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PRELIMINARY REPORT, GEOLOGY OF L'OURS LAKE AREA, DUPLESSIS COUNTY

P.R. NO. 559

DEPARTMENT OF NATURAL RESOURCES

Honorable DANIEL JOHNSON
Minister

PAUL-EMILE AUGER
Deputy Minister

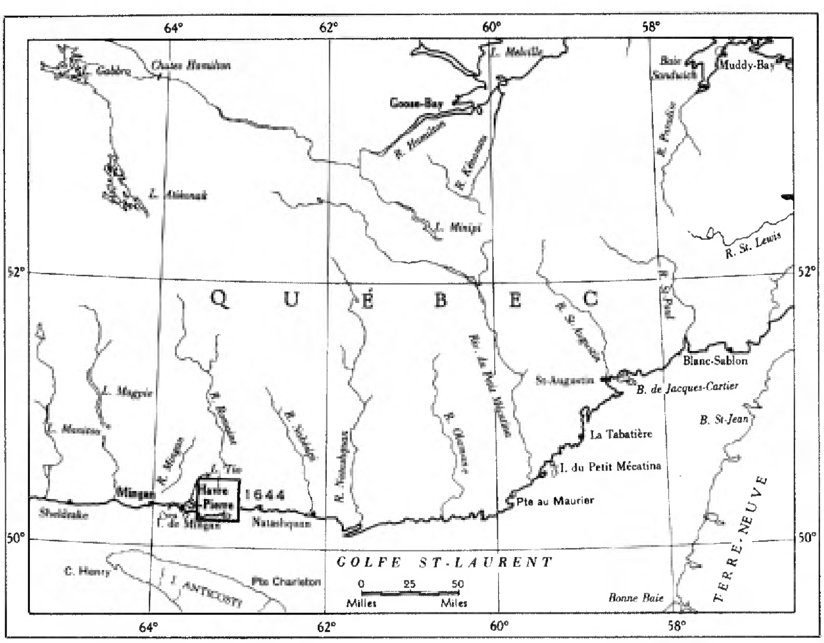
Geology
of
L'OURS LAKE AREA

DUPLESSIS COUNTY

PRELIMINARY REPORT

by

Jean Depatie



QUEBEC

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GEOLOGICAL EXPLORATION SERVICE

ROBERT BERGERON, Director

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INTRODUCTION

The center of L'Ours Lake area is situated about 30 miles east-northeast of Havre-Saint-Pierre on the Gulf of the St. Lawrence. The area is bounded by longitudes 63°00' and 63°30', latitude 50°30', and the north shore of the St. Lawrence river. Several near-shore islands, forming part of the Mingan archipelago, are also shown on the map. This area, which was mapped in the summers of 1964 and 1965, covers 400 square miles of Duplessis county.

Access and supply pose no serious problems. The village of Havre-Saint-Pierre lies only 4½ miles from the area's southwest corner and it is possible to reach almost all parts of the area either by fishing boat on the coast or canoe up the Romaine, Puyjalon, or L'Ours rivers. However the most efficient means of transport is by floatplane from the excellent base at Havre-Saint-Pierre.

Most of the area is untimbered. Its forest and thin humus cover were demolished by a forest fire about 20 years ago.

* Translated from the French.

Since then most of the unprotected soil has been washed off the hills. Rare clusters of the original vegetation were preserved along the rivers. The main species of trees are fir, spruce, birch and poplar.

Beaver, hare, duck and partridge are common in the area. Moose and caribou are rare. Salmon climb the Romaine and Puyjalon rivers and ouananiche and speckled trout are abundant in almost all the lakes of the area.

The area has a long history of geological study. H. de Puyjalon, J. Obalski and J. Richardson worked here near the end of the last century. Since then Twenhofel (1938) studied the fossiliferous limestones of the Mingan islands. In 1941, J. Retty (1944) explored the lower part of the Romaine river, and W. Longley (1950) made a geological survey of the north shore of the St. Lawrence between Mingan and Aguanish. The areas immediately northeast and east of L'Ours Lake area were mapped by P.-E. Grenier (1957) and G.E. Cooper (1957).

Topography

Except for the coastal zone which is marked by wide, flat, swampy marine terraces, the topography of the area is characterized by a peneplane with almost continuous bedrock exposure. The peneplane has a broken surface, deeply dissected by numerous narrow V-shaped valleys. The valley directions are controlled by shear zones, faults, differential weathering between different rock formations, and glacial erosion along joints parallel to the direction of ice movement. The Romaine is the only river to flow in a wide, swampy U-shaped valley.

GENERAL GEOLOGY

Most of the area's consolidated rocks are Precambrian in age. Ordovician sedimentary rocks underlie the coastal zone and offshore islands. The southwestern part of the area is almost completely covered by unconsolidated Pleistocene clay overlain by sand.

The oldest recognized rocks are metasedimentary (quartzites, paragneisses and schists) occurring in the southern and eastern parts of the area. Gabbroic intrusions accompany the metasedimentary rocks and the gabbro also occurs in a domical mass cut by granite in the north central part of the area. The most important intrusive body is the granite mass underlying the entire central part of the area. The same granite is exposed near Ferland and Milieu lakes in the eastern part of the area. The area's northwestern corner (Puyjalon Lake zone) is underlain by part of a large anorthosite massif stretching off to the northwest. This anorthosite is bordered by a band of slightly gneissic diorite which becomes quartziferous away from the anorthosite and grades into the granite in the center of the area.

Pegmatite, mainly concentrated in the southeast part of the area, cuts the Precambrian rocks.

PRECAMBRIAN

Metasedimentary Rocks

The metasedimentary rocks are believed to be the oldest rocks of the area. They are confined to the eastern part of the area and are particularly common near L'Ours lake. South of this lake they are folded and intruded by gabbro, granite and pegmatite. North of the lake they form an ellipsoidal dome, whereas in the northeast and southeast they appear to have been bent and assimilated by the Ferland Lake and Milieu Lake granite masses.

The metasedimentary sequence consists largely of impure quartzites, that is:mica-quartzite, feldspar-quartzite and quartz-biotite schist and gneiss. The rest is a quite pure, white to grayish, fine- to medium-grained quartzite with a vitreous or subvitreous luster on the fresh surface. The two types of quartzite are commonly interlayered as beds of a few inches to a few feet thick. As it is impossible to make a clear distinction between the two types of quartzite the map shows the more common of the two.

The mica and feldspar quartzites are the most widespread varieties of impure quartzite. They are grayish fine-grained rocks with a variable fissility depending on their biotite content. Although quartz is the principal constituent, feldspar makes up 45% of some rocks. Biotite never exceeds 15%. In folded or sheared sectors the quartzite becomes schistose, and the effects of mechanical deformation, such as crushed biotite flakes, show on the planes of schistosity. Quartz-

Table of Formations

PLEISTOCENE and RECENT		Clay, sand, gravel Boulders
GREAT UNCONFORMITY		
PALEOZOIC	Ordovician	Limestone, dolomitic limestone dolomite, sandstone, shale
GREAT UNCONFORMITY		
PRECAMBRIAN	Intrusive rocks	Pegmatite
		Pink biotite granite (fine to coarse grained)
		Gneissic granite, augen gneiss
		Augite and hypersthene diorite, quartz diorite
		Gabbro and its derivatives: fresh gabbro; altered gabbro, gneissic or schistose gabbro, hybrid rocks
		Titaniferous anorthosite, magnetite anorthosite, greenish and pinkish anorthosite
	INTRUSIVE CONTACT	
	Meta-sedimentary rocks	Migmatite: mixed gneiss, banded gneiss
		Mainly gray and white, massive, fine- to medium-grained quartzite
		Mainly impure quartzites: mica quartzite, feldspathic quartzite, quartz-biotite schist, quartz-biotite gneiss, mica schist

biotite gneisses are associated with these schists. These are fine-grained gneisses composed of alternating quartz-rich and biotite-rich layers and containing some small, well-formed garnets. In places the layers are fine enough to be called laminations.

The other type of quartzite has a massive appearance and is composed essentially of quartz (about 85%) with minor amounts of feldspar, biotite and magnetite. Its beds range in thickness from 6 inches to 8 or 10 feet. This is a hard, resistant rock,which underlies all the rounded quartzite hills of the area.

Migmatites (mixed gneiss, banded gneiss)

The quartzites and gabbroic rocks near the borders of granitic masses are cut by many granitic and pegmatitic injections. In places the resulting rock is intensely folded and deformed (by shear folds, boudinage) with the acid material intimately mixed through the quartzite and basic intrusive, to form a mixed gneiss. Elsewhere the rock resembles a banded gneiss with the granite injected into the quartzite lit-par-lit.

Anorthosite

An anorthosite massif fills the northwestern corner of the area and extends from there to the north and west. The Tio Lake ilmenite deposit, mined by the Quebec Iron and Titanium Corp. is situated in the anorthosite about two miles north of the upper eastern part of Puyjalon lake.

The anorthosite is a pale-colored rock and the bare anorthosite hills appear white from a distance. On fresh surfaces it is pale green or pink. At the border of the massif the rock contains more mafic minerals and appears brownish on both fresh and altered surfaces. In this zone the rock is friable and difficult to sample.

The anorthosite contains about 90% calcic plagioclase with some ilmenite disseminated almost everywhere through the massif. It ranges from medium to coarse grained and plagioclase phenocrysts 3 to 4 inches long are not rare.

Most of the anorthosite is massive,although its ilmenite shows a northeastern allignment where it is common enough to be noticed. Blocks of pink anorthosite up to 5 feet long are included in the green anorthosite. These blocks contain more mafic minerals than the common anorthosite.

Gabbroic Rocks

The term gabbroic rocks covers almost all the basic rocks of the area except the anorthosite and the dioritic rocks encircling it. Dikes and sills of gabbroic rocks occur only on the eastern side of the Romaine river. The only traces of these rocks west of the river are gabbroic inclusions in the granitic rocks.

A dike of fresh gabbro cuts the metasediments immediately east of Romaine river in the northern part of the area. It is a massive, friable rock, gray on the fresh surface and rusty weathering. Altered gabbro occurs to the south and east of L'Ours lake, both as sheets resting on the metasedimentary rocks and as intrusions cutting them. The altered gabbro may be massive, schistose or gneissic. The massive variety is coarse grained, hard and dense,and black with white specks. In strongly-folded or sheared sectors the gabbro develops a schistose texture becoming a fine-grained blackish rock composed almost entirely of acicular amphibole. In what appears to be the more strongly sheared localities, the gabbro is altered to a quartz-bearing amphibole-biotite gneiss. It is then difficult to distinguish it from the quartziferous biotite gneiss of metasedimentary rocks.

East of Cormier lake, the gabbro is in contact with a pink coarse-grained granite. The gabbro in this contact zone contains quartz grains and feldspar phenocrysts.

Quartz Diorite

A band of gneissic quartz diorite up to 2 miles wide borders the anorthosite massif. The quartz diorite - anorthosite contact is gradational over several hundred feet, or less commonly abrupt.

The diorite is dark brown to rusty on the weathered surface, and lighter brown on a fresh surface. As in the anorthosite, the grain size ranges from medium to coarse grained. Phenocrysts of plagioclase are common especially close to the anorthosite contact.

Close to the contact the diorite contains enough magnetite to attract a magnet. Quartz is rare here but increases with distance from the contact to a maximum of 15%. The mafic content varies irregularly through the quartz diorite but is generally about 30%. The mafic minerals are alligned to form a gneissosity parallel to the anorthosite-diorite contact.

Fine-grained pink alaskitic granite injects the quartz diorite in the south and southeast parts of the area. It forms quite regular lenses (50 to 100 feet wide by a half to one and a half miles long) oriented roughly parallel to the contact.

Transition zone

The outside edge of the quartz diorite belt has been affected by the arrival of the granitic rocks with which it lies in contact. Here, over a width of about a half mile it is difficult to separate the quartz diorite and granite, and the transition from quartz diorite to granite takes place through a zone of hybrid rock somewhat like the one between the anorthosite and quartz diorite.

Gneissic Granite and Augen Gneiss

Gneissic granite crops out along the east coast between Victor bay and Sauvage point and a little north of St. Lawrence bay. It is also found to the west of the upper part of Cormier lake and in the northeast corner of the area.

The augen gneiss seems to form the core of a dome structure north of L'Ours lake. Augen gneiss also occurs on a small island east of Charlie falls on the Romaine river, and north of these falls as several small bodies in the migmatites which border the granitic rocks.

The gneissic granite and the augen gneiss have similar mineral compositions: feldspar, quartz, biotite and magnetite. They are both pink in color and medium to coarse grained. In the gneissic granite, thin biotite-rich layers separate discontinuous bands composed almost entirely of feldspar and quartz. The feldspar augen of the augen gneiss are not more than an inch in diameter and are outlined by a thin rim of biotite.

Granitic rocks

The granitic rocks underlie about 50% of the area. They can be divided into three groups on the basis of composition, texture and field relationships.

1) Coarse-grained porphyritic granites, which may be either rich in ferromagnesians and brown in color or poor in ferromagnesians and pink.

2) Fine- to medium-grained, pink, leucocratic granites. This type of granite occurs mainly in the north central part of the area.

3) Fine-grained, pink, alaskitic granites; the alaskitic granites occur almost exclusively as dikes which cut the other types of granite but not the pegmatite. The alaskite has a sugary aplitic texture which in places is so pronounced that the rock resembles a sandstone.

The brownish porphyritic granites are restricted to the western part of the central granitic massif. They are generally massive but in places show a lineation of the mafic minerals resembling the lineated rock in the quartz diorite - granite transition zone. To the east of Romaine river the granite is pinkish and varies in texture from porphyritic to granitic, graphic, or granoblastic. The granites are composed essentially of feldspar, quartz and biotite, with amphibole and pyroxene as accessory minerals in the brownish varieties. Minor amounts of magnetite and ilmenite also occur in these rocks.

The mass of porphyritic granite in the center of the area is interrupted in the north by leucocratic and alaskitic granites. These granites have a very simple mineralogy (feldspar, quartz and biotite) and are difficult to separate. Apophyses of these granites extend as far south as Bourassa lake, and along the coast in the eastern part of the area several dikes of alaskitic granite cut the metasedimentary formations and the gneissic granite. In general however, these dikes are too small to be shown on the accompanying map.

Pegmatite

Quite large bodies of pegmatite crop out in the southeast corner of the area, and small dikes of pegmatite are found cutting the other rocks throughout the area. In addition to the essential quartz and feldspar, the pegmatite contains large crystals of muscovite or biotite, and is commonly speckled with magnetite octahedra up to 8 inches in diameter. Tourmaline occasionally accompanies muscovite in the pegmatite.

PALEOZOIC ROCKS

Aphanitic limestones of Ordovician age (Twenhofel, 1938) crop out on the coast at l'Eau-Claire point, Ammonite point, and on the islands of Fausse-Passe and Saint-Charles. Much of this limestone is light to dark gray and certain horizons are fossiliferous. It is overlain by thick-bedded (3- to 5-foot beds) non-fossiliferous tan, dolomitic limestone. These limestones dip very gently (1 to 3 degrees) to the south.

A 1-to 2-inch-thick shale layer is found at the base of the limestone at about sealevel. The shale ranges from black to green in color. In places it is overlain by a bed of dark gray sandstone.

In the more easterly islands (Chasse island, Sainte-Geneviève island) and on Perdrix Head point and Sauvage point the sedimentary rocks are rather dolomitic. They are generally thicker bedded than the limestones although certain layers consist of interbeds of shale and limestone less than 2 or 3 inches thick.

These beds also strike roughly east-west and dip gently to the south.

PLEISTOCENE AND RECENT

A thin layer of glacial deposits covers the flanks of the hills but their summits are generally rounded and scraped bare by the glaciation. The few glacial striae that were measured indicate a southward movement of the ice sheet.

Glacial erratics are common on the bare rocky hills. These erratics do not appear to have been carried far from their source. One 6-foot-high erratic block of ilmenite was observed on the west side of the Puyjalon river, 12 miles south of the Tio Lake deposit.

The low-lying parts of the area along the coast and in the valley of Romaine river are generally covered by sand overlying clay. The sand is 3 to 5 feet thick, whereas the clay ranges from 20 to 30 feet in thickness. Varves are common in the clay deposits of the Puyjalon River valley.

STRUCTURAL GEOLOGY

The structure of the western half of the area appears to have been controlled by the anorthosite massif in the area's northwest corner. The gneissosity of the surrounding rocks strikes parallel to the border of the massif and dips away from it. Several shear zones were noted in the granitic rocks, mainly south of Bourassa lake and slightly west of Romaine river, but the direction of their movement could not be determined.

Folds

The eastern half of the area has a more complicated structure, caused by intrusions into the sedimentary rocks. The quartzites and gabbroic rocks trend parallel to the contacts of Ferland and Milieu Lakes granite masses and invariably dip towards the centers of these masses.

The sedimentary rocks in the area from south of L'Ours lake as far as St. Lawrence bay form a series of folds which have curved axes but trend generally east-west and plunge to the east.

North of Victor bay folds in the quartzites and gabbroic rocks trend northeast and plunge to the southwest. Crossbedding in certain layers of quartzite can be used for top determinations.

A symmetrical,ellipse-shaped dome with its main axis trending north-south underlies the area immediately north of L'Ours lake. The upper part of the dome resembles a wedge pushed into the interlayered metasedimentary and granitic material. The beds near the dome strike approximately north-south and have variable dips.

Faults

East of Cormier lake the gabbroic rocks injected by granites also form a sort of dome elongated in a north-south direction. The part of the dome which should be found on the west side of the lake has, without doubt, been removed by a fault underlying the lake.

Two other, parallel, northeast-trending faults have disturbed the southern part of the dome lying north of L'Ours lake. Granitic material has been injected over a width of several hundred feet along the more important of these faults. Another fault has been traced along the eastern side of the same dome, and marks the limit of Ferland Lake granitic rocks.

Another fault, along the upper part of L'Ours river, causes relative displacement of formations on the two sides of the river. Many shear zones were mapped in the eastern part of the area; the most important being the shear along the western side of the dome north of L'Ours lake and the shear trending east-west immediately south of L'Ours lake.

ECONOMIC GEOLOGY

Ilmenite is disseminated through all the igneous rocks of the area. Some fractures in the anorthosite contain veinlets of ilmenite up to 2 inches wide and occurring intermittently over distances of 10 to 20 feet. The Quebec Iron and Titanium Corp. still holds several claims in the northwest corner of the area, but there is no indication of recent work on these claims.

A little pyrite occurs in the granitic rocks in the center of the area and in the gabbroic east of L'Ours lake. Some chalcopyrite accompanies the pyrite east of L'Ours lake.

Biotite and muscovite in rich patches have formed in the pegmatites. However the crystals of mica in these patches never exceed 3 inches in diameter. Certain pegmatites in the southeast part of the area enclose large, but disseminated crystals of magnetite.

Black magnetite sands of Romaine river were reserved for mining by the Oliver Iron and Steel Co. but these rights expired in June 1959.

The same company held a group of claims covering the sedimentary rocks (limestones) on L'Eau-Claire point and Fausse-Passe island. They had hoped to use the phosphate-rich sediments to manufacture cement, but abandoned the claims in May 1959. The entire eastern part of Saint-Charles island was staked by Francis Charlebois of Club Laviolette of Grand'Mère. He also planned to use the limestone for cement and also allowed the claims to lapse in 1959.

The limestones on L'Eau-Claire point are easily accessible from Havre-Saint-Pierre, about 5 miles to the east. They could supply excellent-quality crushed rock for the road between Havre-Saint-Pierre and Mingan, or for paving the roads of the town. At present, crushed anorthosite is used but is not recommendable.

GEOCHEMICAL PROSPECTING

Several hundred samples of stream sediment were collected as part of a program to establish the feasibility of doing limited geochemical sampling at the time of geological mapping.

The field procedure was to collect two samples, several feet apart, from the active zone of streams encountered on traverses. Pertinent information was recorded on prepared sheets and the samples were sent to the Department's Laboratories in Quebec to be analysed for Cu, Zn, Pb, and Mo.

The concentrations of these elements are shown, in a separate color, on the accompanying map by the following notation: . 20, 65, 30, 15. The dot indicates the location of the sample, and the figures show the concentrations in parts per million (p.p.m.) of the elements in the order Cu, Zn, Pb, Mo.

Where one of the elements has not been analysed, that element's space has been marked with a dash.

No interpretation of the results is given at this stage. However it is believed that early publication of the data will prove useful.

BIBLIOGRAPHY

BLAIS, Roger-A., 1960 - Wacouno-Waco Area, Saguenay Electoral District. Department of Mines, Quebec; Geological Report 96.

CLAVEAU, Jacques, 1949 - Upper Romaine River Area, Saguenay County. Department of Mines, Quebec; Geological Report 38.

COOPER, Gerald E., 1957 - Johan Beetz Area, Electoral District of Saguenay. Department of Mines, Quebec; Geological Report 74.

De PUYJALON, H., 1899 - Monograph on the Minerals of the North Shore of the Gulf of Saint-Lawrence, from Pointe aux Esquimaux to Pointe Giroux; Report of the Commissioner of Colonization and Mines for the Year Ending June 1898, pp. 264-276.

GRENIER, Paul-E., 1957 - Beetz Lake Area, Electoral District of Saguenay. Department of Mines, Quebec; Geological Report 73.

LONGLEY, Warren W., 1948 - Forget Lake Area, Saguenay County. Department of Mines, Quebec; Geological Report 36.

LONGLEY, Warren W., 1950 - North Shore of the Saint-Lawrence, from Mingan to Aguanish, Saguenay County. Department of Mines, Quebec; Geological Report 42, Part I.

OBALSKI, J, 1889 1890 - Mines and Minerals of the Province of Quebec, Quebec.

RETTY, J.A., 1944 - Lower Romaine River Area, Saguenay County. Department of Mines, Quebec; Geological Report 19.

RICHARDSON, J., - Geological Survey of Canada. Progress Report 1853-1856, pp. 239-245.

TWENHOFEL, W.H., 1938 - Geology and Paleontology of the Mingan Islands, Quebec. Geol. Soc. Amer., Special Papers, No. 11.

WADDINGTON, G.W., 1950 - Limestone Deposits of the Mingan Islands Area, Saguenay County. Department of Mines, Quebec; Geological Report 42, Part. II.