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RARE-METAL TARGETS IN INSULAR NEWFOUNDLAND

R.R. Miller
Mineral Deposits Section

ABSTRACT

The extensive infrastructure, less harsh weather conditions and lower exploration costs make insular Newfoundland a more economically attractive place than Labrador to find and develop rare-metal deposits. Yet, to date, the only large rare-metal deposits discovered in this province, the Strange Lake deposit and Mann # 1 showing, occur in Labrador. Little, if any, rare-metal exploration has been carried out in insular Newfoundland.

A model of rare-metal mineralization in high-level felsic peralkaline rocks has been developed from the study of the Strange Lake deposit, the Mann # 1 showing and several other showings in Labrador. The model outlines four major geological settings for rare-metal mineralization in high-level felsic peralkaline rocks. These analogous geological settings can be sought in insular Newfoundland, to assist in rare-metal exploration programs.

Application of the model to insular Newfoundland indicates that eight complexes or regions, contain favourable host rocks for rare-metal mineralization; i.e., felsic extrusive and/or intrusive rocks that are peralkaline in nature or affinity. These exploration targets are: Louil Hills complex—Bull Arm Formation, Cross Hills complex—Mooring Cove Formation, Topsails complex—Sheffield group, St Lawrence Granite and related rocks, Kings Point complex, Grand Beach complex, Seal Island Bight granite, and the Hare Hills peralkaline rocks.

INTRODUCTION

Recent geological and geochemical studies of the rare-metal mineralization within the Strange Lake peralkaline granite, the Red Wine intrusive suite and the Letitia Lake Group (Miller, 1986, 1987) of Labrador (Figure 1), has led to the development of an empirical metallogenic model for these felsic peralkaline rock-hosted deposits. The model can be successfully applied to other similar rare-metal deposits (e.g., Thor Lake, N.W.T., Trueman *et al.*, 1985; Jabal Sa'id, Saudi Arabia, Drysdale *et al.*, 1984; Hackett, 1986), and thus has application to the exploration for undiscovered rare-metal mineralization. In this study, the model is used to constrain and define potential rare-metal targets on the Island of Newfoundland.

To date, the two significant rare-metal deposits discovered in Labrador are a result of exploration programs for uranium in the Strange Lake region (Miller, 1986), and for copper and zinc in the Mann #1 showing (Brummer, 1960). The fact that these exploration programs were not aimed at rare-metal mineralization is due to: 1) the very small number of companies focussing on rare-metal exploration versus the traditional commodities such as Fe, U, Au, Cu or Zn, 2) the low demand and small markets, and 3) the considerably higher cost of exploration programs in Labrador. Thus, the rare-metal discoveries in Labrador were 'fortuitous', rather than 'by design'. The development of an empirical model should help lower the costs, by assisting companies to focus on smaller areas for evaluation, which will better identify the potential that will attract rare-metal exploration companies to Province of Newfoundland and, in particular, insular Newfoundland.

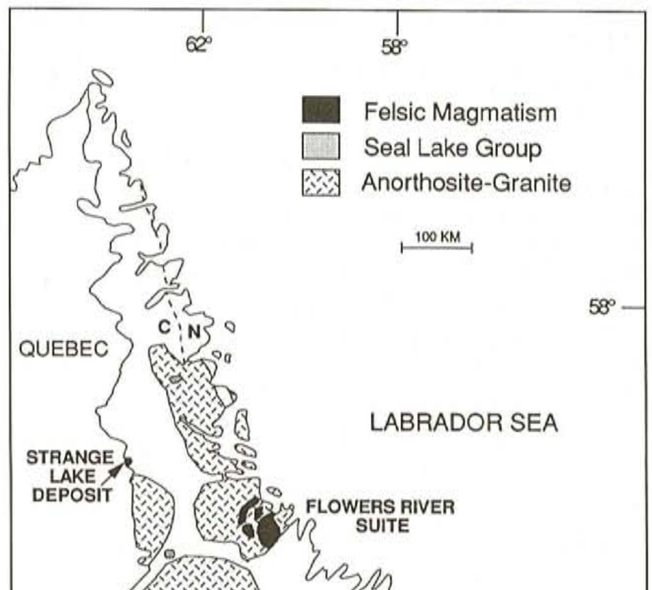

Figure 1. *Rare-metal showings in Labrador. Strange Lake Zr–Y–Be–Nb–REE deposit; Letitia Lake area: Mann #1, Mann #2 and Two Tom Lake showings; Flowers River suite–minor showings.*

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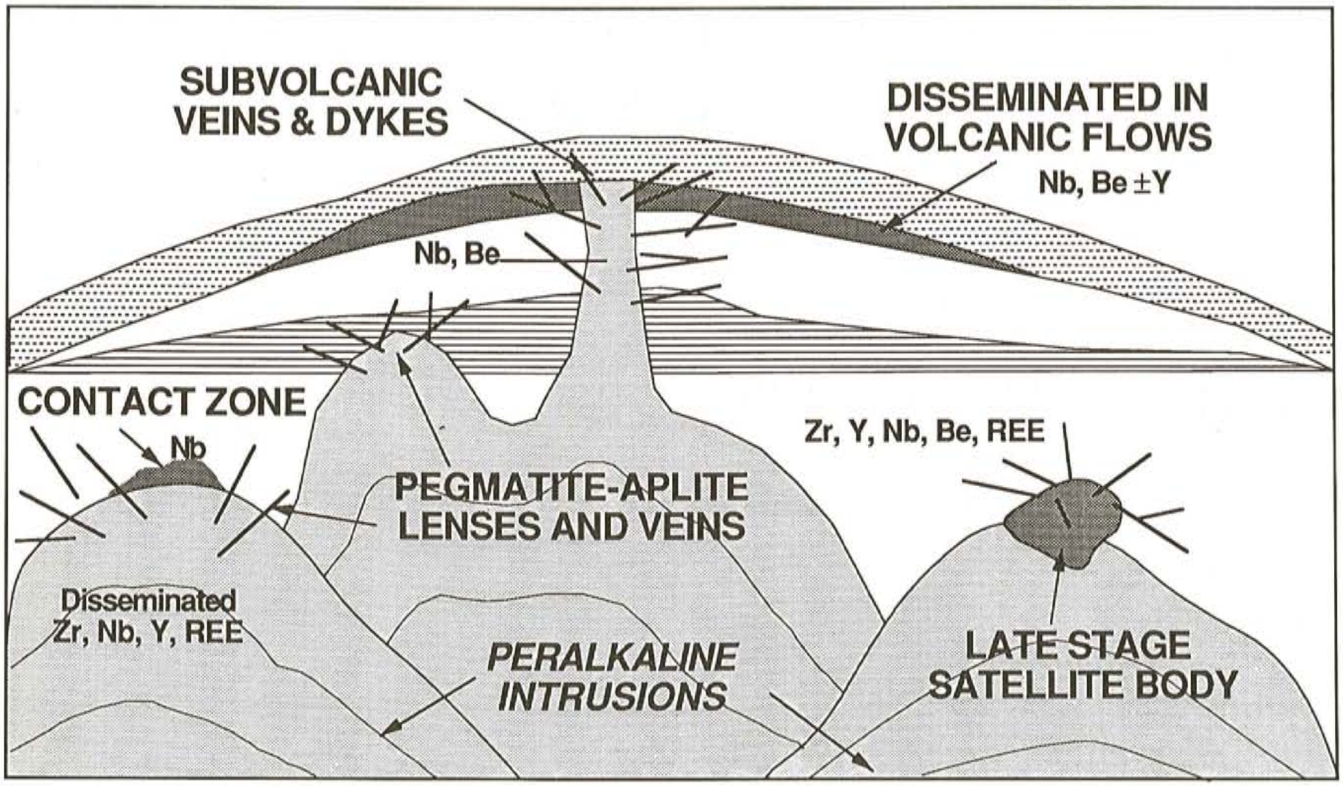

Figure 2. *Rare-metal mineralization model: Setting 1—late-stage satellite bodies and associated pegmatite—aplite veins associated with unvented plutons (granite); settings 2 and 3—veins and disseminated mineralization in near vent volcanic rocks and subvolcanic equivalents (granite or syenite); setting 4—disseminated mineralization and contact zones in unvented plutons (granite and undersaturated syenites).*

When compared to Labrador, insular Newfoundland provides a more favourable environment for exploration and development. Exploration costs are much lower due to the extensively developed infrastructure, the larger workforce and the larger number of services available. These factors would also mean that unlike Labrador, significant discoveries of rare-metal mineralization are more likely to be developed. Thus, insular Newfoundland is a better place to find rare-metal deposits and to bring them into production.

GEOLOGICAL SETTINGS OF RARE-METAL MINERALIZATION

The metallogenic model developed for high-level peralkaline rock-hosted rare-metal mineralization is based on the metallogenic studies of the Strange Lake Zr—Y—Nb—Be—REE deposit (Miller, 1986), the Mann-Type Nb—Be±Y showings in the Letitia Lake area (Miller, 1987; Batterson and Miller, 1987), the mineralization observed in the undersaturated phases of the Red Wine instrusive suite (Miller, 1988) and the mineralization described in the Flowers River Igneous Suite (Hill, 1981; Miller, 1988). The general geological settings and the geochemistry of the mineralization in these Labrador-based examples are certainly not representative of all of the many different kinds of rare-metal deposits found world-wide, nevertheless, a search of the literature indicates that the major settings have been described in the model, and these are illustrated in Figure 2.

This model indicates that rare-metal mineralization, in general (i.e., complex mineralization including one or more of Zr, Y, REE, Nb, Ta, Be), occurs in anorogenic high-level peralkaline felsic intrusions and their near-vent extrusive equivalents (Miller, 1987). The following geological settings have been identified in Labrador:

1) as pegmatite—aplite dykes and late-stage roof zone phases in high-level peralkaline granite plutons that did not vent to the surface (e.g., Strange Lake peralkaline granite),

2) as pegmatite and pegmatite—aplite dykes in the roof zone of vented peralkaline granites and as disseminated mineralization in the near-vent extrusive equivalents, (e.g., Flowers River intrusive suite, Shallow Lake peralkaline granite),

3) as subvolcanic veins associated with peralkaline quartz syenites and as disseminated mineralization in the associated peralkaline trachytes within the near-vent environment (e.g., Mann #1 and Two Tom Lake deposits),

4) as disseminated mineralization within high-level undersaturated peralkaline complexes (e.g., Red Wine intrusive complex of Curtis and Currie, 1981).

Table 1. Minimum and maximum values of rare-metal concentrations in rare-metal host rocks in Labrador.

Setting	Host	Zr	Y	Nb	Be	U
Setting 1	Strange Lake granite	2000	600	250	30	7
		5000	1500	500	80	30
Setting 2	Flowers River granite	600	100	50	-	2
		1100	150	150	-	6
Setting 2	Flowers River volcanics	1000	100	40	-	2
		8000	600	300	-	6
Setting 3	Letitia Lake syenites	700	50	50	7	1
		3600	300	400	50	12
Setting 3	Letitia Lake Group	200	60	20	5	3
		2000	200	800	100	6
Setting 4	Red Wine nepheline syenite	500	50	90	-	1
		5000	200	300	-	14

Sources of data: Strange Lake granite–Miller, 1986; Flower River volcanics–Hill, 1981; Letitia Lake Group–Miller, 1987; Flowers River granite–Hill, 1981; Letitia Lake syenites–Miller, 1987; Red Wine nepheline syenite–Curtis and Currie, 1981; rare-metal values in p.p.m.

Setting numbers 1 and 3 contain significant tonnages of high-grade mineralization (Miller, 1988). High values of rare metals have been found in settings 2 and 4, although significant tonnages have not been outlined.

These same settings have also been shown to contain significant rare-metal mineralization in other parts of the world such as the Northwest Territories (Thor Lake, Trueman *et al.*, 1985), Saudi Arabia (Drysdale *et al.*, 1984; Jackson, 1986), Greenland (Industrial Minerals, 1988b,c) and Australia (Industrial Minerals, 1988a).

The Thor Lake deposit exhibits many of the characteristics of setting 1, although there are many complexities with regard to the genesis of this Be–Nb–Ta–Y–REE–Ga deposit (Trueman *et al.*, 1985; Birkett, 1988). The mineralization occurs in several zones, some associated with metasomatized granite pegmatite and some associated with highly altered peralkaline granite (Grace Lake granite) and amphibole ± olivine ± pyroxene syenite (Thor Lake syenite). There is no evidence to suggest that either the syenite or granite was vented to the surface, although the high-level nature of these rocks is clearly evident. The high degree of metasomatism in the Thor Lake deposit suggests a late-stage development of rare-metal mineralization, in which the late stage is not manifested dominantly by pegmatite–aplite or by vein formation, but by intense hydrothermal–metasomatic activity, possibly associated with pegmatite formation.

Several rare-metal deposits and showings associated with high-level peralkaline felsic rocks have been described from Saudi Arabia (Drysdale *et al.*, 1984). All of these examples are associated with granites or syenites, which are not vented to the surface (Jackson, 1986). One particularly well-studied example is the Jabal Sa'id pegmatite–aplite hosted Nb–Zr–Y–REE–Sn–Ta deposit (Hackett, 1986). The mineralization occurs within a composite pegmatite–aplite body, which is at the contact of a peralkaline granite. This mineralization corresponds to setting 1, and is very similar to the Strange Lake deposit.

Two separate exploration programs in Greenland (Industrial Minerals, 1988b, 1988c) are evaluating eudialyte-bearing peralkaline undersaturated phases of the Ilimaussaq felsic complex. Both properties are being evaluated for Zr–Y–REE deposits similar to the mineralization observed in the Red Wine undersatured rocks and setting 4.

There is very little published geological information on the Brockman Nb–Ta–Y–Zr–REE deposit in Australia (Industrial Minerals, 1988a). Yet, it appears that the mineralization is disseminated in trachytic flows and tuffs of the Brockman volcanics. Mineralogical and other studies of the volcanic host rocks (A. Ramsden, personal communication, 1987) indicate that they are incompatible-element-enriched but alkali-poor (i.e., not peralkaline *senso stricto*, but peralkaline in affinity). Thus, the host rocks are similar to some host rocks in the Letitia Lake Group and are similar in geological setting to setting 3.

Table 1 lists the minimum and maximum values of some rare-metal elements in the various host rocks of rare-metal deposits and showings in Labrador. These values have been presented separately for volcanic and intrusive rocks for comparative purposes. Note that a significant rare-metal deposit has been outlined in the Strange Lake peralkaline granite (Dawe, 1984) and a sizeable resource is suggested at the Mann #1, one of the Letitia Lake area syenites (Dujardin, 1960), and within the Letitia Lake Group volcanic rocks. (This compilation of geochemical data should be useful to exploration geologists wishing to evaluate the potential of a particular rare-metal exploration target (i.e., potential of a high-level peralkaline suite or complex)). Thus, targets with rare-metal values within or near the ranges indicated in Table

Table 2. Rare-metal concentrations in deposits and showings in Labrador.

Setting	Deposit or Showing	Zr	Y	Nb	Be	U
Setting 1	Strange Lake granite	5,000	2,000	1,000	200	50
		27,000	16,000	15,000	5,000	300
Setting 2	Flowers River granite	20,000	2,200	1,000	-	-
Setting 3	Letitia Lake showings	40	150	100	30	5
		180	2,400	10,000	2,500	180
Setting 4	Red Wine nepheline syenite	20,000	2,200	1,000	-	-

Sources of data: Strange Lake granite—Miller, 1986; Letitia Lake showings—Miller, 1987; Flowers River granite—Hill, 1981; Red Wine nepheline syenite—Curtis and Currie, 1981; rare-metal values in p.p.m.

Table 3. Rare-metal exploration targets in insular Newfoundland.

Setting	Area	Plutonic Phase	Associated Volcanics
Setting 1, 2	Grand Lake	Hare Hills peralkaline granite	None Identified
Setting 1	La Scie	Seal Island Bight peralkaline granite	None Identified
Setting 1, 3	Green Bay	Kings Point complex (Per±)	Kings Point complex (Per±)
Setting 2, 3	Topsails	Topsails peralkaline granites	Sheffield group (Per±)
Setting 1, 3	Terra Nova	Louil Hills peralkaline granite	Bull Arm Formation (Per?)
Setting 1, 3	Long Harbour	Cross Hills peralkaline granite	Mooring Cove Formation (Per?)
Setting 1, 3	Burin Peninsula	St. Lawrence peralkaline granite	Rocky Ridge Complex
Setting 1, 3	Burin Peninsula	Grand Beach complex (Per?)	Clancey's Pond complex (Per?)

Per? = Peralkaline nature not well established; may have peralkaline trace-element characteristics but does not have peralkaline major-element characteristics.
Per± = Definitely peralkaline at some outcrops; not peralkaline or questionably peralkaline in others.

1 should be given further consideration, particularly if the settings are the same.

The ranges of rare-metal values in the showings and deposits in Labrador are listed in Table 2. Not all showings have uniformly high values of all rare-metal elements; e.g., the Letitia Lake showings have abnormally low Zr values but significantly higher Be and Nb values.

Insular Newfoundland

The rock types observed in the settings for rare-metal mineralization described previously for Labrador also occur in insular Newfoundland. Rare-metal targets can be outlined and obviously, any occurrence of felsic peralkaline rocks is a potential target. A preliminary literature survey of anorogenic and peralkaline volcanics and intrusions suggests that the complexes or suites listed in Table 3 are potential rare-metal targets. Each of these potential targets is discussed further.

Hare Hills peralkaline granite–quartz syenite (Figure 3): Occurrences of peralkaline granite, peralkaline granite gneiss and peralkaline quartz syenite in the Grand Lake area, were recently described by Whalen and Currie (1984). However, little is known about this target area, since chemical analyses and detailed geological data have not as yet been published. The available data indicate that any rare-metal mineralization

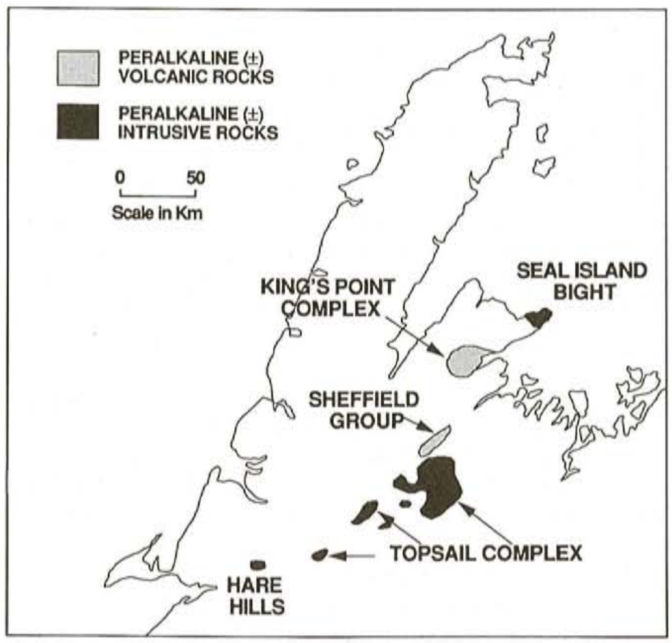

Figure 3. *Rare-metal targets in north–western Newfoundland; peralkaline and peralkaline-related volcanic and high-level plutonic rocks.*

Table 4. Minimum and maximum values of rare-metal concentrations in suggested targets in Newfoundland.

Setting	Host	Zr	Y	Nb	Be	U
Setting 1	Seal Island Bight granite	515	80	33	-	4
		740	-	60	-	-
Setting 2, 3	Kings Point complex	400	60	-	-	-
		800	120	-	-	-
Setting 1, 2	Topsails peralkaline granite	390	50	20	-	3
		1540	340	110	-	9
Setting 2, 3	Sheffield group	805	100	30	-	11
		1660	170	60	-	-
Setting 2, 3	Bull Arm Formation	600	90	100	-	-
		1970	570	490	-	-
Setting 1, 2	Cross Hills granite	220	32	9	4.1	0.8
		1058	268	121	12.7	11.6
Setting 2, 3	Mooring Cove Formation	710	130	30	-	-
		1100	210	80	-	-
Setting 1, 2	St. Lawrence Granite	340	150	100	-	11
		870	-	-	-	-

Sources of data: Seal Island Bight–Whalen *et al.*, 1986; DeGrace *et al.*, 1976; Kings Point Complex–from diagrams in Kontak and Strong, 1986; Topsail peralkaline granite–Whalen *et al.*, 1986; Taylor *et al.*, 1980; Sheffield group–Whalen, 1986; Taylor *et al.*, 1980; Bull Arm Formation–S.J. O'Brien, personal communication, 1988; Cross Hill peralkaline granite–Saunders and Tuach, *this volume*; Mooring Cove Formation–S.J. O'Brien, personal communication, 1988; St. Lawrence granite–Teng and Strong, 1976; Whalen *et al.*, 1986.

associated with these rocks would be in setting 1, or possibly an unvented equivalent of setting 3. This target area requires basic lithogeochemistry and prospecting reconnaissance work to obtain sufficient data to further evaluate it, for any possible exploration program.

Topsail Complex (Figure 3): The Topsail Complex or igneous terrane, described by Whalen and Currie (1983), contains several peralkaline granite intrusions, and peralkaline rhyolitic porphyries and flows. Rare-metal mineralization in this terrane would be found in setting 1 and/or setting 2. Chemical analyses of several of the peralkaline granites and volcanic units of this extensive terrane (*circa* 3000 km^2) have been published by Taylor *et al.*, 1980; Whalen *et al.*, 1986; and Whalen, 1986. Rare-metal concentration in unmineralized samples of granites and volcanic rocks are listed in Table 4. Comparison of these values to those of the Labrador peralkaline granites and peralkaline volcanics (Table 1) clearly show that the Topsail granite rocks fall within the ranges of values, for those from Labrador. The great extent of peralkaline granites in the Topsail terrane and the relatively little data available for the associated volcanic rocks (Sheffield volcanics of Coyle *et al.*, 1986), require an exploration program in this target area, which would include lithogeochemical, prospecting and regional geochemical surveys, before definite detailed follow-up targets can be located. The conclusions of Coyle *et al.* (1986) and Strong and Coyle (1988) suggest that the peralkaline nature of the Sheffield volcanic rocks is due to metasomatic processes rather than primary igneous processes; if this conclusion is true, then these volcanics should be evaluated with a fifth, metasomatic, setting in mind, otherwise setting 2 is most likely.

Kings Point complex (Figure 3): This complex (*circa* 350 km^2) consists of alkali to peralkaline syenites and granites and associated peralkaline and non-peralkaline rhyolitic pyroclastics and quartz–feldspar porphyries (Kontak and Strong, 1986; Mercer *et al.*, 1985). Kontak and Strong (1986) suggest that all of these rocks form a subvolcanic–volcanic complex dominated by a cauldron subsidence structure. The geology indicates that rare-metal mineralization would occur within subvolcanic veins and dykes or disseminated in volcanic units similar to setting 2 (Flowers River Igneous Suite) or 3 (Mann #1 Showing). The Kings Point complex closely resembles both the Flowers River and Mann #1 settings in many aspects, including the structural setting and the occurrence of both peralkaline and non-peralkaline rhyolitic volcanic units. Very little geochemical data is available for the peralkaline rocks of this complex (Table 4; trace-element data taken from graphs in Kontak and Strong, 1986; major-element data unavailable), hence little can be said about the potential for rare-metal mineralization. The size and geology of this complex requires an extensive lithogeochemistry and prospecting program, to adequately evaluate the rare-metal potential; an initial lake sediment survey would be valuable in reducing the area to be covered by ground programs.

Seal Island Bight granite (Figure 3): This peralkaline granite (*circa* 4 km^2) was mapped as part of the La Scie intrusive suite (DeGrace *et al.*, 1976) on the Baie Verte

Penninsula. The lack of evidence to suggest that this granite was vented to the surface (e.g., absence of associated peralkaline rhyolitic volcanics in the nearby Cape St. John volcanic rocks) indicates that any rare-metal mineralization associated with this intrusion would be found in setting 1. Several chemical analyses have been reported (DeGrace *et al.*, 1976; Whalen *et al.*, 1986; Table 4). The comparison of these data with those of similar peralkaline granites in Labrador (Table 1) indicates that the Seal Island Bight granite is a poor rare-metal exploration target. A thorough island-wide exploration program should include basic lithogeochemistry and prospecting reconnaisance to verify and support this conclusion and the earlier published geochemical data.

Cross Hills Plutonic Suite (Figure 4): The Cross Hills Plutonic Suite contains a peralkaline granite (*circa* 8 km²), which has aplite veins containing significant values of Zr, Y and Nb (Hopfengartner, 1982; Tuach, 1984; Saunders and Tuach, *this volume*) similar to setting 1 or setting 2. The regional geology (O'Brien *et al.*, 1984) indicates that the spatially related Mooring Cove Formation felsic volcanic rocks (Long Harbour Group) may be extrusive equivalents of or otherwise related to the Cross Hills Plutonic Suite; i.e., related in a manner similar to that of the Letitia Lake Group non-peralkaline volcanic rocks and peralkaline intrusives. Rare-metal ranges for the Cross Hills peralkaline granite (Strong *et al.*, 1974) and the Mooring Cove rhyolitic rocks (S.J. O'Brien, personal communications, 1988) are in the lower portion of the ranges for the Labrador peralkaline rocks. Yet, the occurrence of high values (Saunders and Tuach, *this volume)* in veins and dykes indicate that the Cross Hills peralkaline granite contains good potential for significant rare-metal mineralization. An exploration program of the peralkaline granite would require a detailed prospecting and lithogeochemistry survey. A program for the Mooring Cove Formation would initially require a regional lake sediment or lithogeochemical survey to reduce the target area, and to follow this up, with detailed lithogeochemical and prospecting surveys.

Louil Hills peralkaline granite (Figure 4): This peralkaline granite (*circa* 5 km²) is part of the Louil Hills suite, which was mapped and described recently by O'Brien (1987). The interpretation of the regional geology (O'Brien *et al.*, 1988) indicates that the Bull Arm Formation (Musgravetown Group) is spatially, chemically and temporally related to the Louil Hills suite, in a manner similar to that of the Mooring Cove Formation and the Cross Hills Plutonic Suite (i.e., the Bull Arm Formation is not peralkaline in major-element chemistry, but has similar trace-element characteristics). Rare-metal mineralization in the Louil Hills area, if present, would probably be found in either settings 1 or 2. Available chemical analyses for the Bull Arm Formation rhyolitic rocks (Table 4; S.J. O'Brien, personal communication, 1988), when compared with analyses of felsic volcanics associated with rare-metal mineralization (Table 1), indicate that there is good potential for volcanic-hosted mineralization. These rocks have the best Y–Nb potential of any volcanic rocks sampled in insular Newfoundland. Evaluation of the rare-metal potential of the Louil Hills

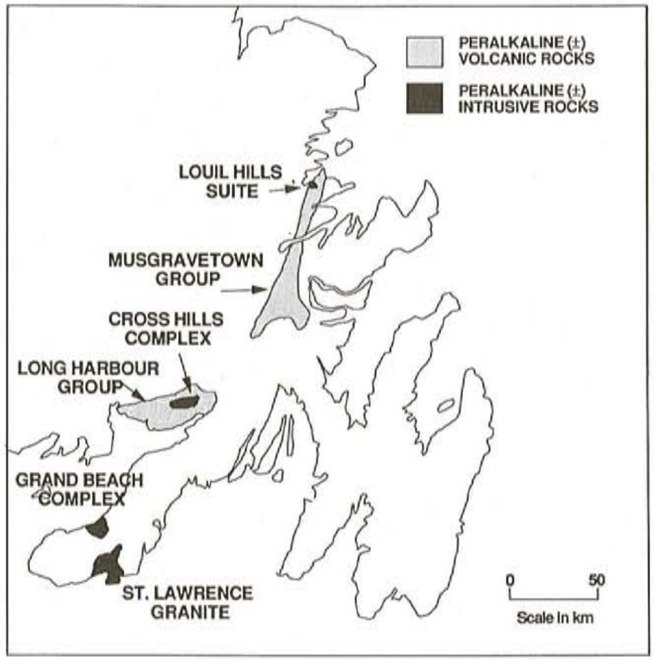

Figure 4. *Rare-metal targets in south–eastern Newfoundland; peralkaline and peralkaline-related volcanic and high-level plutonic rocks.*

peralkaline granite could be accomplished with a relatively minor lithogeochemical and prospecting program, due to the limited areal extent of these intrusive rocks. The regional occurrence of the Bull Arm Formation (> 500 km²) would require a major lake sediment geochemical program, to locate follow-up targets for an extensive lithogeochemistry and prospecting program.

St. Lawrence Granite (Figure 4): This peralkaline granite (*circa* 40 km²) is well known as an economic source of fluorite, which occurs in numerous veins. It also has good potential for rare-metal mineralization in either settings 1 or 2 veins, or disseminated in setting 2 peralkaline volcanics. The St. Lawrence peralkaline granite has been the focus of extensive exploration for fluorite veins; significant rare-metal mineralization was not located during any of this exploration activity. Mapping in the surrounding region has uncovered peralkaline rhyolitic flows and ignimbrite (Rocky Ridge complex; Strong *et al.*, 1978) and peralkaline quartz-feldspar porphyries, which may be extrusive equivalents of the granite. These possible extrusive equivalents have not been sampled or evaluated for rare-metal mineralization and have unknown potential. Chemical values for rare-metal elements (Teng and Strong, 1976; Whalen *et al.*, 1986) from the St. Lawrence Granite (Table 4) indicate a low potential for significant mineralization. Reported analyses for some rare metals from the fluorite veins (Strong *et al.*, 1984) indicate that Y values are significant in the fluorite. This suggests that all of the known fluorite veins should be sampled for rare-metal mineralization. It also indicates that the granite has good potential for mineralization in other kinds of veins, if they are present.

Grand Beach complex (Figure 4): The rocks of this complex are (Strong *et al.*, 1978) possible equivalents of the St. Lawrence Granite as they have similar trace-element characteristics. Chemical analyses for these rocks have, as yet, not been published, but unpublished results (see Table 4; S.J. O'Brien, personal communication, 1988) indicate that although these rocks do not have Agpaitic Indices greater than one, they do have the high trace-element values indicative of rocks of peralkaline affinity; however, peralkaline minerals have not been observed. Mapping and core-logging work (Pitman, 1978) has indicated that most of these rocks are rhyolitic tuffs, ignimbrites and agglomerates. A reconnaissance lithogeochemistry and prospecting program would be required to evaluate their suitability as a target, and a further analysis of the BP core (Pitman, 1978) for rare-metal elements would aid in the evaluation process.

CONCLUSIONS

Metallogenic studies of rare-metal mineralization in Labrador has resulted in the development of a metallogenic model for high-level felsic peralkaline rock-hosted rare-metal mineralization. This model can be applied to insular Newfoundland to assist geologists when exploring for rare-metal deposits.

A literature survey of the geology of insular Newfoundland indicates that there are eight occurrences of extrusive and/or intrusive rocks of peralkaline nature or peralkaline affinity and these occurrences can be ranked as to their exploration potential as follows:

1) Louil Hills peralkaline granite—Bull Arm Formation—The high values of Y (570 ppm) and Nb (490 ppm) make the Bull Arm Formation a very favourable exploration target.

2) Cross Hills peralkaline granite—Several aplite veins contain high grades, but insignificant tonnages of rare-metal elements, indicate that rare-metal concentration processes were operative during the formation of this granite, however, it is difficult to evaluate if significant recoverable tonnages were produced.

3) Topsails peralkaline granite—The available analyses for the numerous granite bodies in the Topsails igneous terrane are not encouraging, but the large number and great areal extent of these bodies indicate that much more work is required, before these peralkaline granites can be considered barren. The related Sheffield volcanic rocks also have an unknown potential.

4) St. Lawrence peralkaline granite—High values of Y in fluorite veins indicate that rare-metal element concentration processes were operative during the formation of this granite. Evaluation of rare-metal concentrations in all fluorite veins has not been attempted and a search for rare-metal-enriched pegmatite—aplite veins has not been carried out.

5) Kings Point complex—The large areal extent and lack of rare-metal analyses make the rare metal potential of the rocks of this complex unknown; further work is needed to better evaluate its potential.

6) Grand Beach complex—The lack of extensive analyses of the rocks of this complex make its potential unknown.

7) Seal Island Bight peralkaline granite—The relatively poor concentration of rare-metal elements in this granite indicate that it is a low priority target; reconnaissance work is needed to better evaluate its potential.

8) Hare Hills peralkaline rocks—The lack of data and small areal extent of these rocks make them a low priority target; more information is required to better evaluate these rocks.

This preliminary evaluation indicate that there are several high-potential exploration targets in insular Newfoundland.

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