PROJECTS RELATED TO RARE-EARTH ELEMENTS (REE)

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Exploration for rare-earth elements (REE) and related commodities has been important since 2008. The Strange Lake deposit on the Quebec-Labrador border is one of the world's largest REE resources. This project was office-based in 2012. Activities included resource estimation at Strange Lake, and petrographic, mineralogical and geochemical studies.

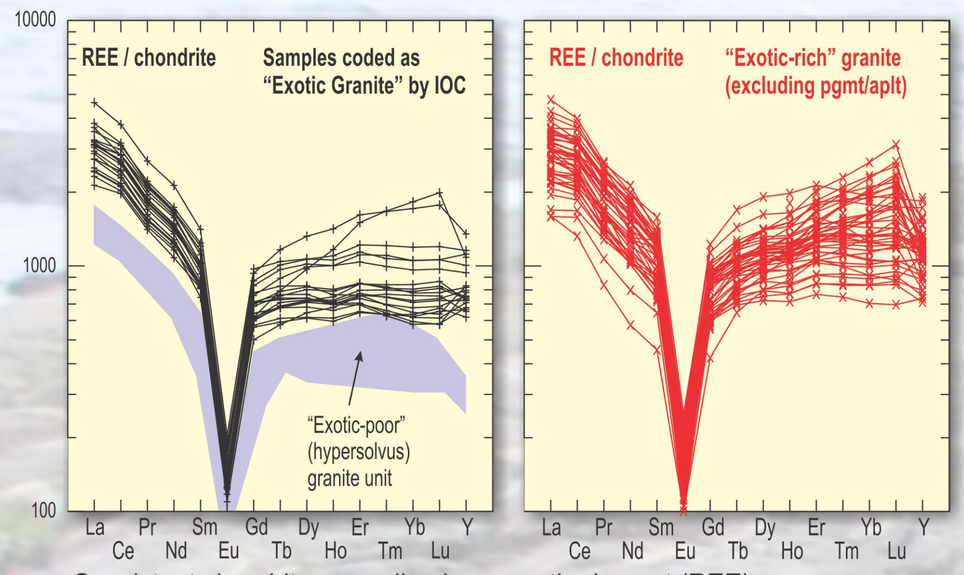
Granite with disseminated REE-bearing minerals, Strange Lake.

REE in Labrador: Strange Lake Area

Strange Lake is one of the world's largest resources of yttrium (Y) and rare-earth elements (REE). The overall near-surface resource was estimated in 1985 at some 57 Mt of 3% ZrO_2, 0.31% Nb_2O_5, 0.08% BeO and 0.92% total REE oxides (including Y). However, REE estimates were based on limited data. The deposit currently sits in Exempt Mineral Land, but exploration in adjacent Quebec by Quest Rare Minerals has identified a separate deposit (the B-Zone) of possible economic importance.

The REE behave coherently, and are well correlated with elements such as Y and Be. Statistical investigations suggest that many REE (notably the valuable "heavy" group) can be reliably predicted from historical Y data using linear regression. Further development and testing of these methods in 2012 supports this inference, and permits calculation of new resource estimates for REE at the Main Zone deposit in Labrador. These remain confidential.

New REE data from Strange Lake are also of interest in the context of deposit genesis. The remarkable constancy of REE patterns through a variety of rock types is consistent with igneous processes such as fractional crystallization rather than pervasive hydrothermal mobilization of REE. The latter may have some local roles, but Strange Lake is fundamentally an orthomagmatic deposit.

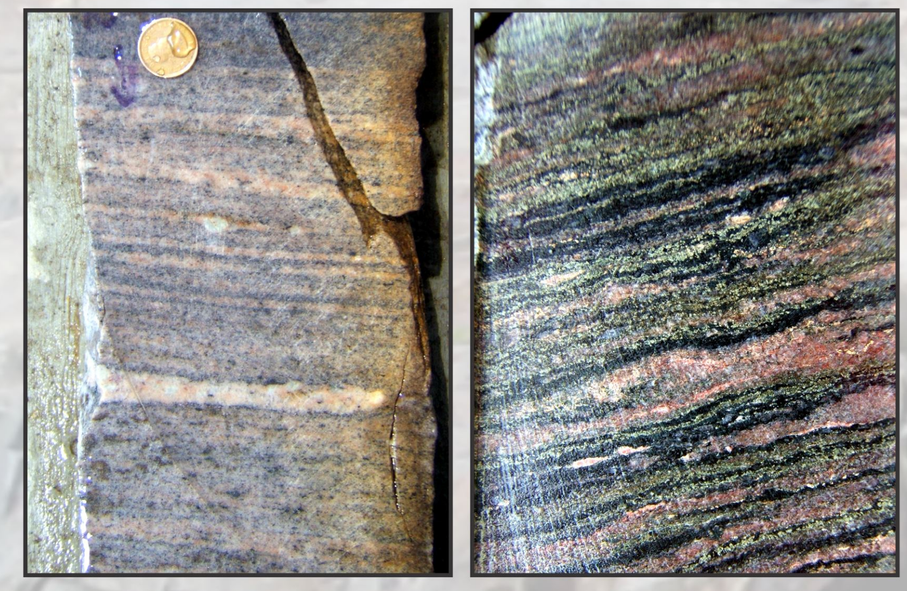


Consistent chondrite-normalized rare-earth element (REE) patterns from the Strange Lake deposit, Labrador.

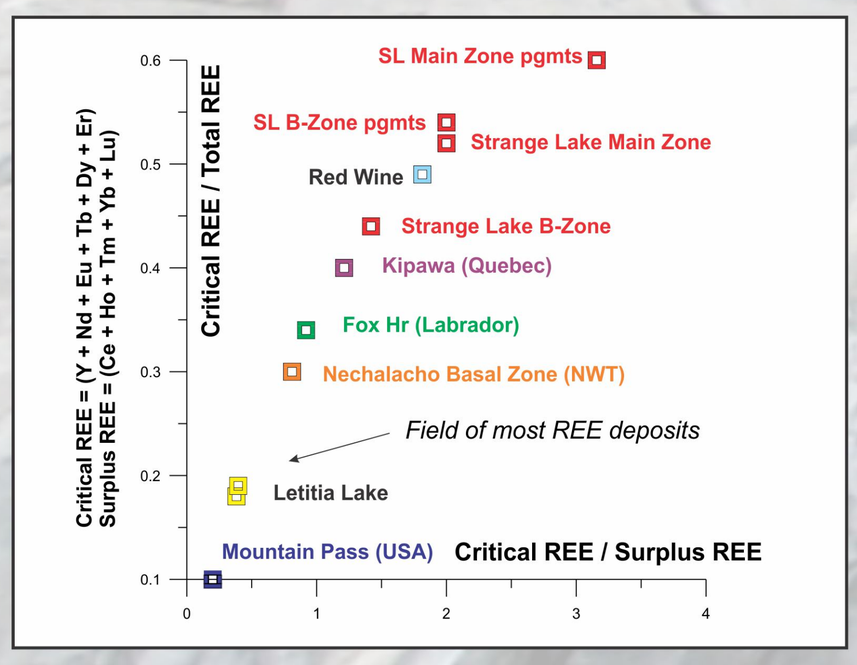
Metamorphosed REE Deposits in the Grenville?

REE mineralization in the Grenville Province of southern Labrador differs from that found in the north, in that it is less obviously orthomagmatic in origin. In 2012, new resource estimates were announced for deposits located near Letitia Lake and Port Hope Simpson. Both deposits are relatively enriched in the light REE, rather than the heavy REE, but they contain interesting grades for Nd and some other REE. They also benefit from predictable attitude and geometry. The host rocks to these deposits are essentially gneisses in regional shear zones..

The mylonitic and attenuated nature of these deposits suggests that they may represent transposed and sheared vein or pegmatite swarms of originally Mesoproterozoic age, in which intense deformation has destroyed original intrusive relationships with their host rocks.



Strongly deformed rocks containing REE mineralization. At left, felsic gneiss from Fox Harbour, southern Labrador; at right, syenite gneiss from Letitia Lake, central Labrador.



Classification of Labrador REE Deposits

Although there is exploration interest in all REE, not all are forecast to be in short supply. Those of most interest are the less abundant "heavy" REE, and the light REE Nd. It has been suggested that comparing so-called **Critical REE** to so-called **Surplus REE** is useful in classifying deposits. Most previously exploited deposits, and most near-future producers have Critical to Surplus REE ratios below 1, and Critical to Total REE ratios below 0.25.

Several REE deposits currently under exploration in Labrador are notable for their high relative contents of the Critical REE. Strange Lake shows the strongest relative enrichment, but significant heavy REE contents are also present in deposits of the Redwine Mountains area, and in some showings from the Grenville of southeastern Labrador.