

RP 517(A)

PRELIMINARY REPORT, GEOLOGY OF MANNERELLE - JONCAS AREA, ABITIBI TERRITORY

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DEPARTMENT OF NATURAL RESOURCES

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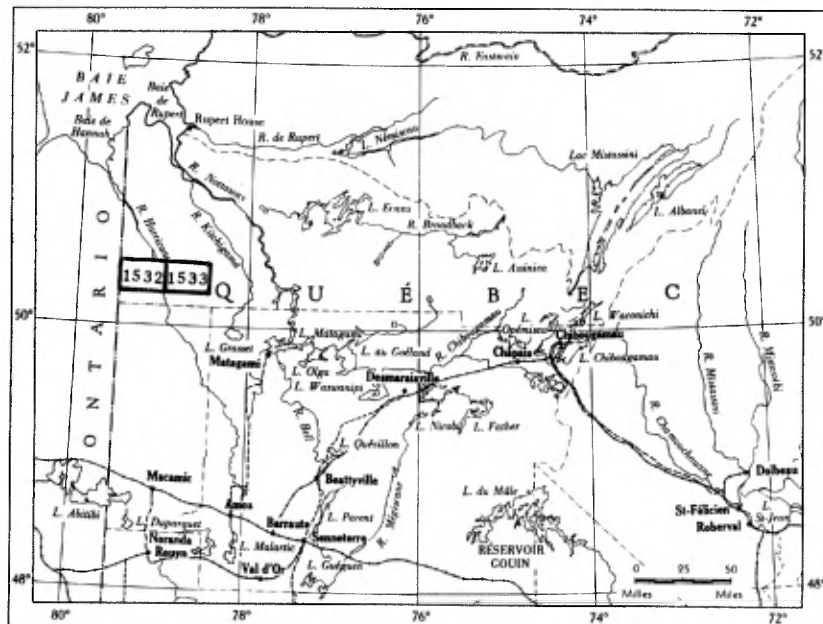
Geology
of
MANNERELLE-JONCAS AREA

ABITIBI TERRITORY

PRELIMINARY REPORT

by

Jerome H. Remick



QUEBEC

1964

E R R A T U M

P.R. No. 517

Page 8, 5th paragraph, 3rd line, should
read "... 2,465 million years ..."
instead of "1,465 million years".

QUEBEC DEPARTMENT OF NATURAL RESOURCES

RENÉ LÉVESQUE, MINISTER

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GEOLOGICAL EXPLORATION SERVICE

H.W. MCGERRIGLE, CHIEF

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INTRODUCTION

The Mannerelle-Joncas area was geologically mapped during the summer of 1960 as part of a project which included the Manthet-Jérémie-La Forest area to the south (Remick, 1961). The area lies between latitudes 50°15' and 50°30' and longitudes 78°30' and 79°31' (Quebec-Ontario boundary) and is covered by two map sheets of slightly less than 400 square miles each. Its centre is approximately 140 miles north of Amos and 75 miles northwest of Mattagami lake.

Traversing within the area was shared by three two-man teams which were transported to and from fly camps, and supplied, by a Bell G-2 helicopter. Abundant landing areas for a helicopter are provided by patches of muskeg, rock outcrops, and the many lakes and ponds.

Access

Aviation companies with bases at Amos, La Sarre, Watson lake and Moosonee provide transportation into the area.

Landing places for float-planes are limited to a few lakes in the Mannerelle River map-area, two places on Harricana river, and a small number of lakes in the Joncas River map-area. The Beaver float-plane can land on Breyant lake in the Mannerelle (des Truites) River map-area, but, since the lake is shallow and contains boulders, it cannot take off with a full load.

Only the Harricana and Joncas rivers are large enough for motor canoes. Prospector canoes may be used on Malouin and Mannerelle (des Truites) rivers. Travel is difficult on these rivers during mid-summer when the water level is low. The other rivers and streams in the area do not contain

sufficient water for canoe travel and all the rivers contain numerous boulder rapids and some falls.

Topography

The surface of the area is a plain sloping gently towards James bay. The topography is gentle and geologically controlled.

The drainage is northward into Harricana river and thence into Hannah bay. The streams and brooks west of Aulnes river and the sand belt in the Joncas River map-area trend northward. The streams swing gradually more and more to the northeast as the distance increases eastward from Aulnes river.

In the northeast and north central parts of the Mannerelle (des Truites) River map-area, bedrock outcrops in small rounded hills rising up to 50 feet above the general level. The tree cover here is very light as the area was burnt over many years ago, and exposures are clean. The west part of the Mannerelle River map-area is flat and is overlain by a thick cover of sand with, in places, patches of muskeg. Narrow streams have cut deeply into the sand. The south part of this map-area is flat except for a few small, widely scattered, tree-covered rock hills rising up to 20 feet above the muskeg.

The Joncas River map-area is flat and is covered by spruce and local areas of muskeg. Small hills or areas of rock, mostly covered by moss, are widely scattered throughout the area. The forest cover is somewhat thicker than in the Mannerelle River map-area, but walking remains relatively easy.

Field Work and Mapping Methods

A special effort was made to examine almost every rock outcrop in the Mannerelle River map-area, as it is accessible only by helicopter. Time did not allow examination of all outcrops in the Joncas River map-area, but all outcrops noted, whether examined from the ground or not, are indicated on the geological map. More than 90% of the outcrops are visible on air photographs as the tree cover is light. Air photos at a scale of 1/2 mile to the inch taken by Photo Air Laurentide, Quebec, were used in the field.

Brief reconnaissance over the area immediately to the east of the east boundary of the Joncas River map-area indicated widely scattered, small outcrops of granite and granite gneiss within a heavy forest cover.

Claude René assisted by Gérald Pomminville mapped the Joncas River map-area. Bart Paulding and Bert Sakrison assisted by Eric Riordon mapped the Mannerelle River map-area. R.G. Roberts did some mapping in both areas in 1961.

The writer supervised the project, visited isolated outcrops by helicopter, and compiled the above-mentioned geologists' observations and reports.

Previous Work and Work in Adjoining Areas

No previous federal or provincial governmental geological work has been carried out in the area except for reconnaissance geology along Harricana river, as shown on compilation maps by Cooke (1927) and Bergeron (1956).

The area to the south was mapped at the same time (Remick, 1961) as the Mannerelle-Joncas area and that to the north, in 1961 (Remick, Gillain, and Durden, 1963). The areas to the east and west are unmapped. A geological map at 8 miles to the inch outlines the regional geology (Remick and Gillain, 1963).

Resources

Game is scarce in the area, and only a few moose, heaver and bear were seen.

Fish are not common in Harricana river as it contains considerable suspended sediment, but they are abundant in the larger lakes. Pike and pickerel are the main species; trout are present in some of the smaller streams. Some commercial sturgeon fishing is carried out from time to time by the Indians in that part of Harricana river north of Sept Milles island.

A long narrow gorge in a massive jointed granite in Harricana river, on each side of the south end of Sept Milles island, provides a potential source of hydroelectric power. The gorge on the east side is about 1/4 mile long, 50 feet wide and 25 feet deep.

GENERAL GEOLOGY

The consolidated rocks of the area are Precambrian and comprise, from oldest to youngest, metamorphosed volcanic and sedimentary rocks, a granite gneiss complex, and basic dykes. Fluvioglacial and post-glacial sediments consisting of clay, silt, sand, gravel, and boulders cover much of the area.

It is possible that flat-lying Paleozoic sedimentary rocks extend southward from the area to the north (Remick, Gillain, and Durden, 1963) and underlie a small muskeg- and sand-covered area in the north part of the Mannerelle River map-area just west of Breyant river.

Table of Formations

CENOZOIC	Recent Pleistocene	Unconsolidated sediments	Muskeg peat Boulder clay, varved clay, silt, sand, boulders
UNCONFORMITY			
PRECAMBRIAN		Basic dykes	Diabase
		Intrusive contact	
		Granite gneiss complex	Muscovite pegmatite Pink hornblende granite Pink biotite granite, pegmatite Grey biotite granite, pegmatite Hornblende-biotite gneiss, biotite gneiss Amphibolite inclusions
		Metamorphosed volcanic, sedimentary, and basic intrusive rocks	Meta-gabbro Amphibolite, biotite paragneiss

Note: The rock units are grouped lithologically and not necessarily in the order of their age.

Metamorphosed Volcanic, Sedimentary and Basic Intrusive Rocks

Amphibolite, Biotite Paragneiss, Meta-gabbro

A zone about one mile wide of amphibolite with a few included outcrops of biotite paragneiss and an outcrop of meta-gabbro extends from the east shore of Harricana river in the central part of the area eastward for about 9 miles. The eastern extent of the zone is not known owing to lack of outcrop. A few outcrops of amphibolite separated by outcrops of the granite gneiss complex were noted about $\frac{3}{4}$ and $1\frac{1}{2}$ miles west of Despreux

(Riordot) river (6 miles west of the outcrops on the Harricana) and may represent the western continuation of this zone. Most of the area between the outcrops on the Harricana and those west of Despreux (Riordot) river is flat or is underlain by muskeg and contains very few outcrops.

The amphibolite, which is believed to have been derived from both sedimentary and volcanic rocks, is black, fine and fine-to-medium grained, and consists of 50-70% black hornblende and 30-50% feldspar. Accessory amounts of pink garnet were noted in some of the lenses of coarser hornblende on the east shore of Harricana river. Accessory epidote occurs in places as grains and small lenses. A few disseminated grains of chalcopyrite and pyrrhotite were noted in one specimen of amphibolite. A little quartz and about 2% magnetite in small octahedra occur in amphibolite west of Despreux river. In most outcrops, hornblende is in fairly well aligned black needles, and the rock breaks parallel to the foliation.

Much of the rock is homogeneous, but in places a lenticular layering is present owing to lenses slightly richer in hornblende or feldspar, to lenses containing more coarsely crystalline hornblende, to rusty lenses, to lenses rich in epidote or garnet, or, rarely, to narrow concordant layers of granite or quartz.

Biotite paragneiss was noted with amphibolite near the north part of the zone on the shore of Harricana river. The rock weathers light grey, is slabby and medium grained, and contains 10-30% biotite, along with quartz, feldspar, and, locally, accessory garnet. It lacks original layering.

Schistose meta-gabbro was noted in the amphibolite zone east of Harricana river. The rock is fine to medium grained and has a black weathered surface that is rougher than that of the amphibolite. It consists of dark green actinolite or hornblende and granulated plagioclase. The amphibole is coarser and equant in contrast to the black needles in the amphibolite.

Granite Gneiss Complex

General Statement

Gneissic to massive, mostly granitic rocks consisting of biotite and/or hornblende, feldspar, and quartz comprise about 99% of the outcrops in the area. Small inclusions of amphibolite and dykes and masses of pegmatite are numerous. As several rock types occur in many outcrops in varying proportions, separation into mappable units is not possible.

Biotite gneiss and amphibolite are the oldest rocks in the complex. Grey biotite granite (much of it foliated) and associated grey pegmatite intrude the biotite gneiss concordantly as lit-par-lit layers and also discordantly. Pink biotite granite and associated pink pegmatite occur as dykes or masses, many of which enclose blocks of grey granite or biotite gneiss. Pink hornblende granite is one of the youngest members of the complex. Quartz veins cut all rock types.

Although crosscutting contacts point to a sequence in age relationships, formation of hybrid rocks and structural variations make it

difficult to subdivide all the rocks encountered in the area.

Amphibolite Inclusions

Amphibolite occurs as small elongated to blocky inclusions up to 4 feet long and 2 feet wide in gneisses and in the grey biotite granite.

The rock is fine to medium grained, massive to foliated, and greenish black on fresh surface, and consists of about 65% greenish black amphibole along with feldspar and, in places, biotite. It is usually uniform in texture and composition and is more resistant than the surrounding granite or gneiss.

Biotite Gneiss, Hornblende-biotite Gneiss

Biotite gneiss and hornblende-biotite gneiss are most concentrated in the north central part of the Mannerelle River map-area and in the adjoining map-area to the north (Remick, Gillain and Durden, 1963), where they are associated with grey and pink granites. In the Mannerelle-Joncas area, gneiss may form up to 80% of an outcrop, but usually it forms 50% or less.

Biotite gneiss shows considerable variation in the form of its gneissic structure. The most common form is a light grey biotite gneiss in which 10-15% biotite is fairly evenly distributed through a medium- to coarse-grained granitic-appearing rock. Layering is not pronounced except where concordant granitic layers occur. The strike of foliation varies from 10° to 40° within any outcrop. Grey or pink biotite granite may vein large masses or enclose large blocks of this type of gneiss. The gneiss grades into a foliated biotite granite, and in places it is difficult to differentiate between granite and gneiss.

Well layered gneiss consisting of dark, less resistant layers rich in biotite and light-coloured layers poor in biotite were noted in places in the northern part of the Mannerelle River map-area, especially along Harricana river opposite Sept Milles island. The foliation is straight and the contacts between the layers are sharp.

A less common type of biotite gneiss consists of curved (locally ptygmatically folded) lenticular layers slightly richer in biotite associated with pink granite containing only a small amount of biotite. Foliation is variable within any rock outcrop, and only generalized directions could be recorded.

Rust stains caused by weathering of disseminated grains of pyrite occur in some exposures of biotite gneiss.

Hornblende-biotite gneiss and hornblende gneiss usually occur as layers which grade laterally into biotite gneiss and, in places, grade along strike into small inclusions of amphibolite. This suggests that much of the hornblende in the biotite gneiss may have been derived from inclusions of amphibolite. The quartz content is lower and the mafic content higher in the hornblende-biotite gneiss and hornblende gneiss than in the biotite gneisses

Grey Biotite Granite and Pegmatite

Grey biotite granite and associated grey pegmatite are the most widespread rock types in the area. They occur also to the north (Remick, Gillain, and Durden, 1963) and to the south (Remick, 1961).

The grey biotite granite occurs as concordant and discordant intrusions in the biotite gneiss; encloses large blocks of biotite gneiss; and, in a few places, occurs with only a few schlieren or small lenses of biotite gneiss or amphibolite.

The rock is massive to foliated and has paper-thin lenticular laminae of biotite here and there. In some outcrops the rock could be classified as a foliated biotite granite or as a granitic gneiss. It consists of quartz, feldspar and up to 10% biotite. Accessory magnetite, epidote and pyrite occur in some outcrops. In places biotite is chloritized and hematite coats the feldspar.

Grey pegmatite occurs in many outcrops of grey biotite granite as small crosscutting dykes or, more commonly, as patches that grade into the granite. It also occurs as concordant and discordant intrusions in biotite gneiss. Feldspar phenocrysts about 5cm. long occur here and there in small patches in the granite. The pegmatite consists of up to 20% quartz, 2% biotite, white feldspar and, in a few dykes, muscovite. The crosscutting dykes contain more and coarser biotite than the gradational pegmatites.

A brick-red band about 1mm. wide was noted along some joints and fractures in the grey biotite^{granite} and, in places, is associated with epidotization. A width of $\frac{1}{2}$ -1 inch or more on either side of the red band has a light pink tinge, and in this pink zone the biotite is chloritized.

Pink Biotite Granite and Pegmatite

Pink biotite granite and associated pink pegmatite occur in the north half of the area and in the map-area to the north (Remick, Gillain, and Durden, 1963). It is not common in the map-area to the south (Remick, 1961).

The rock is most abundant east of Harricana river in the north part of the area where it may comprise an entire outcrop or several square miles of outcrop containing only a few schlieren or lenses of biotite gneiss. In places it crosscuts or encloses large blocks of grey biotite granite.

The rock is medium to coarse grained (pegmatitic) and commonly massive, although foliation is shown by alignment of biotite in some outcrops. It is well jointed, usually with two vertical sets and one horizontal set of joints, in contrast to the poorly jointed grey biotite granite. Both the fresh and weathered surfaces are light pink.

It is homogeneous in composition and consists of 15-20% quartz, 1-5% biotite (somewhat less than in the grey biotite granite), and feldspar. Accessory magnetite occurs in most outcrops.

Pink pegmatite is generally present in the pink biotite granite. It

usually occurs as gradational patches or stringers, but dykes, some of which have quartz cores, were noted. The rock consists of pink microcline, quartz, and biotite. Magnetite is generally present in amounts up to 1% as disseminated crystals or groups of crystals up to 1 inch in diameter. Some of the microcline shows graphic intergrowths with quartz. Muscovite occurs with biotite in a few outcrops, and small reddish brown garnets were noted in two pegmatite dykes along the shore of Harricana river.

Pink Hornblende Granite

A few outcrops of pink hornblende granite were noted in the north part of the Mannerelle River map-area and in the map-area to the north (Remick, Gillain, and Durden, 1963), but none in the area to the south (Remick, 1961).

The rock is massive to somewhat foliated, is medium to coarse grained, and consists of 3-5% green hornblende, 10% quartz, plagioclase, and potash feldspar. Sphene and magnetite are constant accessory minerals. Hornblende is altered to chlorite and epidote in places.

Megascopically the rock is similar to the pink biotite granite except for the presence of hornblende. Lenses of biotite occur in some outcrops of hornblende granite.

Muscovite Pegmatite

Dykes of unzoned muscovite pegmatite crosscut the zone of amphibolite in the centre of the area. The dykes are 2-20 feet wide and up to 60 feet long. As their relationship to a granitic mass cannot be proved, and, as they are somewhat different in appearance from the pegmatites associated with the pink or grey biotite granites, they are discussed separately. Similar muscovite pegmatites were noted by the writer in other volcanic zones (Remick, Gillain, and Durden, 1963).

The potassium-argon age of muscovite in the pegmatite cutting the zone of amphibolite on the shore of Harricana river at about latitude $50^{\circ}20'$ is given as 1,465 million years by the Geological Survey of Canada (C.H. Stockwell, personal communication).

The pegmatite contains quartz, light pink perthitic microcline, and fairly thick booklets of muscovite. Reddish brown garnets about 2mm. in diameter occur in a granitic phase within some of the pegmatites. Green crystals of beryl were noted in the pegmatite from which the potassium-argon age analysis was made.

Basic Dykes

Diabase

Dykes of diabase from 2 inches to 5 feet wide were noted in several places in a northeasterly trending zone in the northeast corner of the Mannerelle River map-area. The rock is fine grained, dark green, and brownish weathering, and consists of pyroxene and plagioclase with accessory amounts of disseminated pyrite.

A small exposure of a deeply weathered diabase dyke containing joints filled with yellowish-white calcite was noted very close to Paleozoic sedimentary rocks on the west shore of Harricana river about 2 miles north of the north end of Sept Milles island in the map-area to the north (Remick, Gillain, and Durden, 1963). The deep weathering in the dyke suggests that it formed part of the erosion surface before deposition of the Paleozoic sediments. As no dykes were noted cutting Paleozoic rock in the area, the diabase dykes may be considered to be pre-Silurian in age and probably Precambrian.

The dykes within the area parallel, and therefore probably fill, joints in granite. They are jointed at about one foot intervals normal to their confining walls. The dykes along the shore of Harricana river are less resistant to erosion than the country rock (possibly owing to the close joints in the diabase) and so occupy troughs 1-3 feet deep.

PLEISTOCENE

Sediments

Boulder clay, varved clay, silt, sand, gravel, and boulders cover much of the area.

A thin cover of sand with some boulders was noted in the area of concentrated outcrop in the northeast part of the Mannerelle River map-area. This outcrop area may have risen above the body of water in which the clay and silt along Harricana river were deposited.

A generalized sequence of grey varved clay, overlain by 20 feet of grey boulder clay, and topped by 4 feet of sand, was noted on the west shore of Harricana river 5 miles to the south of Sept Milles island. Varved clay was also seen on Mannerelle river and on Joncas river, in each case about $1\frac{1}{2}$ miles south of the north boundary of the area.

Boulder clay occurs in many places along the banks of Harricana river; these banks are up to 60 feet high in the south part of the area. Grey boulder clay overlain by 20 feet of sand was seen on Joncas river about $2\frac{1}{2}$ miles south of the north boundary of the area.

Sand was observed in many parts of the Joncas River map-area, and raised sand beaches were noted in the north part of this map-area and in the adjacent area to the north.

A northerly trending esker-like ridge of sand, which commences somewhat north of Amos and terminates in the south part of the Joncas River map-area, is the main topographic glacial feature. South of the area, the ridge rises more than 100 feet above the general level, but within the area it diminishes in height gradually northward. Kettle lakes occur within the ridge zone near its western margin. The ridge is interpreted as a wide esker that was deposited before the lacustrine and marine silts and clays.

Erosional Features

The few roches moutonnées noted trend S.30°E.

Glacial striae trending from S.37°E. to S.20°E. were noted in a few places in outcrops on the shore of Harricana river. Glacial striae are rare away from the river probably because the rocks in the granite gneiss complex are susceptible to relatively rapid mechanical weathering which would destroy any glacial striae that may have been present.

The presence of slabs of Paleozoic rock, similar to those found in the adjoining area to the north, indicates that ice crossed the area from northwest to southeast.

STRUCTURAL GEOLOGY

Major structural elements are difficult to delineate because of the scarcity of rock outcrops in much of the area and the variation in the strike of foliation within an outcrop or adjoining rock outcrops. Intrusion of grey granite and pink granite and pegmatite, melting, recrystallization, and breaking up of the older gneissic rocks all produced local variations in foliation. Foliation is constant in outcrops of well layered gneiss, but this rock type is not common.

Joints are well developed in the grey and pink granites, especially in the latter, where two vertical sets and one horizontal set are common. Joints in the pink granite control the narrow gorge at the south end of Sept Milles island and some of the falls along Harricana river.

ECONOMIC GEOLOGY

Beryl and molybdenite in a few small pegmatite dykes were the only minerals of economic interest noted in the area.

Small (a few feet long) lenticular, rusty areas occur in all members of the complex, the rust resulting from weathering of small amounts of pyrite or, in some places, of biotite.

Beryl

About a dozen crystals of pale green beryl were noted in a pegmatite cutting amphibolite on the east shore of Harricana river at latitude 50°20'. The crystals are in well-developed prisms $\frac{1}{2}$ - $\frac{3}{4}$ inch in diameter and up to 2 inches long.

The pegmatite is unzoned and contains light pink perthitic microcline, quartz, muscovite, and beryl. Reddish-brown garnets about 2mm. in diameter occur in a finer, granitic phase in the pegmatite. Overburden and water conceal the extent and form of the pegmatite. Similar pegmatites, but without beryl, occur within the same zone of amphibolite. The pegmatites are in straight-walled dykes 2-20 feet wide and up to 60 feet long. They cut the schistosity of the amphibolite at a small angle.

A few crystals of beryl up to 1 inch long were noted in a light pink pegmatite in the west central part of the Mannerelle River map-area. The pegmatite is irregularly shaped and comprises about 75% of an outcrop 1,000 square feet in area. Besides beryl, the pegmatite contains quartz, microcline and biotite.

Molybdenite

Molybdenite and pyrite occur in small rusty patches in an irregularly shaped light pink pegmatite along the east shore of Harricana river in the northeast part of the Mannerelle River map-area. The molybdenite flakes are 1/8-1/4 inch in diameter and are surrounded by several inches of rusty weathering rock.

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