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PRELIMINARY REPORT, GEOLOGY OF LEGENDRE AREA (MONT-TREMBLANT PARC), MONTCALM AND JOLIETTE COUNTIES

P.R. NO. 541

DEPARTMENT OF NATURAL RESOURCES

RENÉ LÉVESQUE, MINISTER

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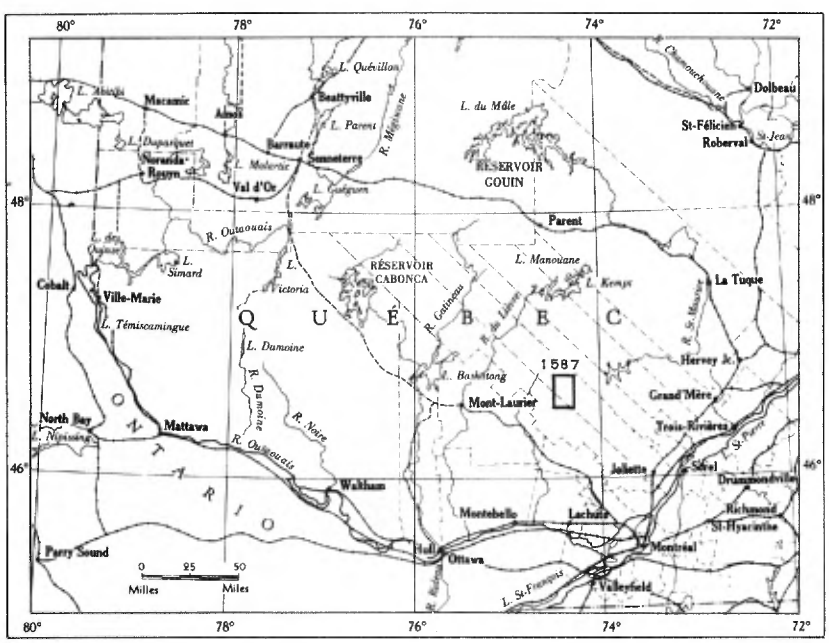
by

M.B. Katz



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GEOLOGICAL EXPLORATION SERVICE

H.W. MCGERRIGLE, CHIEF

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Preliminary Report

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INTRODUCTION

The Legendre area was mapped during the summer of 1964. This area of 205 square miles is bounded by latitudes 46°30' and 46°45', and longitudes 74°15' and 74°30'. It lies entirely within Mont-Tremblant park and includes the whole of Legendre township and parts of Forbes, Olier, Lusignan, and Laverdière townships in Joliette county, and parts of Jamet, Cousineau and Viel townships in Montcalm county.

Although there is no settlement in the area, it is accessible by a network of park and private logging roads. The eastern part can be reached from St-Michel-des-Saints and St-Guillaume-Nord by way of Cypress Depot and various private roads of the Consolidated Paper Company. Another road that services Mont Tremblant park north of St-Faustin enters the southern part of the area and goes as far as Diable lake.

The southwest portion can be reached by means of a logging road of the International Paper Company from north of Macaza to Savane lake and as far north as des Mocassins lake. Access to the northwestern part is made by float-plane.

The area is in the Laurentian uplands. Many of the valleys have been filled with drift and, as a result, the relief is generally quite moderate. In the north and central parts of the area the largest valley is that of Matawin river and its tributaries which include En Escalier brook and the west branch of Matawin river. The Diable (Devil) River valley is the largest in the southern part of the area. The greatest local relief is about 1,000 feet from the bottom of the valley of En Escalier brook to the fire tower located at the northern boundary.

The topography in many places reflects the underlying lithology and structures. Much of the surface expression of igneous rocks is more rugged than areas of predominant gneiss and granulite. These latter rocks underlie plateau-like areas in many cases. Streams and lakes commonly mark contacts and so generally outline structural or lithological units.

Most of the area drains to the St. Lawrence by way of Matawin river to the St-Maurice. The southern part of the area is drained southward to the Ottawa by way of Diable river to Rouge river.

GENERAL GEOLOGY

The area is part of the Grenville subprovince of the Canadian Shield and all of the consolidated rocks are Precambrian in age.

The oldest rocks are believed to belong to the Grenville Series, and consist of pyroxene, hornblende, and biotite gneisses, rusty-weathering garnet-sillimanite gneisses, quartzites, and calcareous gneisses. They cover a fairly large area around Diable lake in the southeast and occur as irregular bands and lenses throughout the map-area. Although one particular member of the series may be predominant locally, they are interlayered and, in many places, are intergradational.

The pyroxene, hornblende and biotite gneisses also form bands in the granulites and in migmatite zones. Near igneous contacts, the rocks are commonly converted into porphyroblastic augen gneisses and are granitized to variable degrees. The rusty-weathering garnet-sillimanite gneisses are less common than the mafic gneisses. Quartzites are the least common of all. Many large exposures of porphyroblastic, alaskitic, augen gneiss are associated with quartzite zones in the quartz mangeritic augen gneisses. Of the scattered outcrops of limy rocks, most are remnants or inclusions in later rocks and have been converted into calc-silicates. Calcareous rocks are also found as small local interlayers associated with biotite and garnet gneisses.

The green (charnockitic) pyroxene granulites are interbanded with the paragneisses at the border of the quartz mangerite bodies and in the

banded gneiss complex. The pink alaskitic granulites define large lens-shaped bodies that occupy the cores of folds and appear to be mixed with the banded gneiss, as in the eastern part of the area.

A large intrusive sheet of green quartz mangerite in the central part of the area has been deformed to give augen and flaser gneisses. Probably related to the quartz mangerites are the coarse-grained pink and brown granites and quartz syenites. These rocks are characteristically porphyritic but may be deformed. They occur as large stock-like circular masses, whose borders are generally conformable to the attitude of the surrounding gneisses.

The youngest rocks are the aplite and pegmatite dikes, which intrude all the other rocks and are particularly common in the banded gneisses. Pegmatites and aplites are also extensively developed in migmatite zones. Melanocratic dikes, which may be younger than the pegmatite and aplite dikes, cut the paragneisses and the quartz mangerite augen gneisses.

GRENVILLE SERIES

Pyroxene, Hornblende and Biotite Gneisses

Many of the pyroxene, hornblende and biotite gneisses are associated with garnet gneisses; they also form common but local conformable bands and pods in the granulites. The pyroxenic gneisses are more commonly associated with the pyroxene granulites, whereas many hornblendic varieties and amphibolites occur in the alaskitic granulites. In places, the rock has recrystallized into biotite-rich, medium- to coarse-grained, granitic material near igneous contacts.

Other constituents include microperthite, quartz, plagioclase and garnet. Rutile, pyrite and graphite are conspicuous accessory minerals.

These gneisses are gray to dark green and black, fine grained and usually well foliated or banded. The weathered surface is commonly somewhat rusty and speckled, and streaked with quartzo-feldspathic stringers. The gneisses are well exposed on the shores and islands of Diable lake.

Garnet-sillimanite Gneisses

These rocks are characteristically rusty on the weathered surface. A fresh specimen is usually gray and may have a pinkish cast. The rocks may be foliated (and highly contorted), banded, or quite massive.

Table of Formations

Pleistocene and Recent			Clay, sand, gravel, boulders
PRECAMBRIAN	LATER INTRUSIVES		Diabase dikes
	MORIN SERIES	Pine Hill	Pegmatites and aplites Pink to brown porphyritic granites, syenites and augen gneisses
		Buckingham	Quartz mangerite augen gneisses
	GRANULITES		Alaskitic granulites (Trembling Mountain gneisses) (includes banded gneisses) Charnockitic pyroxene granulites (green-gray granitic gneiss)
	?		Porphyroblastic augen gneisses (biotitic and alaskitic)
	GRENVILLE SERIES		Calcareous and calc-silicate rocks Quartzites Garnet-sillimanite gneisses Pyroxene, hornblende, and biotite gneisses

Small and pink to quite large red crystals of garnet are conspicuous. In some instances, as on the shores of Wood lake in the south corner of Legendre township, shimmering, felted groups of sillimanite needles surround the garnet crystals. Graphite flakes are disseminated throughout the rock.

Quartzites

Dense, massive, dark grayish-blue, in places opalescent, quartzites are common as inclusions in the later intrusive rocks. Where interbanded with the paragneisses, the quartzites seem to grade into garnet-sillimanite gneisses, and become progressively richer in garnet. Contacts may be sharp or gradational.

Calcareous and Calc-silicate Rocks

Calcareous and calc-silicate rocks are rare in the area. They are found as layers within the other paragneisses and more often as calc-silicate inclusions at the contacts of later intrusions. The rock exposed on the North Matawin River road contains appreciable amounts of phlogopite and apatite. A grayish, coarsely crystalline marble was found on the south-west shore of Mosquic lake in Jamet township. Disseminated flakes of graphite and mica and small green crystals of diopside may be identified in hand specimens. Many of these rocks contain grossularite, plagioclase, scapolite, sphene, wollastonite and other lime silicate minerals.

Porphyroblastic Augen Gneisses (Grenville ?)

Most, if not all, of the rocks of the Grenville type have been affected by migmatitization and granitization, especially near the contacts of the later intrusive rocks. In many contact zones feldspar metacrysts seem to have grown, usually along foliation planes, to eventually convert the rock into a porphyroblastic augen gneiss. Dark and pink varieties of the latter are common in the area.

The darker variety contains large, conspicuous augen-shaped porphyroblasts of pink feldspar, wrapped in a biotitic matrix. This type, referred to as biotite porphyroblastic augen gneiss, may cover extensive areas and seems to grade imperceptibly into quartz mangerite augen gneisses, like those north of des Mocassins lake. It may also contain hornblende, plagioclase and, in a few places, pyroxene.

The pink type (alaskitic porphyroblastic augen gneiss), which resembles some varieties of the Pine Hill granites, consists of about 60% augen-shaped porphyroblasts up to 2 inches long of reddish-pink feldspar embedded in a coarse, dark, quartzose matrix making up about 35% of the rock. This rock may have a little biotite and iron ore besides the quartz and feldspar. Large exposures are found with quartzites and quartz mangerites, such as those near the En Escalier brook fire tower at the northern boundary. Every gradation from apparently pure quartzite to feldspathized quartzites and ultimately 'alaskitic porphyroblastic augen gneiss' may be seen.

GRANULITES

Charnockitic Pyroxene Granulite

Much of this fine-grained rock weathers to a thin, white, chalky surface beneath which is a rusty zone a few inches thick. The fresh rock is dark green to almost bluish and has a peculiar resinous appearance. It may be well foliated, streaky with small eyes, or, occasionally, massive. On the weathered surface the minerals making up the foliation can be seen to be dark quartz leaves and streaks of pyroxene with a bronze luster. The small augen of feldspar usually have a scaly appearance, probably owing to deformation of cleavage flakes. A good exposure of this rock occurs with the quartz mangerites at the small falls near the North Matawin River road just northeast of Legendre lake.

Thin, dark, interbanded gneisses and conformable quartz lenses and bands are common. Local sills and dikes of pink, occasionally zoned pegmatites and aplites cut these rocks. The gneisses consist of about 50% microperthite and/or antiperthite (oligoclase), 35% quartz and 10-15% pyroxene. Hornblende and biotite are also usually present.

Alaskitic Granulite

These rocks are usually pink, slightly gray when weathered, and thinly foliated. Very fine leaf-like plates of dark quartz contribute largely to making up the foliation. Contortions and small flow folds are common. The outcrops show typically conformable quartz bands and quartzose pods and blocks. Layers of dark gneisses are commonly distorted and drawn out, and are occasionally ruptured in boudins. Dikes and sills of pegmatite and aplite are quite common in the granulites.

The rocks are composed of about 50% microperthite and oligoclase antiperthite, the former usually predominant, and 45% quartz. Garnet makes up as much as 5% of the rock and pyroxene, hornblende and biotite may also be present.

A similar granulitic rock with abundant dark layers occurs on the Bess Lake road in the northeast quarter of the area and defines a complex of banded gneisses.

MORIN SERIES

Buckingham Rocks

Quartz Mangerite Augen Gneiss

These rocks are usually medium to coarse grained, with a rusty subsurface and a gray, rough weathered surface. The fresh surface varies from green in pyroxene-rich rocks to pinkish in hornblende-rich varieties. The quartz mangerites occur as a large sheet-like concordant body in the central and northern parts of the area. Excellent exposures are found west of the North Matawin River road, north of Legendre lake.

The rock is composed of about 40% plagioclase, 35% microperthite, 10% quartz and 10% pyroxene and/or hornblende. Garnetiferous facies are common near contacts. Much of the plagioclase in these rocks is mantled by microperthite. The pyroxene converts to hornblende during increasing deformation.

Pine Hill Rocks

Pink to Brown, Porphyritic Granites, Syenites and Augen Gneisses

The Pine Hill intrusive rocks are relatively undeformed, coarse-grained, porphyritic granites and quartz syenites. Brown varieties are usually pyroxene-bearing and pink varieties are rich in hornblende. In the area, the rocks are mainly exposed in two stock-like masses in the southeast corner around de la Poupée (Dolly) lake and in the southwest corner west of Albert lake.

The phenocrysts are quite large (up to 2 inches), pink to iridescent and may be euhedral, rounded or deformed into augen. The rock consists of about 40% perthite, 30% plagioclase, 20% quartz and 10% pyroxene and/or hornblende. Many of the perthites are mantled by an antiperthitic plagioclase, as in a rapakivi texture.

Pegmatites and Aplites

Coarse pegmatites and finer grained aplite dikes cut all the other rock types in the area except the diabase. They are particularly abundant in migmatite zones at igneous contacts and in the banded gneisses and the granulites. They are composed of microcline perthite, plagioclase and quartz. Other minerals found in the pegmatites are pyroxene, hornblende and biotite. Tourmaline-bearing pegmatites were found in the paragneisses on Diable lake.

LATER INTRUSIVE ROCKS

Diabase

Only a few diabase dikes were seen in the area. A typical exposure is just west of the En Escalier brook fire tower at the northern boundary. It is a dark dike about one foot thick and cuts garnetiferous gneisses. Chilled contacts are conspicuous and the core is coarser grained and porphyritic. Phenocrysts of feldspar are set in an aphanitic groundmass composed of quartz, feldspar and dark minerals.

PLEISTOCENE AND RECENT

Glacial and fluvioglacial material is widespread across the area and, in places, is quite thick, as around Mosquic lake. Many of the hills are covered with drift and boulders and many valleys are filled with clay, sand and gravel. The direction of ice movement was from the north as indicated by glacial striae, crescentric gouges, scour, and roche moutonnées.

STRUCTURAL GEOLOGY

Foliation

Most of the rocks are more or less foliated, and consequently foliation is the most important structural element in the area. The general regional trend is northeast, and is especially well developed in the south.

Dips are moderate to steep to the southeast. Northerly to northwesterly strikes are common in the northern part of the area. Here the dips are less consistent, implying more complex structures. The quartz mangerite sheet and the granite stocks seem to be conformable to the trends of the adjacent gneisses and granulites.

Lineation and Folds

Lineations, mostly developed by elongation of quartz leaves in the gneisses and granulites, are quite consistent throughout the area and are generally southward with moderate to steep plunges. Other minerals contributing to lineation are spindles of feldspar and prisms and plates of dark minerals. Minor drag folds and boudinage structures also have linear elements.

Indications of folds are found in the banded gneiss complex of the northeast quarter of the area. Fold-like features are also found in the paragneisses east of Mosquic lake in the west center of the area and in the quartz mangerites and associated porphyroblastic augen gneisses near the northern boundary. The distortion and folding of the dark layers in the banded gneisses suggest flowage.

Faults, Joints and Lineaments

Many small, faulted, dark bands in the granulites show displacements up to several inches. Larger structures possibly include the north-south scarp that marks the limits of exposures of granulites in the northwestern corner and the linear feature that lies to the west of the North Matawin river north of Legendre lake in the north center.

ECONOMIC GEOLOGY

Iron and Titanium

A magnetic anomaly of 6,900 gammas (4,000 gammas regional) at the north end of Legendre lake was investigated. There is a general lack of good exposures here, but the quartz mangerites contain much iron- and titanium-oxide minerals as fine aggregates interstitial to the feldspathic augen. In places these oxides seem to make up 5-10% of the rock.

Chalcopyrite

A few specks of chalcopyrite were found in the banded gneisses near the first bridge on the Matawin River road northwest of the Sac-à-Commis fire tower. The chalcopyrite specks are more or less altered to a pale green powder (malachite) and seem to be confined to a dark inter-banded layer, locally rich in garnet.

Pyrite

Pyrite is disseminated in the paragneisses and contributes in many places to the rusty-weathering surfaces so common in these rocks. A peculiar quartzite containing up to 5% tiny pyrite cubes was found in the alaskitic porphyroblastic augen gneisses near the En Escalier brook fire tower in Laverdière township.

Graphite

Graphite is conspicuous as disseminated flakes in some of the rusty-weathering gneisses around Diable lake. It is also found locally in appreciable amounts in the calcareous gneisses, where it occurs as scattered, coarse, pod-like masses up to one inch in diameter.

Phlogopite

Coarsely crystalline phlogopite as large as 2 by 4 inches was found on the North Matawin River road near the northern boundary in a fine-grained lime-silicate rock. Some portions of the rock contained more than 50% phlogopite.

Monumental and Construction Stone

Just southwest of the area in the Savane Lake region, some of the granites and syenites are being tested at present for monument stone. Sand and gravel are used extensively for local road maintenance and construction.

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