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PRELIMINARY REPORT ON NATEL LAKE AREA, MISTASSINI TERRITORY AND NEW QUEBEC

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PROVINCE OF QUEBEC, CANADA

DEPARTMENT OF NATURAL RESOURCES

HONOURABLE RENÉ LÉVESQUE, MINISTER

P.-E. AUGER, DEPUTY MINISTER

GEOLOGICAL SURVEYS BRANCH

H. W. MCGERRIGLE, CHIEF

PRELIMINARY REPORT

ON

NATEL LAKE AREA

MISTASSINI TERRITORY AND NEW QUEBEC

BY

P. R. EAKINS



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1961

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INTRODUCTION

The Natel Lake area covers 367 square miles bounded by latitudes 52°00' and 52°15' and longitudes 75°30' and 76°00'. This area, with the exception of approximately 40 square miles in the northwest corner, was mapped by the writer during the summer of 1960.

The area is about 165 miles north-northwest of Chibougamau, and is easily reached from that point by light hydroplane. The Hudson's Bay Company post at East Main on James bay, at the mouth of the Eastmain river, is 120 miles west of the area. Access to the area from James bay by canoe up the Eastmain river would be arduous and difficult. Many rapids and falls occur along the route and the current of the river is very swift.

Travel by aircraft is easy within the area. Lakes and stretches of river suitable for landings occur throughout. Bars and reefs, however, render many sections of the Eastmain dangerous during periods of low water. Although the Eastmain, in general, is a swift and turbulent river, canoe travel within the area from the eastern boundary to the top of the main Grand-Détour rapids, below the outlet of Tournesol lake, is easy for experienced canoemen, particularly during periods of medium to high water. At such periods the only interruptions along the route are the Dôme rapids which are passed by short shore-line portages. At low water, two sets of rapids develop in the stretch above the Dôme rapids.

Along the length of its course from the southern New Quebec to James bay, the Eastmain has only a few large lakes, and these are insufficient to stabilize its volume. Consequently, the river rises and falls dramatically in response to major variations of rainfall in its catchment area. During the 1960 season the river slowly dropped 12 feet during June and July. During the latter part of July it rose 10 feet and then once again began to subside.

Caché creek, which drains the southeastern part of the area, is easily navigable in a light canoe during periods of medium and high water as far upstream as Boulder lake. Anaconda creek is readily navigable by motor canoe as far upstream as the rapids at the start of a headwater chain of lakes. Most other streams within the area are passable only with continuous hard labor.

The area has an average elevation of about 1,000 feet above sea-level.

Numerous lakes occupy wide valleys surrounded by broad hills in the rolling topography near the Grand-Détour. The average relief is in the order of 150 to 200 feet, but locally is considerably greater. North and east of Natel Lake and surrounding Labyrinth the lake, steep hills rise abruptly 300 to 400 feet. Low cliffs are present in many places.

Muskeg is largely confined to three sections of the area. One section is within the southern loop of the Grand-Détour of the Eastmain. Another is along, and east of, Anaconda creek. The third, and smallest of the three muskeg areas, is cut by the north flowing stretch of Caché creek. Scattered and low outcrops occur within all the muskeg areas.

Numerous striae, outcrop forms, and occasional chatter marks indicate that continental ice moved across the area in a direction S.65°W. The receding ice left only a thin and discontinuous mantle of moraine, and, consequently, outcrops are generally plentiful. Morainal material forms low hills at the west end of Natel lake and at the eastern boundary immediately south of Eastmain river. Terraces and low natural levees of sand are common along the Eastmain and Anaconda creek. A prominent esker forms several islands in Clarkie lake.

Despite glaciation, topographic features are closely related to bedrock structures. The trends of most of the hills and valleys reflect trends in the underlying rock. The Eastmain, however, follows an almost random course across the area and only locally - for example, at the Dôme rapids - does its course appear to be affected by bedrock structure.

Forest fires have swept the area many times, and the consequent second growth consists of sparse stands of spruce and jack pine and small thickets of scrub birch and alder with a heavy undergrowth. Stands of virgin timber consisting of spruce and birch up to 12 inches at the butt are still to be found, however. Here, the individual trees are widely spaced and there is little or no undergrowth. These stands would be of economic importance if mining operations were to develop in the area.

GENERAL GEOLOGY

All the consolidated rocks of the area are considered to be of Precambrian age. Generally speaking, the geology of the area appears relatively simple: a typical assemblage of volcanic rocks, or "greenstones", and underlying sedimentary rocks have been tightly folded and intruded from a westerly direction by a variety of granitic rocks. In detail, however, relationships between many rock bodies are structurally complex and obscure because of the strong deformation and metamorphism the rocks have sustained during at least two periods of folding and intrusion.

The Precambrian geological events of this area, as far as they are presently known, can be summarized as follows:

1. Sedimentation;
2. Volcanism with continued minor sedimentation;
3. Folding, faulting, and regional metamorphism with the formation of axial plane foliation and horizontal lineations parallel to main fold axes;
4. Intrusion of basic and acidic dykes and quartz diorite with considerable metamorphism of the volcanic rocks along major contacts and the continued folding of the volcanic and sedimentary assemblages and the earlier formed foliation and lineations;
5. Intrusion of granitic rocks and in part continuation of deformation;
6. Late shearing and regressive metamorphism in many rock bodies;
7. Intrusion of late basic dykes.

TABLE OF FORMATIONS

<p>PLEISTOCENE AND RECENT</p>	<p>River sands and gravels Glacial till and eskers</p>	
<p>PRECAMBRIAN</p>	<p>Basic dykes</p>	
	<p>Intrusive contact</p>	
	<p>Massive to gneissic granitic rocks with a few small dykes of aplite and pegmatite</p>	
	<p>Intrusive contact</p>	
	<p>Gneissic quartz diorite containing many xenoliths and septa of hornblende-plagioclase gneiss and amphibolite</p>	
	<p>Intrusive contact</p>	
	<p>Quartz and /or feldspar porphyries, diorite and gabbro; and ultrabasic rocks</p>	
	<p>Intrusive contact</p>	
<p>Metavolcanic rocks</p>	<p>Andesitic and basaltic lavas; Pyroclastic rock with minor bands of rhyolitic lavas and tuffs; graphitic schists; At least one thin band of sedimentary rocks associated with volcanic conglomerate and agglomerate; Hornblende-plagioclase gneiss, amphibolites and chlorite schists</p>	
<p>Metasedimentary rocks</p>	<p>Paragneiss, schists, graywacke and conglomerate</p>	

Metamorphosed Sedimentary Rocks

Deformed and metamorphosed sedimentary rocks underlie three sections in the eastern part of the area. These sections are:

- a) the area bounded by, and lying south of, Caché creek around Boulder lake in the southeast corner;
- b) the area bounded by Anaconda creek and Eastmain river around Lloyd lake in the east central part;
- c) the area around the western and northwestern shores of Clarkie lake in the northeastern corner.

The sedimentary rock types of these three areas are different, although all appear to have undergone the same degree of deformation and metamorphism. The contacts between the sedimentary rocks and adjoining volcanic rocks are not exposed. Top determinations in the volcanic rocks suggest that the volcanic assemblage structurally overlies the main sedimentary rock groups, and field relations show a conformity of structure between the Clarkie Lake and Lloyd Lake sedimentary rocks and the nearby volcanic rocks. The structural trends in the Boulder Lake belt are not reflected in the trends of the nearby volcanic band, suggesting the possible presence of an unconformity between the two assemblages in the southeastern part of the area.

The Boulder Lake area comprises an assemblage of paragneisses, hornblende-plagioclase gneisses, amphibolites, and several varieties of granitic rocks. Exposures of bedrock are not plentiful in the Boulder Lake area, and mapping on the present scale did not define any bands or bodies within the varied lithologic assemblage.

The Lloyd Lake area is underlain by garnet-staurolite-biotite schists interbedded with amphibolites of sedimentary origin and metamorphosed tuffaceous rocks. Granitic rocks intrude this assemblage in several places.

The Clarkie Lake area is underlain by massive graywacke containing bands of conglomerate. In this section, unlike the other two, granitic intrusions do not occur.

Metamorphosed Volcanic Rocks

A contorted band of volcanic rocks, the outstanding feature of the Natel Lake area, extends from Fed lake in the southwestern corner eastward to the eastern boundary south of Eastmain river and northward through Natel lake in a giant zigzag pattern to Eau - Claire river and the Northern boundary. This band of "greenstones" consists for the most part of massive and pillowed andesitic and basaltic lavas in various states of metamorphism and sill-like intrusions of diorite and gabbro. Interbedded with the

lavas are numerous bands of tuffaceous and agglomeratic rocks, and one or more narrow bands of sedimentary rocks. Rhyolitic flows and tuffs with small lenses of graphitic material are particularly common along the southern part of the volcanic band between Hidden creek and the Eastmain.

Pillowed andesitic lavas are well exposed in new burn around the west end of Grand-Allée lake, and they occur throughout the area underlain by the volcanic assemblage. Top determinations based upon pillow shapes can be made in many of the exposures of pillowed lava and provide the principal evidence for the suggested closed isoclinal syncline trending N.70° E. from the east end of Fed lake.

The thin zones of sedimentary rocks interbanded with the volcanic assemblage are variously composed of graywacke, siltstone, dolomite and slate, and are closely associated with beds of tuff, agglomerate, and volcanic conglomerate. The sedimentary rocks appear to be part of a continuous horizon that roughly parallels the course of the Eastmain from near to eastern boundary to a point about a mile below Dôme rapids. The rocks seen in individual exposures, however, are all strongly deformed by folding and faulting, and correlation from outcrop to outcrop is extremely difficult. From present evidence, the individual zones are only a few tens of feet thick.

Early Acidic and Basic Intrusive Rocks

Only a few bodies of acidic and basic intrusive rocks have been recognized, and none have been shown on the accompanying map. These early intrusive rocks have been deformed and metamorphosed along with the enclosing volcanic rocks and appear very similar in hand specimen to metamorphosed acidic and basic lavas and tuffs. Only in exceptionally clean exposures can intrusive relationships be established.

The commonest acidic intrusive rock is a schistose, fine-grained porphyry with phenocrysts of quartz and/or feldspar. Several dykes of such porphyry are definitely later in age than the initial folding in the lavas for they were intruded along the axial foliation of the folds and, later, were themselves folded. Other massive, fine-grained acidic intrusive rocks may be much later in age.

The commonest basic intrusive rock is a medium-grained diorite or gabbro. Bodies of such rock, where they have been deformed and metamorphosed, are distinguished with difficulty from the enclosing metamorphosed volcanic rocks.

Exposures of massive and schistose talc-carbonate rock scattered throughout the area indicate the former presence of ultra-basic (peridotite or dunite) intrusive bodies.

Gneissic Quartz Diorite

Gneissic quartz diorite underlies the western third of the area and intrudes the volcanic assemblage to the east. The quartz diorite is in turn intruded by later granitic rocks of several ages.

The quartz diorite is medium grained and strongly foliated and characteristically contains numerous xenoliths composed of highly metamorphosed volcanics. Near the main contact with the volcanic band, it is complexly interfingered and interbanded with the volcanic rocks to form a zone of coarse migmatite. Long septa of highly metamorphosed volcanic rocks extend into the quartz diorite masses and make up at least a third of the area mapped as quartz diorite.

Granitic Rocks

A variety of granitic rocks intrude the sedimentary and volcanic assemblages and the quartz diorite. Some of these later bodies are gneissose; others are massive. The commonest variety is a microcline-hornblende-biotite granite with occasional porphyritic texture which crops out around Tournesol lake and Fer-à-Cheval lake in the Grand-Détour section of the area and forms the mass intruding volcanic rocks around Labyrinthe lake.

A few narrow, pink, aplite dykes cut the earlier granitic rocks, and one outcrop of pegmatite was observed.

Late Basic Dykes

Fine- to medium-grained north-trending dykes of gabbroic composition appear to be the latest bedrock bodies in the area. Dykes of similar composition, but showing signs of incipient feldspathization along fine fractures, are also present, but are presumably of earlier age.

Three large outcrops of anorthositic gabbro appear to trace a north-northwesterly trending giant dyke in the southeast corner of the area just north of Boule-de-Neige lake. The outcrops are made up of a spectacular accumulation of spheroidal-feldspar masses up to the size of footballs in a scant groundmass of dark green amphibole. No contact relations with surrounding rocks were observed.

STRUCTURAL GEOLOGY

With the exception of the latest granitic rocks and the late basic dykes, all the rocks of the area have been strongly and complexly deformed by folding and faulting that has occurred in several distinct phases. The deformations have resulted in a lack of homogeneity in structural pattern that exists down to the scale of small outcrops and hand specimens.

Foliation of a secondary origin is common in most of the rocks of the area. In many places in the volcanic assemblage, it cuts across bedding planes. The secondary foliation is itself warped and folded. Most of the foliation represents an axial cleavage formed by early folding; it was subsequently deformed itself by later folding, probably at the time of intrusion of the quartz diorite. A strong north to northwesterly trending cleavage is seen in widely separated parts of the area.

Lineation is generally well developed, and most commonly is due to the parallel orientation of hornblende crystals or biotite lenses. Lineation formed by small folds and the stretching of pebbles and lapilli is also common. Two or more lineations with different orientations of the same type have been observed in a number of exposures, and apparently many of the lineations, as well as much of the secondary foliation, have been deformed.

Top determinations along, and south of, the Eastmain indicate the presence of a tight synclinal fold with a steep axial plane. Lineations in this synclinal belt have a remarkably consistent pattern. East of Dôme rapids they plunge westward at angles of 70-80 degrees, whereas west of the rapids they plunge eastward at 40-85 degrees, the plunges becoming progressively shallower to the west. In and around the rapids, lineations plunge steeply and vary markedly in attitude over short distances. In the area north of the rapids, the lineations plunge southward 50 to 90 degrees.

This pattern of lineations may result from the refolding of the synclinal fold with its initial horizontal lineations parallel to the fold axis.

The structural pattern is not as clear elsewhere in the area, but appears to be of the same type as the pattern south of the Eastmain. The Boulder Lake, Lloyd Lake, and Clarkie Lake sedimentary sections seem to be parts of complex anticlinal arches. The folds of the area are probably all of the shear or flowage variety.

Many rock bands have been broken by small-scale faults with a diversity of trends, and major faults undoubtedly transect many parts of the area. Prominent topographic linears, which probably reflect bedrock fractures, are shown on the map. Hidden creek may follow the outcrop zone of a major fault.

Zones of strong shear are rare, and most of the narrow zones of schist have been warped or folded and healed by the development of amphibole needles. Eastmain river east of Dôme rapids appears to parallel, and partly cover, an irregular trending major schist zone.

Joints are not particularly well developed except in the later granites; these frequently have a well developed joint system and a prominent horizontal to subhorizontal sheeting. Such strongly jointed rocks are usually not well exposed.

METAMORPHISM

Most of the rocks of the Natel Lake area show signs of intense metamorphism of the dynamic and regional variety and also indications of regressive changes in mineral composition.

The development of amphibole needles a few millimeters to a few centimeters long is a common metamorphic change in the massive pillow lavas as well as in the schistose volcanic rocks. Amphibolitization has also taken place under stress conditions, resulting in the development of medium- to coarse-grained, amphibole-plagioclase gneisses after basic lavas and intrusive rocks.

Feldspathization is common in the volcanic belt in a zone near the quartz dioritic intrusions, and results in a confusing assemblage of rocks.

ECONOMIC GEOLOGY

The section of the area east of Dôme rapids along the Eastmain was extensively prospected for gold about 25 years ago. At that time, numerous trenches were dug across arsenopyrite-bearing shear zones in the volcanic and basic intrusive rocks, and several short holes were drilled. Results were disappointing. Apart from this older work, little evidence of prospecting activity was seen. A little work has been done recently at Natel lake where several pyritized zones have been stripped and, in one case, sampled by trenching.

Mineral occurrences observed in the area are as follows:

- 1) disseminated arsenopyrite needles in sheared, carbonate "greenstone" accompanied by varying amounts of quartz as irregular stringers with minor gold, and occasional grains of chalcopyrite.
- 2) disseminated fine-grained pyrrhotite and minor chalcopyrite in rhyolitic rocks, fine-grained siltstones, or graphitic tuffs.
- 3) disseminated pyrite and minor chalcopyrite in irregular, small, silicified and quartz-veined zones in volcanic rocks.

Small, irregular, apparently barren quartz veins are common throughout the area, but are particularly plentiful east of Dôme rapids on Eastmain river.

Lithologically and structurally, the area is a promising one for the discovery of base metals, and deserves careful prospecting.

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