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PRELIMINARY REPORT ON PEPPLER LAKE AND CAILLETEAU LAKES AREA (WEST HALF), SAGUENAY COUNTY

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PRELIMINARY REPORT

ON

PEPPLER AND CAILLETEAU LAKES AREA (WEST HALF)

SAGUENAY COUNTY

BY

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Preliminary Report

on

PEPPLER AND CAILLETEAU LAKES AREA (WEST HALF)

Saguenay County

by

A.J. Sinclair

INTRODUCTION

The Peppler and Cailleteau Lakes Area (west half), mapped during the summer of 1960, is some 145 miles north-northwest of Sept-Iles and 25 miles northeast of Jeannine lake. The 306-square-mile area is bounded by longitudes 67°45' and 68°00', and by latitudes 52°30' and 52°05'. It contains most of Thury and Beaudoin townships, and parts of Menneval, Sevestre, Boucault, Claudel, Laussedat and Tilly townships.

Access by float plane is limited to the larger lakes in the northernmost portion of the area. An alternative is to fly to Elbow lake, 1½ miles south of the area on Little Manicouagan river (west branch), and proceed north by canoe. This river is easily navigable from Little Manicouagan lake, 14 miles south of the south boundary of the area, northward to a point 1½ miles within the area. Farther north, the river contains many rapids but may be navigated with difficulty to within 6 miles of the northern boundary. Little Manicouagan lake is accessible by a 190-mile road from Shelter Bay on the Gulf of St. Lawrence. The proposed extension to Mount Wright of the Shelter Bay - Jeannine Lake railway passes through the southeast corner of the area.

Drainage is effected entirely by the Manicouagan river system, whose waters flow southward into Little Manicouagan lake and eventually reach the St. Lawrence by way of Manicouagan river.

Within the map-area most of the surface lies between 1,900 and 2,500 feet above sea-level. Merry mountain, the highest point in the region, has an elevation slightly greater than 2,800 feet. The northern third of the area is rugged, with local relief up to 600 feet. This rougher topography is mainly a reflection of the underlying migmatized feldspar-quartz-biotite gneisses. The reflection of the underlying bedrock in topography is best illustrated by the "metasedimentary group", which commonly crops out as

hills or ridges. Ultramafic rocks normally crop out as small but prominent knolls.

Forest cover is sparse and consists mainly of black spruce and larch. Small amounts of jackpine, poplar and birch occur locally, and alders and small shrubs are plentiful. Roughly one-quarter of the area has been burned over, and little new growth has yet appeared.

The area is part of a larger region that was mapped geologically at a scale of 4 miles equals 1 inch by Duffell and Roach (1959). Geological mapping on a scale of ½ mile equals 1 inch has been carried out on areas adjoining the present map-area by Phillips (1959), MacKean (1959), and Sinclair (1960).

GENERAL GEOLOGY

Pleistocene and Recent deposits of till, sand and gravel, glacial erratics and peat cover more than 95% of the area. Exposures of rock, therefore, are relatively few and scattered.

Migmatized feldspar-quartz-biotite gneiss, and a variety containing accessory hornblende and epidote, are the oldest rock types present, and crop out mainly in the northern third of the area. Members of the metasedimentary group, including marble, quartzite, iron silicate rocks, quartz-magnetite rocks, and quartz-specularite rocks, overlie the gneisses. Several occurrences of specularite and magnetite-bearing rocks are of sufficient size to be of economic interest. An upper, migmatized, feldspar-quartz-biotite gneiss, which overlies the metasedimentary group, is lithologically indistinguishable from the lower migmatized rocks. Feldspathic gneisses, with a wide range in content of hornblende, biotite, and garnet, overlie the upper migmatized gneisses.

Igneous-appearing rocks include a few small pegmatite bodies; a single outcrop of massive quartz diorite; and scattered exposures of coarse-grained, ultramafic rock in the southern half of the area along the valley of Little Manicouagan river (west branch).

The rocks of the area were subjected to at least two periods of folding. Each orogeny produced attendant characteristic linear structures, such as small folds and lineations, which are particularly well developed in the migmatized gneisses.

All rocks in the area have been subjected to high-grade metamorphism under conditions corresponding to the almandine-amphibolite facies. Chloritization and epidotization are rare.

TABLE OF FORMATIONS

PLEISTOCENE AND RECENT		Till, sand and gravel, glacial erratics and peat
Unconformity		
PRECAMBRIAN	Intrusive (?) Rocks	Pegmatite
		Quartz diorite
		Ultramafic rocks
		Hornblende-bearing feldspathic gneiss complex: characterized by highly variable proportions of hornblende, biotite, and, to a lesser extent, garnet.
		Migmatized feldspar-quartz-biotite gneiss. In places contains accessory graphite.
	Metasedimentary Group	Marble; quartzite; iron silicate iron rocks; quartz-magnetite rocks; and quartz-specularite rocks
		Migmatized feldspar-quartz-biotite gneiss. Garnet is a common accessory mineral. A distinct variety contains accessory hornblende and epidote.

PRECAMBRIAN

Migmatized Feldspar-quartz-biotite Gneiss

A lower migmatized feldspar-quartz-biotite gneiss is the oldest rock exposed in the area. It is fine to medium grained, grey, and crystalline, and contains up to 30 per cent medium- to coarse-grained pegmatite. Outcrops weather rusty or dark grey. Feldspar is normally in excess of quartz, and biotite generally ranges from 10 to 20 per cent. Garnet and muscovite are the main accessory minerals, although sporadic. In the northeast corner of the area, the gneisses are comprised mainly of a variety containing accessory hornblende and epidote. In the immediate vicinity of Merry mountain, and stratigraphically close to the metasedimentary group, the rock is a feldspar-quartz-muscovite gneiss. Hornblende-epidote-bearing rocks are commonly interbedded with gneisses lacking hornblende and epidote and are of little use as marker beds.

The pegmatites are pink to white, coarse to medium grained, and are composed of variable proportions of quartz and feldspar. They are in discontinuous layers varying from ½-inch or less to several inches thick.

Coarsely crystalline, dark green pods and lenses of amphibolite up to several inches thick are widely scattered in the lower gneisses. In some instances within the cores of small folds the amphibolites are thickened to as much as one foot. Mineral components are mainly hornblende, biotite and plagioclase, with or without garnet and minor calcite. The original layered nature of these amphibolites is indicated by the fact that they are spaced intermittently along specific horizons.

An upper migmatized feldspar-quartz-biotite gneiss overlies the metasedimentary group and is lithologically indistinguishable from the lower migmatized rocks. However, a few outcrops of the upper migmatized gneisses contain accessory graphite, whereas, in the lower gneisses, graphite appears to be absent.

Foliation in the migmatized rocks is due to platy parallelism of micas, compositional layering within gneisses, and the discontinuous pegmatitic layers, all three of which structures are parallel. The foliation is highly contorted.

METASEDIMENTARY GROUP

The metasedimentary group includes marble, quartzite, and rocks rich in iron silicates, and/or magnetite, and/or specularite. The marble and quartzite are commonly interfingered or interbedded with the iron-bearing rocks, and are records of abrupt changes in type of sedimentation.

The stratigraphic succession of the members of the metasedimentary group varies from place to place, and this irregularity

probably is related to facies changes in the original sediments (Knowles and Gastil, 1959).

Marble (Duley formation)

The marble is a medium- to coarsely-crystalline rock consisting of white calcite and dolomite with pale green calc-silicate (up to 30%) and white quartz (up to 10%) layers. The carbonates weather buff; the calc-silicates, to pale grey or white; and the quartz, to pale grey. Quartz and calc-silicates occur in layers 2 inches or less thick, which stand in relief about one half inch above the intercalated massive carbonate layers. The layers are generally extremely regular and possibly represent original beds. In some places, such as the south shore of Peter pond, small folds are abundant.

The thickness of the marble appears to be quite variable, although nowhere could it be accurately measured. The estimated minimum thickness at the south end of Casse lake is 55 feet, whereas 3½ miles to the northwest the calculated minimum thickness is more than 1,000 feet.

Within the area the marble commomly occurs at the base of the metasedimentary group. In the Merry Mountain section, however, it is missing and quartzite forms the base.

Quartzite (Wapussakatoo formation)

Quartzite directly overlies either marble or iron silicate rocks within the area, except at Merry mountain, where quartzite directly overlies a feldspar-quartz-muscovite gneiss. It is possible that the marble and quartzite may, in part, be time equivalents.

The quartzite is white to grey and medium to coarse grained. The beds vary from about 10 feet thick on the south shore of Peter pond to about 150 feet at Merry mountain. Colour layering, due to variable concentrations of accessory minerals, probably represents original bedding and is ordinarily more distinct in the medium-grained than in the coarse-grained types. The accessories include specularite, and/or magnetite, and/or muscovite, which, combined, do not generally exceed 3 per cent. However, a few thin layers of quartz-muscovite schist occur within the quartzite at Merry mountain.

Iron-bearing Rocks (Wabush Lake formation)

The iron-silicate rocks are dark brown to greenish brown and rusty weathering. They consist of varying amounts of quartz, iron silicates (amphibole and pyroxene), carbonate (at least some of which is calcite), and magnetite. Thin quartz-rich and silicate-rich layers, normally about one inch thick, stand out in relief on weathered surfaces. The silicates are medium grained and the other constituents are generally fine to medium grained. Although small folds are common in these rocks, the silicate

minerals do not appear to have a preferred orientation.

This zone is best exposed on the west and south shores of Peter pond, and west of Cassé lake.

Quartz-magnetite rocks crop out near Merry mountain, at the southwest corner of Peter pond, and north and northwest of Cassé lake. North of Cassé lake, quartz specularite rocks have recrystallized to coarse-grained, quartz-magnetite rock in aureoles up to one foot wide at the contacts with pegmatite.

Most of the quartz-magnetite zone is a dark grey, slightly rusty weathering, fine- to medium-grained, granular rock consisting of quartz, magnetite and minor amounts of iron silicates. The rock is thinly layered owing to varying degrees of separation of magnetite and quartz. Brown silicates occur as medium-grained crystals spaced intermittently along certain horizons. Magnetite normally constitutes about 40 per cent of the rock and is responsible for the characteristic dark grey colour. Foliation from outcrop to outcrop commonly is variously contorted.

Quartz-specularite rocks crop out at Merry mountain (where they are 40-150 feet thick), north of Cassé lake, 1½ miles west of the central part of Cassé lake, and near the northwest corner of Peter pond. In all instances the rock is medium to coarse grained and dark grey with a bright lustre. Quartz (30-90%) and specularite (10-70%) are the only major constituents. Accessory minerals are muscovite and biotite. Muscovite is especially common at Merry mountain.

Compositional layering is invariably present, with individual layers ranging from ¼-inch or less to several inches thick. This foliation is variably contorted. It possibly represents original beds.

Two thin layers of plagioclase-hornblende gneiss are exposed within the metasedimentary group in the vicinity of Merry mountain, and the mountain itself consists almost entirely of this gneiss. The rock is medium grained and dark grey. It weathers to a dark, dull grey with some rust. Mineral constituents are plagioclase, hornblende, biotite, and garnet. Combined mafic minerals normally total between 50 and 60 per cent of the rock.

Hornblende-garnet-bearing Feldspathic Gneiss

Hornblende-garnet-bearing feldspathic gneiss crops out meagrely in the southern half of the area. The rock varies widely in mafic mineral content and in structure. Mineral components in approximate order of abundance are: feldspar (50-95%), biotite (trace to 20%), hornblende (trace to 10%) and garnet (trace to 5%). Feldspar and garnet are the only minerals invariably present in appreciable amounts.

Where, as in a few exposures, mafic minerals are rare,

they commonly are concentrated in lenses up to ¼ inch thick, and the foliation is poorly defined. Where the mafic content is higher the gneissic structure is pronounced, and the mafic minerals may be concentrated in definite layers.

The colour of the rock depends on the mafic mineral content (varying from trace to 50%) and the colour of the feldspar (pink, pale grey, white). Thus the rock colour may be dark grey, pale grey or pink. Grain size varies from fine to medium.

The rocks are similar in appearance to the plagioclase-quartz-potash feldspar gneiss of the adjoining Georget Lake area (Sinclair, 1960). However, the potash feldspar porphyroblasts which are characteristic of the gneisses in the southern half of the Georget Lake area are rare in the present area.

Igneous-appearing Rocks

Pegmatite

Pegmatite occurs primarily as thin, contorted, lenticular layers that constitute an integral part of the feldspar-quartz-biotite gneisses. Several dykes and irregular bodies of pegmatite cut members of the metasedimentary group.

At the northwest corner of Peter pond, a north-striking, vertical dyke one foot wide cuts the quartz-specularite rock. The central 4 inches of the dyke consists of coarse, pink feldspar and quartz, with about 10 per cent specularite in feathery wisps elongated parallel to the dyke. The border zones are paler and lack specularite.

Northwest of Cassé lake, large irregular pegmatitic masses occur within the metasedimentary group. Near the north shore of Charlotte lake, quartzite is cut by a pegmatite dyke that is approximately 20 feet thick.

The pegmatites are post-deformational in age, and record the latest geological event in the area prior to uplift and erosion.

Quartz Diorite

A quartz diorite was found only south of Peter pond. The rock is pink, coarse grained, and massive, and consists of pink feldspar (85%), quartz (12%), muscovite (2%), and biotite (1%). It possibly represents a "fine-grained" phase of the pegmatite.

Ultramafic Rocks

Ultramafic rocks occur in four localities along a line roughly paralleling the southern part of the Little Manicouagan river(west branch). The rocks are characteristically medium to coarse grained and dark green. The weathered surface is pitted and commonly rusty. The major mineral components are hornblende and pyroxene, with small amounts of olivine, biotite and garnet.

PLEISTOCENE AND RECENT

More than 95 per cent of the area is covered with Pleistocene or Recent deposits, mostly till and glacial erratics with a lesser amount of sand and gravel. An esker, braided in places, follows much of the course of Little Manicouagan river (west branch). High sand plains, characterized by a roughly undulating topography and a preponderance of widely spaced jackpine growth, border the river in the southern part of the area. Crag and tail features point to a southerly movement of glacial ice across the area. Hill and valley elongations and glacial striations particularize this movement as south by south-southeast.

STRUCTURAL GEOLOGY

Folds

The area has been complexly folded and has undergone at least two periods of deformation, as suggested by lineation studies. Minor structures, such as small folds, are abundant, particularly in the migmatized rocks and the metasedimentary group. The small folds commonly indicate opposing directions of relative movement in individual outcrops, and, therefore, have not been used in the interpretation of the major folds outlined below.

The Merry Mountain fold, 3 miles south of the northwest corner of the area, is interpreted as a refolded, overturned syncline. The two limbs of the refolded structure are referred to as the Charlotte Lake fold on the west and the Nose Lake fold on the east. Abundant structural data are available only for the Nose Lake fold, which is plunging about 50° southward. The approximate axial planes of both folds strike north and dip 41° west.

Rocks of the matasedimentary group are exposed on a peninsula on the west shore of Peter pond, and the observed foliations indicate a tight syncline with an average east limb striking N. 42°W. and dipping 52° southwest, and an average west limb striking N. 20°W. and dipping 60° east. The calculated plunge is 17° in a direction S.30°E., and the approximate axial plane strikes N.30°W. and dips 87° west.

The southern three-fifths of the area represents a large, northwest-trending, synclinal structure. This is outlined by the lithologic sequence and by the orientation of foliations. From near the south end of Cassé lake to the southern boundary of the area, the lithologic sequence in ascending order is lower migmatized feldspar-quartz-biotite gneiss, metasedimentary group, upper migmatized feldspar-quartz-biotite gneiss, feldspathic gneiss, upper migmatized feldspar-quartz-biotite gneiss, metasedimentary group, and lower migmatized feldspar-quartz-biotite gneiss. Foliations commonly strike northwest and dip southwesterly near Cassé lake and northeasterly near the southern boundary of the area.

Shear Zone

Shearing zones are present in several outcrops in the southern part of the area, being close to ultramafic bodies. In general, they trend northwesterly or northeasterly. The rocks have been recrystallized following shearing.

Joints

The two most pronounced sets of joints strike approximately N.35°E. and N.45°W. respectively. Both dip steeply on either side of the vertical. A minor set of joints strikes about S.85° E. and also is nearly vertical. Most of the pegmatite-filled fractures parallel the minor joint set, although several dykes are perpendicular to it.

ECONOMIC GEOLOGY

Quartz-magnetite rocks crop out on the southwest shore of Peter pond, near the northwest corner of Cassé lake, in the vicinity of Merry mountain, and in the south-central part of the area. Although outcrops of the quartz-magnetite rock are not abundant, magnetic anomalies indicate considerable continuity of the various layers except in the last-mentioned case. The rock is predominantly quartz but contains an average of 30 to 40 per cent fine- to medium-grained magnetite, and some thin layers are almost entirely magnetite. Accessory iron silicate is present in some outcrops.

Quartz-specularite rocks crop out northwest of Peter pond, north of Cassé lake, and in the vicinity of Merry mountain. The Cassé Lake deposit consists of a number of low hills of iron-bearing rocks with a small proportion of intercalated quartzite and calc-silicate rock. The hills rise only from 10 to 30 feet above the surrounding ground level. The observed outcrop area is about 0.1 square mile. A conservative estimate of the Cassé Lake deposit would be 280,000 tons per vertical foot. This estimate includes only the area on the west side of Little Manicouagan river (west branch). It is possible that the zone of iron-bearing rocks extends to the east and joins with the Peter Pond deposit.

The Merry Mountain quartz-rocks occur as a thick, continuous layer within a refolded syncline. The content of specularite ranges from 5 to 70 per cent and, in many of the observed outcrops, it averages about 40 per cent.

The above-described locations of iron-bearing rocks are held by Quebec Cartier Mining Company Limited. A single outcrop of quartz-specularite rocks is located 1½ miles west of central Cassé lake, on claims held by Jubilee Iron Corporation Limited. This latter specularite rock is associated with iron silicate rocks and marble, and a magnetic anomaly was noted in the general region.

Eskers and sand plains, previously referred to, will be important sources of sand and gravel for road and railway construction when deposits in the general area are developed.

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