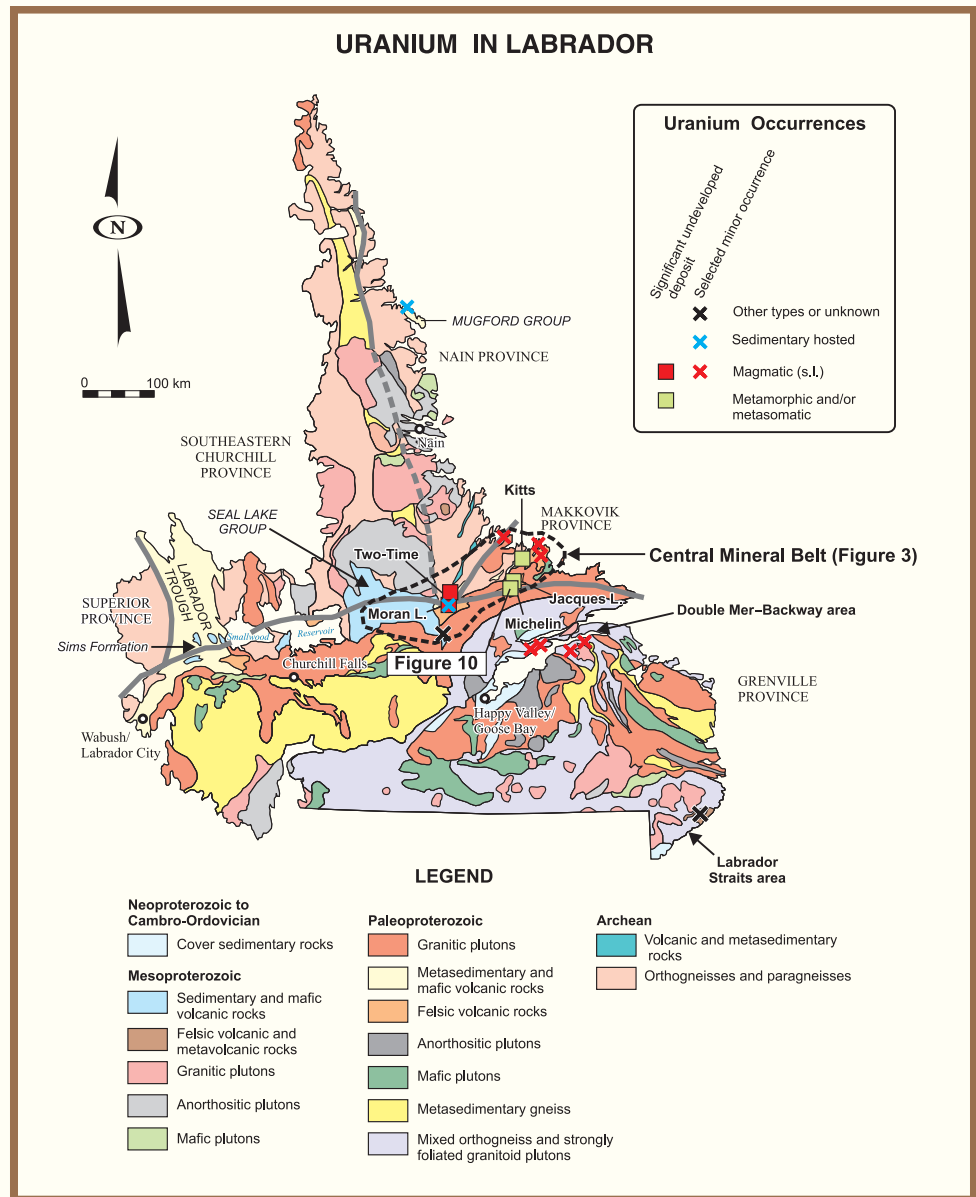
In Labrador, virtually all uranium mineralization is located within the Central Mineral Belt (CMB) dominated by Paleoproterozoic supracrustal and intrusive rocks (Figure 1). The styles of uranium mineralization are diverse, but the most significant finds are hosted within the metavolcanic and sedimentary rocks. In Newfoundland, uranium mineralization is hosted in sandstones and limestones mostly within the Carboniferous sedimentary rocks of the Deer Lake Basin (Figure 2). However, uranium occurs in several other geological environments on the Island.

Since 2005, uranium exploration has picked up, notably in the CMB, where resources at previously known deposits were revised significantly upward and new discoveries were made. The most significant upward revision is at the Michelin deposit (Figure 1), where the inventory of  $U_3O_8$  (as of 2009) is six times greater than originally estimated in the 1970s. Uranium mineralization in Labrador is diverse, and occurs as syngenetic magmatic concentrations (in pegmatites and felsic volcanic rocks), epigenetic-hydrothermal deposits (some possibly of Iron-Oxide-Copper-Gold (IOCG) affinity), shear zone-hosted deposits of possible metamorphic-metasomatic origin, and as broadly strati-

*The distribution and variety of radioactive occurrences marks the area as an uranium metallogenic province ..... A.P. Beavan (1958).*

form zones in arenaceous sedimentary rocks. To date, no clear examples of unconformity-style uranium deposits, akin to those of the Athabasca Basin (Saskatchewan), have been identified in Labrador.

In Newfoundland, where new showings were discovered in several areas and in diverse settings, uranium mineralization in the sedimentary rocks may have broad affinities to sandstone-hosted deposits of the Colorado Plateau, USA and Niger, West Africa.



**Figure 1.** Simplified geological map of Labrador, showing districts of uranium mineralization, and principal examples discussed in the text.

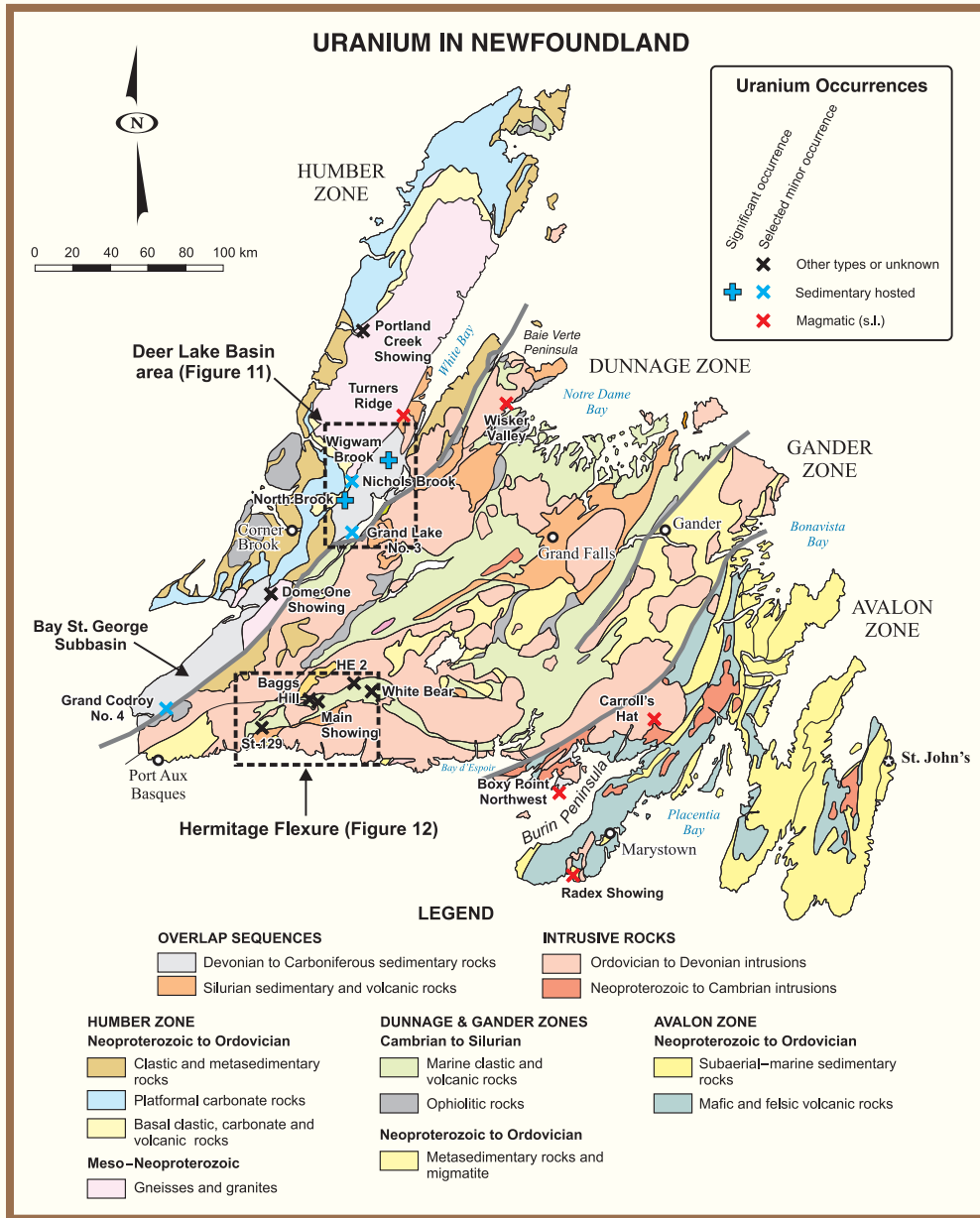


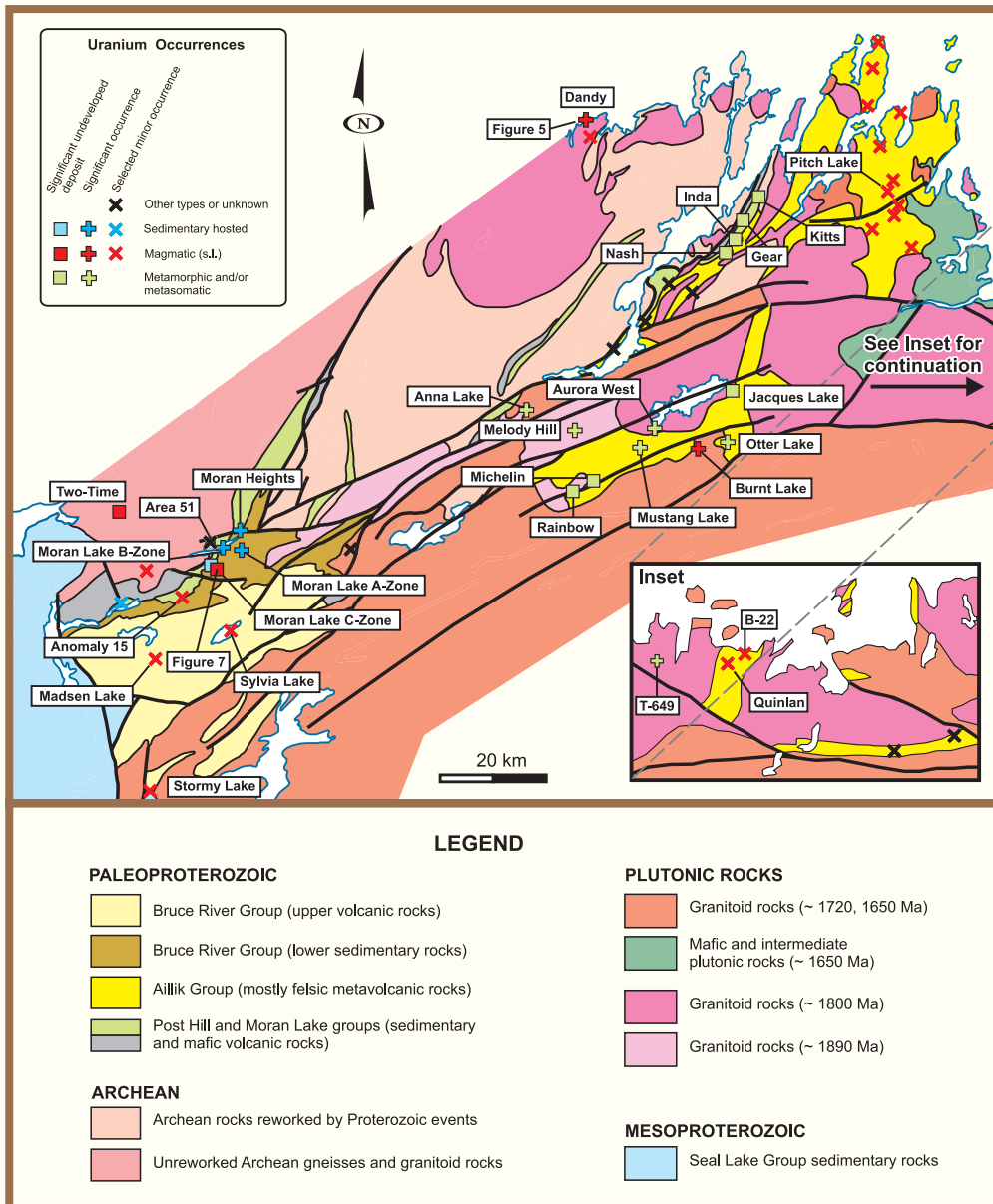
Figure 2. Simplified geological map of Newfoundland, showing districts of uranium mineralization, and principal examples discussed in the text.

### Labrador–Central Mineral Belt Uranium District

The CMB includes portions of the Archean Nain Province, the Paleoproterozoic Makkovik and Churchill provinces and the Paleoproterozoic to Mesoproterozoic Grenville Province (Figures 1 and 3). The stratigraphy and evolution of the CMB is depicted schematically in Figure 4, along with the principal settings of uranium mineralization. The oldest rocks are Archean gneisses and

granitoid rocks of the Nain Province and their reworked equivalents in the Makkovik Province. Supracrustal rocks of the Moran Lake and Post Hill groups consist of mafic volcanic and clastic sedimentary rocks deposited between 2.2 and 1.9 Ga, and are stratigraphically equivalent; the former rests unconformably upon the Archean, but the latter is strongly deformed. The 1.89 to 1.85 Ga Aillik Group is dominated by felsic volcanic and volcanoclastic rocks, but has some sedimentary rocks in its lower section. The 1.65 Ga Bruce River Group consists of a lower sedimentary sequence and an overlying felsic volcanic sequence; it rests unconformably upon the Moran Lake Group. The youngest supracrustal sequences in the CMB are the 1.33 Ga Letitia Lake Group, consisting mostly of alkaline volcanic rocks, and the 1.27 Ga Seal Lake Group, consisting of terrestrial sedimentary rocks and lesser mafic volcanic rocks and mafic sills. In addition to these supracrustal sequences, the CMB encompasses large tracts of dominantly grani-

toid intrusive rocks. These include suites of ca. 1.89, 1.8, 1.72 and 1.65 Ga ages. The main Proterozoic deformational event within the CMB is the ca. 1.8 Ga Makkovikian Orogeny, but the southern part of the area lies in the northern part of the Grenville Province, and was thus affected by ca. 1.0 Ga deformation. Also, there are earlier (pre-Makkovikian) orogenic episodes whose timing and relationships to uranium metallogeny remain poorly understood. Uranium mineralization in the CMB is dominantly epigenetic with respect to its host rocks, and the precise timing of mineralizing events remains unknown.



**Figure 3.** Simplified geological map of the Central Mineral Belt, east of the Seal Lake area, showing the principal sites of uranium mineralization.

## Mineralization of Broadly Magmatic Affinity

### Syngenetic Mineralization

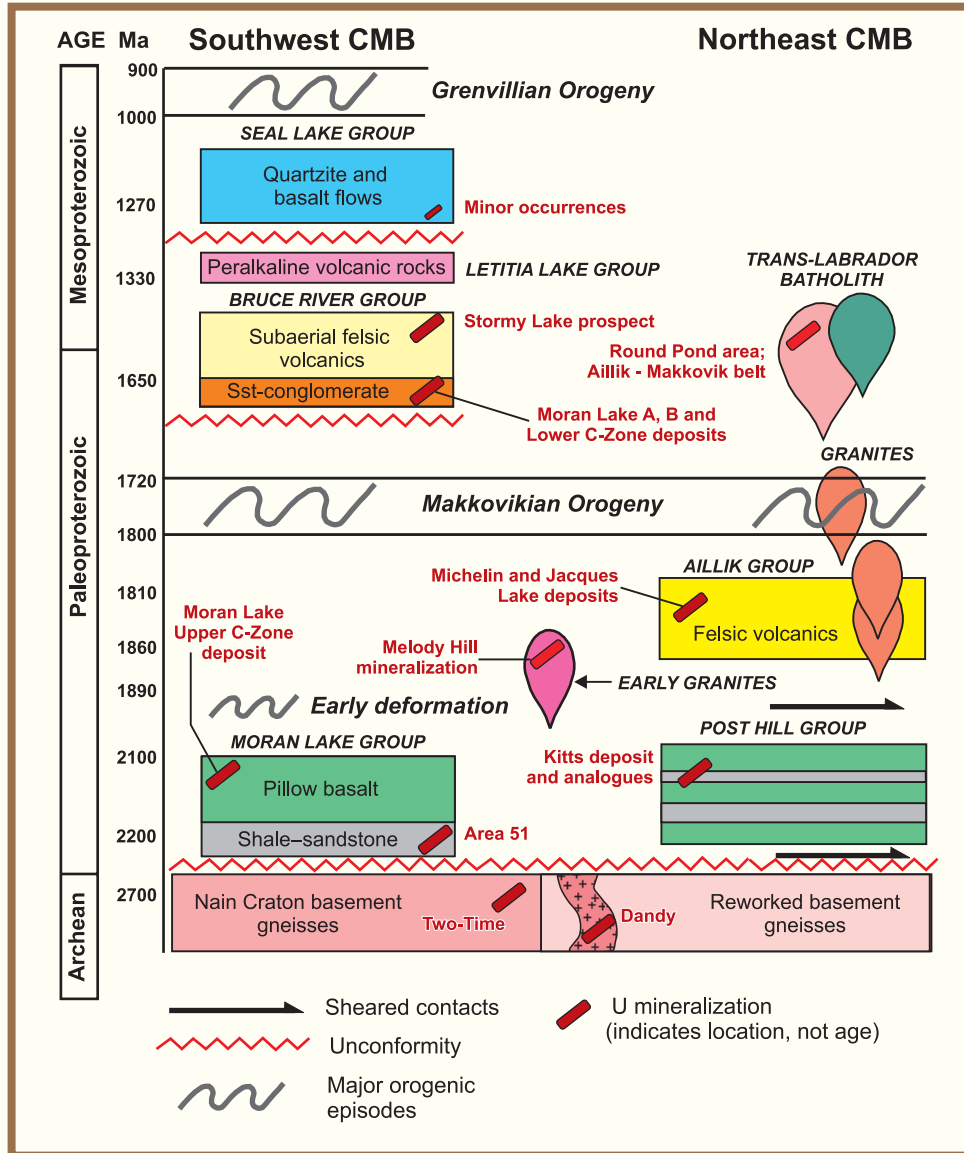
**Pegmatites and Aplites.** Uranium-enriched pegmatites and related aplites occur within the southern Nain and northern Makkovik provinces (Figure 3), mostly of limited extent. The most widespread mineralization is at the Dandy prospect, where pegmatite and

*Exploration since 2005 has led to a sixfold increase in the total uranium resource defined at the Michelin deposit; few projects worldwide can lay claim to such rapid expansion.*

leucogranite sheets, in a regional shear zone, contain up to 0.18%  $U_3O_8$ , and show widespread uranophane staining (Figure 5); the host rocks are dated at ~1.87 Ga. Some uraniumiferous pegmatites in reworked Archean basement rocks are cut by mafic dykes correlated with a ~2.23 Ga swarm, implying that they could represent some of the earliest uranium concentrations in the CMB.

### Felsic Volcanic Rocks.

Uranium mineralization of probable syngenetic (or diagenetic) origin is known in the Aillik Group, and also in the younger Bruce River Group; the clearest examples are in the latter, at the Madsen Lake and Sylvia Lake prospects, and possibly also at Stormy Lake (Figure 3). Mineralization is sporadically distributed throughout discontinuous fractures and minor shear zones within ash-flow tuffs, but also occurs in crosscutting veins in, and around, younger mafic dykes. Grab samples from the Madsen Lake prospect locally contain up to 4.6%  $U_3O_8$ , but the mineralization is low grade, and associated with fluorite and malachite. Several uranium occurrences in little-deformed areas of the Aillik Group also appear to be stratigraphically controlled, and are thought to be synvolcanic. The Burnt Lake prospect (Figure 3) is associated with chlorite-hematite alteration, F, Pb, Zn and Mo, and contains up to 0.25%  $U_3O_8$ . Other possible occurrences of this type exist in the northeastern part of the Aillik Group, associated



**Figure 4.** Schematic stratigraphic chart for the Central Mineral Belt, indicating the settings of various examples of uranium mineralization. Note that the ages implied for these are those of the host rocks, not necessarily the age of the mineralization, which may be much younger.

with Mo, Cu and F (Figure 3), but some of these may be epigenetic hydrothermal veins. Larger deposits in the Aillik Group are now viewed as shear-zone-hosted deposits of metamorphic or metasomatic origin (see page 5), but it remains possible that some of these represent deformed synvolcanic uranium deposits.

### Epigenetic Mineralization

*M*agmatic-Hydrothermal Mineralization of IOCG (?) Affinity. Uranium (± vanadium, copper) mineralization is associated with complex iron-rich breccias hosted

within the Moran Lake Group volcanic rocks in the Moran Lake C-Zone area (Figure 6). This area also contains uranium mineralization, within the younger rocks of the Bruce River Group (Figure 6). In the Upper C-Zone deposit, the most intense mineralization is associated with deep red, intensely hematized rocks, and with discrete (multistage) brecciated zones that contain intensely altered fragments in an iron-carbonate-rich matrix (Figure 7). Grades range from <0.05% to over 1% U<sub>3</sub>O<sub>8</sub> in intensely altered material. Recent exploration increased the estimates of the total resources of U<sub>3</sub>O<sub>8</sub> significantly (Table 1). Similar mineralization at the nearby Anomaly 15 prospect



**Figure 5.** Uraniferous quartz-feldspar-rich leucogranite displaying a distinctive yellow staining, Dandy prospect (see Figure 3 for location).

is overlain unconformably by unmineralized sedimentary rocks of the Bruce River Group, implying that uranium was deposited prior to 1.65 Ga. At the Two-Time Zone (Figure 3), uranium is associated with similar hydrothermal breccias and iron-rich alteration within Archean granodiorites. The mineralization is extensive (Table 1), but generally low grade (0.1%  $U_3O_8$ ).

**Hydrothermal Veins.** High-level granites in the eastern part of the CMB, south of Makkovik, are associated with vein systems containing Mo, Cu, Zn, Pb and locally Ag and Au; there are also numerous, small Mo and F showings (Figure 8). Radioactivity is associated with some of these veins. The best known example is the Pitch Lake showing, the original 1954 discovery site of uranium.

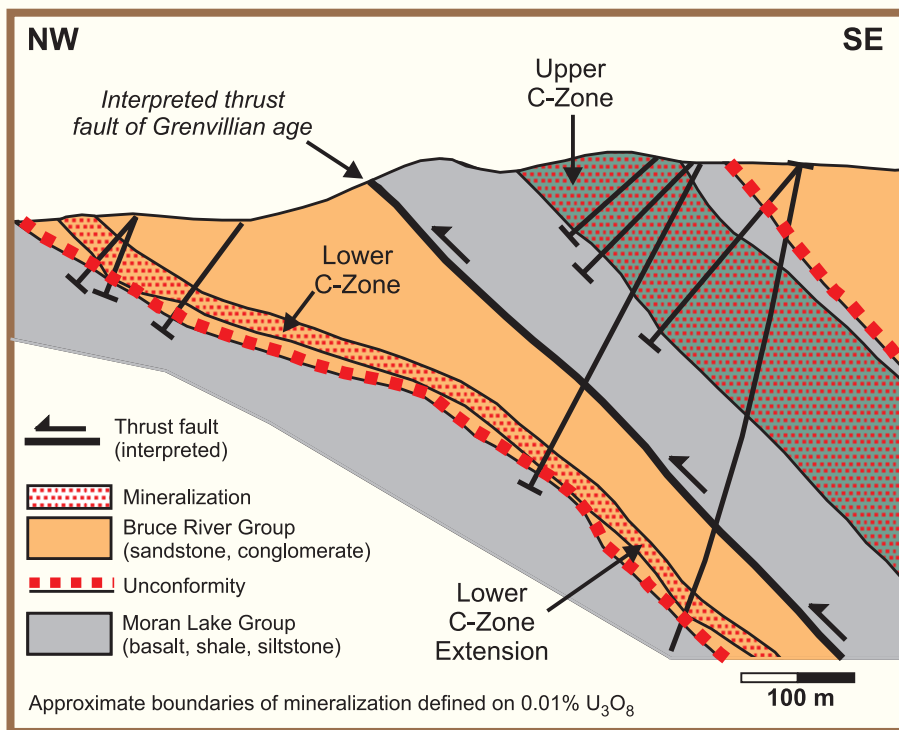
### Mineralization of Metamorphic and/or Metasomatic Affinities

This mineralization probably includes the largest and most significant uranium deposits in the CMB, *i.e.*, Michelin, Jacques Lake and Kitts (Figures 1 and 3). Previous models considered these to be either syngenetic volcanic-hosted deposits subjected to intense deformation (*e.g.*, Michelin) or syngenetic to epigenetic concentrations in pelitic metasedimentary rocks (*e.g.*, Kitts). A relationship to regional shear zones was first suggested in the 1970s,

and the importance of such structures as metallogenic controls is now increasingly recognized. There is a spatial relationship between mineralization and shear zones, and these deposits may have affinities to so-called albitite (metasomatite) deposits that are best known in the Baltic Shield. The temporal relationships between mineralization and deformation remain unclear, and these deposits remain difficult to place in the context of wider classifications of uranium deposits.

#### *Mineralization in Strongly Deformed Felsic Metavolcanic Rocks.*

This mineralization includes the Michelin and the nearby Jacques Lake deposits, and several smaller prospects in the southwest part of the Aillik Group (Figure 3). Several of these deposits are localized in a curvilinear zone of intense deformation, termed the "Aurora Corridor". The Michelin deposit comprises several *en echelon*, concordant min-



**Figure 6.** Schematic cross-section of the area around the Moran Lake uranium deposits, illustrating the stratigraphic and structural settings of the Upper and Lower C-Zone deposits. Derived, in part, from the Crosshair Exploration and Mining website, 2007.

**Table 1. Uranium resources in Newfoundland and Labrador**

Deposit	Tonnage (millions of tonnes)	Grade (% U <sub>3</sub> O <sub>8</sub> )	Cutoff (% U <sub>3</sub> O <sub>8</sub> )	Contained resource (millions of Kg of U <sub>3</sub> O <sub>8</sub> )
<b>Part 1:</b> Historical estimates from 1970s explorations (geological resources; not compliant with NI-43-101)				
Michelin	6.430	0.130	n/a	8.36
Kitts	0.185	0.730	n/a	1.35
Inda	0.514	0.155	n/a	0.80
Nash	0.216	0.224	n/a	0.48
Rainbow	0.270	0.100	n/a	0.27
Burnt Lake	0.140	0.082	n/a	0.11
Gear	0.077	0.145	n/a	0.11
<b>Totals</b>	<b>7.832</b>			<b>11.48</b>
<b>Part 2:</b> Recent resource estimates from exploration since 2004 (NI-43-101 compliant; see notes for details)				
Michelin (underground)	29.976	0.120	0.050	35.97
Michelin (open pit)	14.505	0.070	0.030	10.15
Jacques Lake (underground)	6.550	0.080	0.050	5.24
Jacques Lake (open pit)	4.520	0.060	0.030	2.71
Rainbow	2.019	0.085	0.030	1.72
Inda	4.502	0.067	0.030	3.02
Nash	1.370	0.076	0.030	1.04
Gear	0.730	0.060	0.030	0.44
Moran Lake Upper C-Zone	12.240	0.030	0.015	3.67
Moran Lake Lower C-Zone	1.450	0.050	0.035	0.73
Two-Time Zone	4.980	0.055	0.030	2.74
<b>Totals</b>	<b>84.002</b>			<b>64.69</b>
<b>Notes:</b> To obtain resources in millions of pounds of U <sub>3</sub> O <sub>8</sub> , use a conversion factor of 2.2 lbs to 1 Kg. Estimates in Part 1 from the Mineral Occurrence Database System (MODS), based on unpublished exploration reports, mostly from British Newfoundland Exploration Company (BRINEX). Estimates in Part 2 include resources in all categories, reported by exploration companies and are subject to changes as new data come available. Figures have been rounded to the nearest 1000 tonnes, and to three decimal places for grades, and may differ slightly from those reported. Sources are as follows: Michelin, Jacques Lake, Rainbow, Inda, Nash and Gear: Aurora Energy Resources (June 2008) Moran Lake Upper and Lower C-zones: Crosshair Exploration and Mining (August 2008) Two-Time Zone: Silver Spruce Resources (June 2008)				

eralized zones that collectively define a steeply dipping, tabular zone about 1 km long and 40–75 m thick (Figure 9a). Within this mineralized envelope, thicker, higher grade zones plunge southwest (Figure 9b). The U–Pb ages from post-mineralization intrusive rocks indicate that the mineralization must be earlier than ~1805 Ma. The principal ore mineral is uraninite,

*“It is said that gold is where you find it, but in Labrador, it seems that uranium is where you look for it.”*

which is disseminated within sodic silicate minerals, and associated with iron–titanium oxides and zircon; regional alteration is dominated by sodium metasomatism and potassium depletion. Typical grades are between 0.1 to 0.2% U<sub>3</sub>O<sub>8</sub>, low Th, and little associated base metals or Mo. The Jacques Lake deposit is hosted by similar felsic metavolcanic rocks, and resembles the Michelin mineralization. Exploration is still at an early stage, but resource figures are similar to those seen in the 1970s for the Michelin deposit (Table 1). Other examples likely include the Rainbow, Otter Lake and Aurora West prospects, and mineralization in the Mustang Lake area (Figure 3).

*Mineralization in Strongly Deformed Metasedimentary Rocks.* The Kitts deposit is hosted within a zone of strong deformation that is, in part, coincident with an argillitic (pelitic) metasedimentary unit located within the Post Hill Group (Figure 3); several smaller analogues occur within the extension of this zone. A recently discovered zone of U–Mo mineralization in metasedimentary rocks near Anna Lake (Figure 3) may also be of this type. The Kitts deposit consists of concordant and weakly discordant mineralized veinlets and shears, collectively defining a larger stratiform zone. Some parts of the deposit are high-grade, containing up to 20% U<sub>3</sub>O<sub>8</sub>; 1970s estimates indicated an average grade of 0.73% and minor associated Cu and Mo. Kitts was an important element in the economics of 1970s development proposals, forming a "sweetener" for the larger but lower grade Michelin deposit, and it remains a significant uranium resource (Table 1). The Gear, Inda and Nash deposits (Figure 3) are located within correlative metasedimentary rocks, and show many of the same features, although the grades are lower than at Kitts (Table 1). However, exploration activity between 2005 and 2009 increased the total resources at all these sites (Table 1). The mineralization in the Post Hill Group appears to predate intense deformation, *ca.*, ~1.8 Ga; however, these rocks were affected by earlier deformational events, and the mineralizing episode may be temporally discrete from that recorded at Michelin. The Kitts





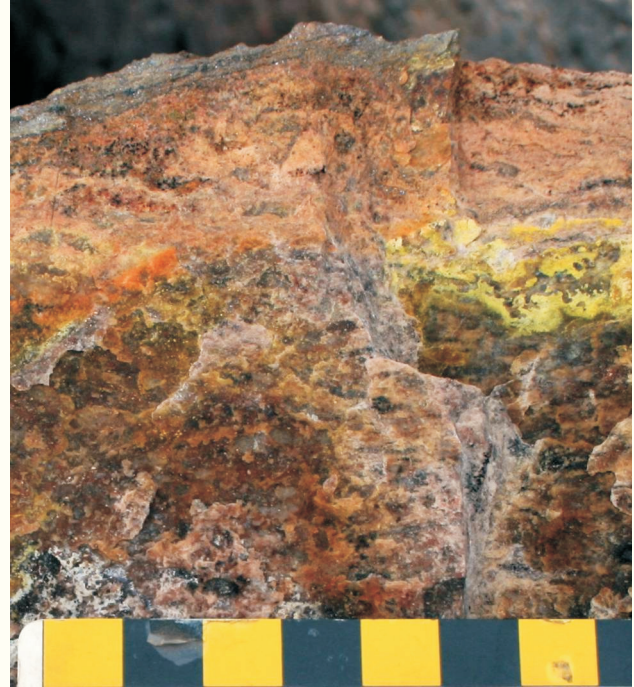
**Figure 7.** Intense hematite alteration and associated hydrothermal brecciation developed within pillow basalt of the Moran Lake Group, Moran Lake C-Zone (see Figure 3 for location).

deposit remains largely untested at depth, and represents a potential environment for high-grade uranium deposits.

*Mineralization in Metaplutonic Rocks.* Several examples of uranium mineralization in plutonic rocks within the CMB are also associated with shearing, and these may have affinities to metamorphic and metasomatic mineralization described above. The Melody Hill showing (Figure 3) is defined mostly by boulders of sheared granite containing up to 28%  $U_3O_8$ , but there is also lower grade *in situ* mineralization in similar host rocks. Much effort has been directed toward the search for additional bedrock sources, but so far, these have proved elusive.

### Uranium Mineralization in Sedimentary Environments

*Epigenetic (?) Mineralization in Sandstones and Conglomerates.* The Lower C-Zone deposit at Moran Lake (Figure 3) is hosted by terrestrial sedimentary rocks of the lower Bruce River Group, which sit structurally below the older Moran Lake Group (Figure 5). Uranium is concentrated within reduced "grey" zones in sandstone and is broadly conformable with bedding and the basal unconformity, although likely epigenetic in timing. Uranium is associated with vanadium, as in the nearby Upper C-Zone deposit, and these two deposits have been grouped for



**Figure 8.** Fracture-hosted Mo mineralization and accompanying hematization and uranophane staining developed within the wall-rock alteration of the host felsic volcanic succession.

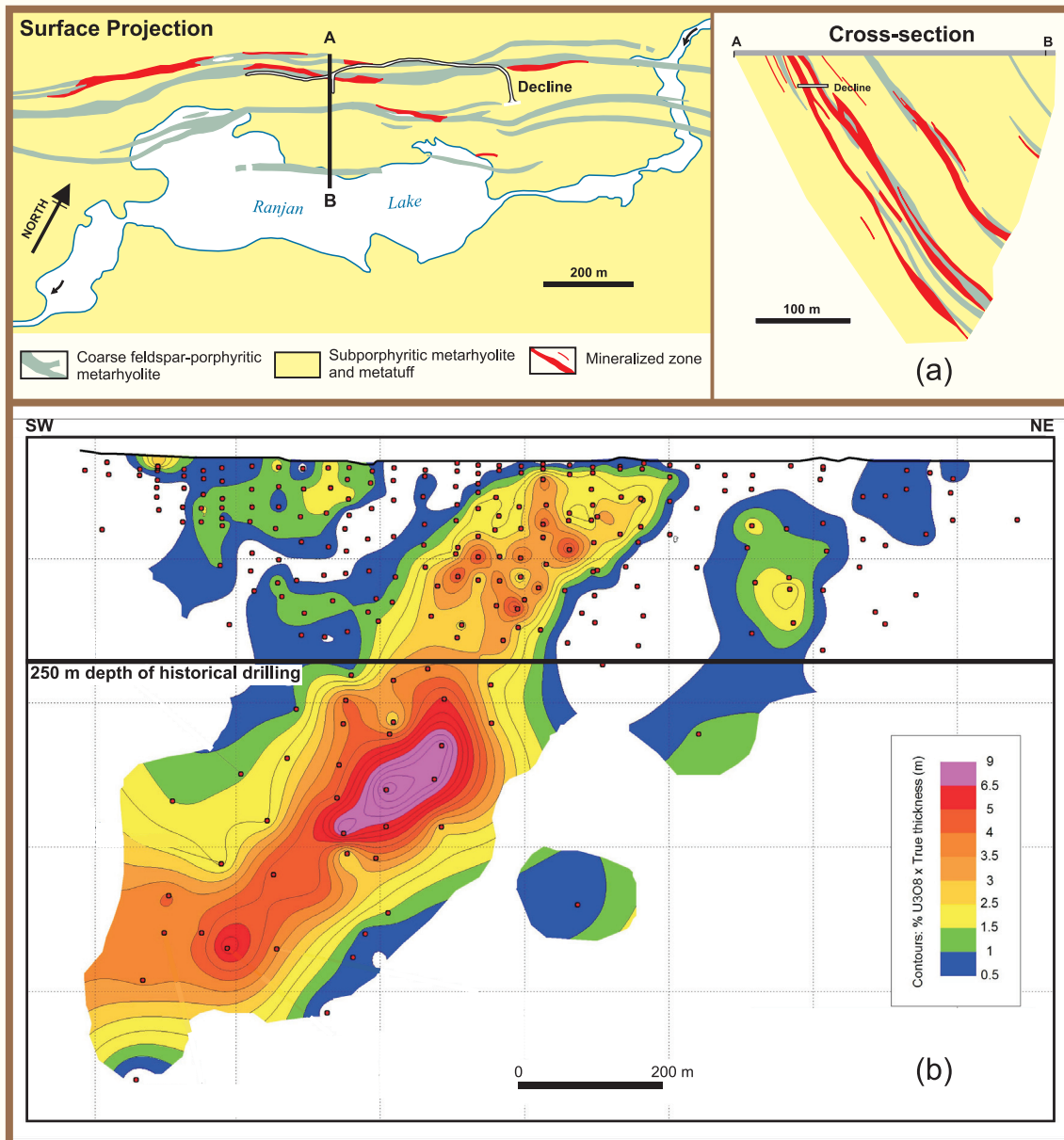
resource estimation (Table 1). Similar mineralization occurs at the Moran Heights prospect, and at the Moran Lake B-Zone. Conglomerates of the Bruce River Group host mineralization at the Moran Lake A-Zone prospect, where uranium is associated with sulphides and copper enrichment, and pyrite is abundant. The origins of mineralization hosted by the lower Bruce River Group remain enigmatic, and a spatial link to the basal unconformity of this sequence remains possible. In some other respects, the mineralization resembles sandstone-hosted deposits such as those within Mesozoic and Cenozoic strata of the Colorado plateau.

*Mineralization of Uncertain Origin in Dolostones.* Minor uranium enrichment is known in carbonate rocks, interbedded with clastic sedimentary rocks in the lower part of the Moran Lake Group, at the Area 51 prospect (Figure 3). Little is known about this style of mineralization, but it appears to be sporadic and low in grade.

### Other Areas in Labrador

Outside the confines of the CMB, Labrador has yet to attract intense exploration. Regional airborne radio-

*In 2006 and 2007, the Central Mineral Belt was second only to the Athabasca Basin in terms of uranium exploration expenditures.*



**Figure 9.** Generalized plan views and cross-sections through the Michelin deposit (Figure 9a). The colours on the longitudinal cross-section (Figure 9b) indicate (grade x thickness) contours. Based on information from Gandhi (1978) and Aurora Energy Resources website, 2007.

metric data are mostly confined to the CMB, and this basic empirical information is lacking for large tracts of the Superior, Grenville and Churchill provinces (Figure 1).

From the perspective of regional target definition, Proterozoic sedimentary sequences and associated unconformities have attracted some interest. The most widespread unconformity is located at the base of the

*The diverse uranium metallogeny of the Central Mineral Belt of Labrador includes several deposit types that elsewhere account for significant uranium production.*

~1270 Ma Seal Lake Group, but the Stormy Lake showing (Figure 3) more closely resembles volcanic-hosted mineralization in the Bruce River Group. The Sims Formation (Figure 1), deposited prior to ~1.45 Ga, is broadly correlative with the Athabasca Basin of western Canada, but is of limited extent. Minor uranium enrichment (<0.03% U<sub>3</sub>O<sub>8</sub>) is reported from black shales in the lowermost section of the Paleoproterozoic



**Figure 10.** Uranophane staining developed along a shear plane within hematized felsic volcanic rocks from the Michelin deposit (see Figure 1 for location).

Mugford Group in northern Labrador (Figure 1). Similarly, black shales at the base of the Paleoproterozoic Menihék Formation in western Labrador are also reported to be locally uranium enriched. The Eocambrian(?) Double Mer Formation, of the Lake Melville area, consists of terrestrial sedimentary rocks that developed in fault-controlled grabens, akin to those of the Deer Lake Basin in Newfoundland, and may have similar potential.

Uranium occurrences, in the Double Mer–Backway area of the Grenville Province (Figure 1), are hosted by leucocratic granitoid rocks derived via local anatexis. Grades are generally low and sporadic, and the mineralization is likely of syngenetic magmatic type. Exploration within the interior Grenville Province in southeastern Labrador indicates low-grade uranium mineralization associated with gneisses, pegmatites and posttectonic granites. Similar late granites and associated pegmatites are also important uranium exploration targets in adjacent regions of Québec.

## Newfoundland

Newfoundland has not received the same intense exploration enjoyed by Labrador. Mineralization is known in several settings, and new discoveries were made between 2005 and 2009. The most important exploration areas are the Carboniferous rocks of the Deer Lake and Bay St. George basins (Figures 2 and 11), and early

Paleozoic metasedimentary and metavolcanic rocks of the Hermitage Flexure (Figure 12). The Topsails area, underlain by peralkaline igneous rocks, has also received much recent attention.

*Mineralization in Clastic Sedimentary Rocks.* The Deer Lake and Bay St. George areas represent Carboniferous sedimentary basins developed along major fault systems (Figure 2). In the former, mineralization is hosted by limestones and calcareous conglomerates at the Rocky Brook and North Brook showings (Figure 11); the limestones are dolomitic and contain algal lamination. Uranium enrichment appears to be stratabound and syngenetic; although generally low grade, these rocks locally contain as much as 3.7%  $U_3O_8$ . Higher in the sequence, clastic sedimentary rocks host low-grade uranium mineralization in bedrock (Figure 11). High-grade uranium mineralization occurs as boulders, notably at Wigwam Brook (Figure 13) where grades are locally spectacular, ranging up to 11.5%  $U_3O_8$ , 3% Ag and 380 g/t Au. Subsurface mineralization appears to be related to redox boundaries in the host clastic sedimentary rocks, suggesting affinities to deposits of the Colorado Plateau. Carboniferous deposits in sedimentary rocks derived from peralkaline volcanic terranes in Niger, West Africa, may also represent a possible deposit model for this environment. Similar mineralization exists in the Bay St. George Basin, where grades of up to 2.2%  $U_3O_8$  are localized in coal fragments and fossil wood within conglomerates at the Grand Codroy No. 4 showing (Figure 2).

*Mineralization in the Hermitage Flexure Area.* Uranium was first discovered here in the 1980s. Mineralization is generally stratiform and associated with intermediate to felsic tuffs and sedimentary rocks of the Bay du Nord Group (Figure 12). Results from surface showings indicate potential for high grades, but subsequent drilling results have been sporadic. The mineralization is of uncertain origin and affinity, although there may be a link to nearby granitic intrusions.

*Other Areas.* Uranium occurs in several other mineralizing environments, including granitoid plutonic rocks (e.g., Baggs Hill and Carrol's Hat showings; Figures 2 and 12), and hydrothermal Pb–Zn veins on the Burin Peninsula (e.g., Radex showing, Figure 2). Precambrian granites host mineralization of uncertain character at the Dome One and Portland Creek showings (Figure 2); the former revealed grades up to 1.8%  $U_3O_8$ . In the King's Point area, uranium

*Large parts of the Canadian Shield in Labrador have yet to be evaluated using airborne radiometry, let alone subjected to systematic exploration.*

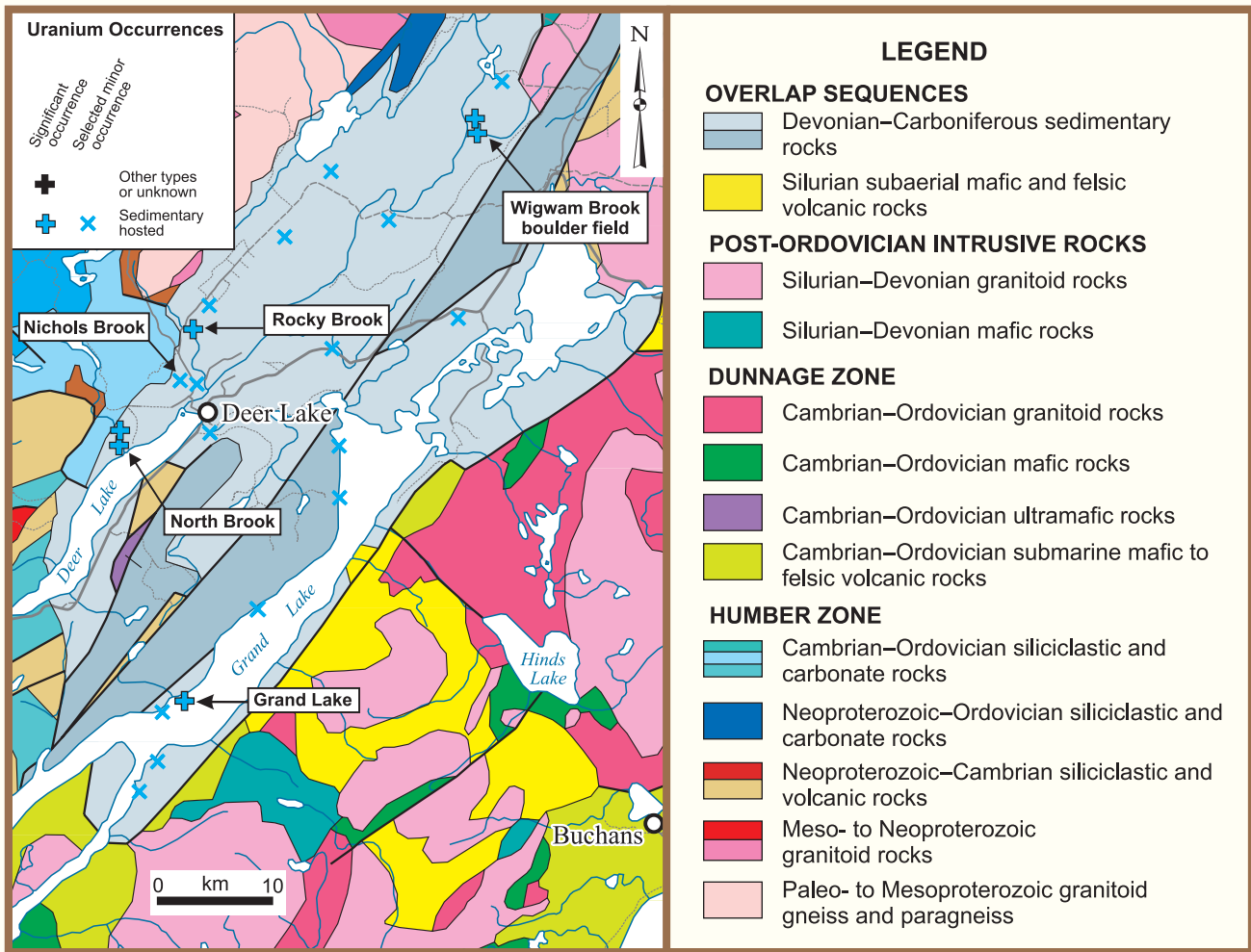


Figure 11. Geology of the Deer Lake Basin and surrounding areas, showing the locations of important uranium occurrences.

was recently discovered in peralkaline felsic volcanic and pyroclastic rocks, suggesting wider potential for mineralization in post-orogenic Silurian caldera settings; similar mineralization occurs at Turners Ridge (Figure 2). These evolved felsic volcanic rocks may also have acted as sources of uranium, later concentrated in Carboniferous sedimentary basins.

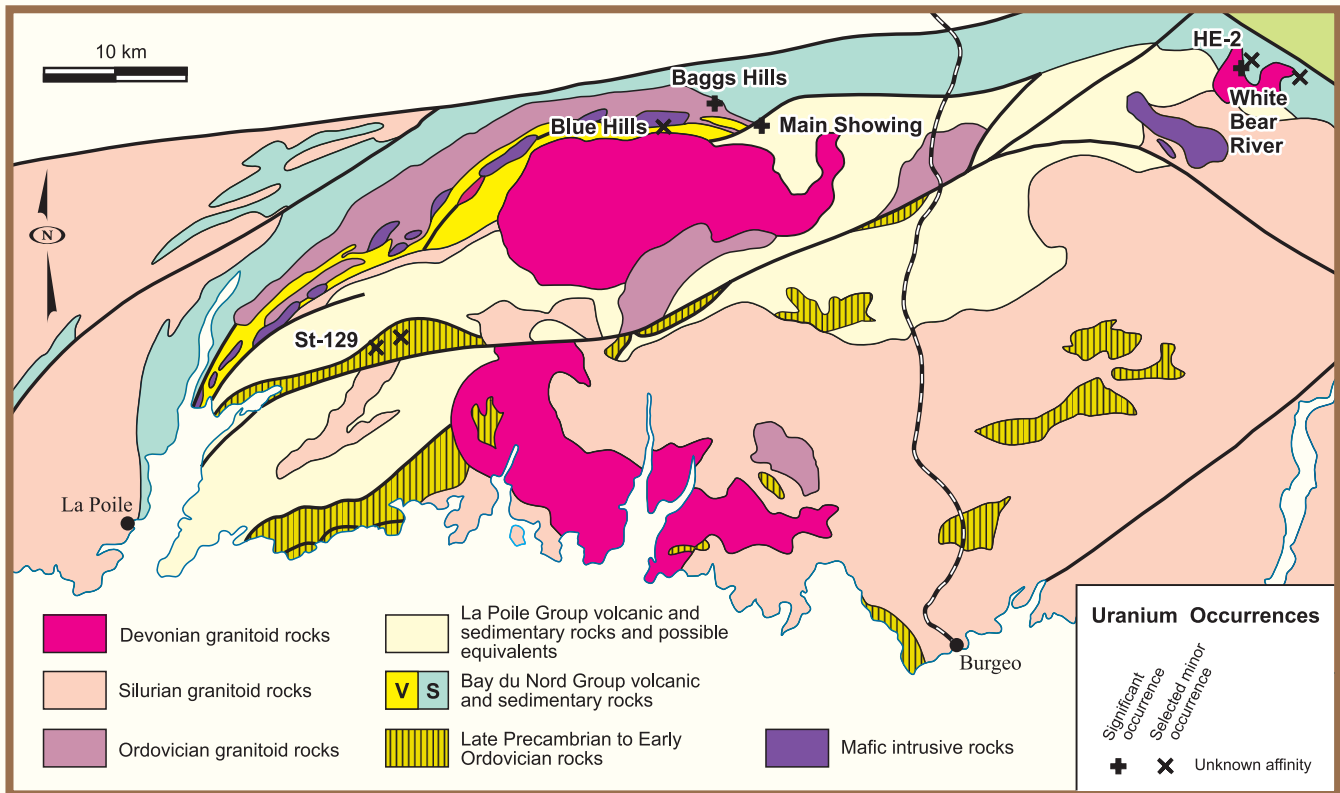
## Exploration Potential across the Province

Exploration for uranium enjoyed a renaissance between 2005 and 2008 because of increases in commodity prices. This exploration effort remained focused mostly within areas previously explored between 1955 and 1980.

*Locally super high-grade mineralization in the Deer Lake Basin provides a strong incentive for exploration of this possible analogue to the Colorado Plateau uranium district.*

The CMB of Labrador remains the most active target area. Deeper exploration at previously defined sites significantly increased the resources defined at several deposits. New discoveries within settings previously seen as less prospective indicate that much remains to

be learnt concerning the habitats of uranium in the CMB. Every uranium prospect in the CMB has surface expression, in the form of radioactive outcrops or related boulder dispersion trains, and there have as yet been no discoveries of blind uranium deposits. The spectrum of uranium deposits in the CMB includes several types that elsewhere make significant contributions to world uranium production. The geological evidence indicates that there were at least two discrete episodes of uranium mobilization and precipitation within the CMB during the Proterozoic.



**Figure 12.** *Geology of the Hermitage Flexure area on the south coast of Newfoundland, showing principal locations of uranium mineralization.*



**Figure 13.** *High-grade sandstone float from the Deer Lake Basin grading 10.2% U<sub>3</sub>O<sub>8</sub> and 529 g/t Ag (photo courtesy of Altius).*

Elsewhere in Labrador, large areas remain unexplored, notably within the Churchill (north-central Labrador) and the Grenville (southern Labrador) provinces. The Paleoproterozoic sedimentary and volcanic rocks of the Labrador Trough contain no known uranium occurrences, but equivalent units in adjacent Québec contain significant uranium mineralization. Several Proterozoic sedimentary sequences, and their related unconformities, also provide potential targets for the future.

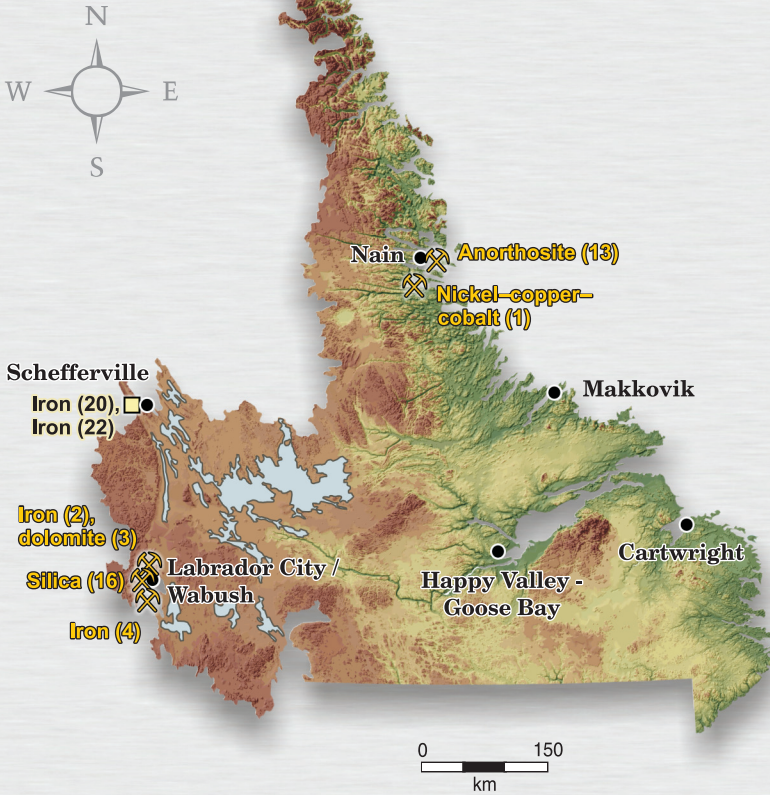
In Newfoundland, Carboniferous sedimentary basins contain sandstone-hosted mineralization of locally polymetallic aspect, perhaps analogous to important deposits of the Colorado Plateau and Niger, West Africa. Uranium also occurs in other settings on the Island, including peralkaline felsic volcanic rocks. The latter are areally extensive, and have seen essentially no previous exploration for uranium. Despite the traditional focus on Labrador as a uranium metallogenic province, the Island portion of the Province should not be discounted as a potential exploration target area.

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# PRODUCING MINES AND DEVELOPING PROPERTIES

FALL 2009



\* Note scale differences of  
Labrador and Newfoundland maps



## Producers

1. *Vale Inco Newfoundland & Labrador Limited, Voisey's Bay*
2. *Iron Ore Company of Canada, Labrador City*
3. *Iron Ore Company of Canada, Labrador City*
4. *Wabush Mines Limited, Wabush*
5. *Teck Duck Pond Operations, Duck Pond*
6. *Beaver Brook Antimony Mine Inc., Beaver Brook*
7. *Anaconda Mining Inc., Pine Cove*
8. *Rambler Metals and Mining Plc., Nugget Pond Mill*
9. *Hi-Point Industries (1991) Limited, Bishop's Falls*
10. *Atlantic Minerals Limited, Lower Cove*
11. *Atlantic Barite Limited, Buchans*
12. *Hurley Slate Works Company Inc., Burgoynes Cove*
13. *Tornigait Ujaganniavingit Corporation, Ten Mile Bay*
14. *Terra Nova Granite (2007) Inc., Jumpers Brook*
15. *Galen Gypsum Mines Limited, Coal Brook*
16. *Shabogamo Mining & Exploration Limited, Labrador City*

## Under development

17. *Canada Fluorspar (NL) Inc., St. Lawrence*
18. *Continental Stone Limited, Belleoram*
19. *Hi-Point Industries (1991) Limited, Gander Bay*
20. *Labrador Iron Mines Holdings Limited, Howells River*
21. *Newfoundland Pyrophyllite, Manuels*
22. *New Millennium Capital Corp., Howells River*
23. *Peat Resources Ltd., Stephenville*
24. *Rambler Metals and Mining Plc., Baie Verte*