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PRELIMINARY REPORT ON TUTTLE LAKE AREA, SAGUENAY ELECTORAL DISTRICT

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PRELIMINARY REPORT

ON

TUTTLE LAKE AREA

SAGUENAY ELECTORAL DISTRICT

BY

LAURENCE S. PHILLIPS

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PRELIMINARY REPORT

ON

TUTTLE LAKE AREA

SAGUENAY ELECTORAL DISTRICT

by

Laurence S. Phillips

I N T R O D U C T I O N

The Tuttle Lake area, mapped during the summer of 1957, lies approximately 175 miles north-northwest of Sept-Iles in the electoral district of Saguenay. It includes most of Hauteville and Faber townships and parts of Raimbault, Vieuxpont, Francheville and Menneval townships. It comprises an area of 183 square miles. bounded by latitudes 52°30' and 52°45' and by longitudes 67°30' and 67°45'.

At present, access is by float-plane from Sept-Iles, but future development of railroads to Wabush lake, 40 miles to the northeast, and to Mount Reed, 40 miles to the southwest, will provide other means. The upper section of the Manicouagan river, which drains the southern half of the area, is not suitable for travel by canoe.

The greater part of the area lies between 2,000 and 2,500 feet above sea-level. The southern half has both greater elevation and more local relief than the northern part. This is due to the greater diversity of the underlying rocks in the southern part of the area, where thicker developments of the iron formation occur and where the rocks now crop out as pronounced ridges with a local relief of 200 to 300 feet. Much of the northern and western parts of the area is covered by alternating, low boulder ridges of glacial origin and muskeg swamps.

The drainage of the area follows three systems. The southern part of the area, including the five large lakes, drains southward into the Little Manicouagan river system. The area east of Stakel and O'Keefe lakes drains eastward via Clef lake to Aux Pécans river, and the northwestern part of the area drains into Peliptacau lake. In general, the area lies on a watershed and the streams are small and turbulent, and are of little use for transportation.

The area has a variable cover of spruce forest, with birch on sheltered slopes and alder along stream courses. The cover is thickest in the eastern and southern parts of the area, but much in the south has been destroyed by forest fire. The areas underlain by glacial deposits have a sparse cover of spruce, with caribou moss.

GENERAL GEOLOGY

Outcrops are fairly abundant throughout the southern half of the area. In the northern half, with the exception of the areas east of Stakel lake and south of Clef lake, bedrock is seen only in scattered groups of roches moutonnées.

All the consolidated rocks of the area are of Precambrian age. It is believed that they represent, in part, the metamorphosed southwesterly extension of the iron-bearing sequence of the Labrador Trough. The rock types comprise (going from north to south) biotite gneisses and migmatites, with amphibolites and granite gneiss; amphibolite-free biotite schists and gneisses and migmatites; iron formations,including quartzites and crystalline marbles; and hornblende-biotite gneiss. With the exception of a small mass of gabbro, all the rocks are of high metamorphic grade.

The structure of the area is complex and the rocks are folded into tight isoclinal and overturned folds, mostly trending north-northwest.

The principal rock units are listed in the Table of Formations.

PRECAMBRIAN

GNEISSES AND MIGMATITES (Southern part of area)

Included in this group are biotite schists and gneisses, migmatised representatives of these rocks, felsic hornblende-bearing gneiss and granite gneiss. These are shown on the map as one unit, with the exception of mappable bodies of granite gneiss.

Biotite schists and gneisses are the most common rocks. The typical rock is a coarse-grained biotite-quartz-plagioclase schist, with a pronounced foliation due to segregation of mafic and felsic components. The biotite content is variable, and the rock varies from a light coloured felsic gneiss to a dark biotite schist.Muscovite, chlorite and garnet also occur in some varieties. The foliation may be even and regular or greatly contorted and drag-folded.

The hornblende-bearing gneisses occur mainly in the southern part of the area, notably south of the eastern part of Tuttle lake and southwest of Harvey lake. The typical rock is an evenly foliated felsic gneiss composed of hornblende,biotite, epidote, oligoclase, and quartz. Hornblendic skarn bands also occur locally in the biotite schists.

TABLE OF FORMATIONS

ERA or PERIOD	DESCRIPTION
PLEISTOCENE and RECENT	Sand and gravel esker deposits; ground moraine; erratic boulders.
PRECAMBRIAN	Gabbro
	(Regional metamorphism ?)
	Amphibolite Granite gneiss (Northern part of area) Biotite schist, gneiss, and migmatite.
	IRON FORMATIONS: Garnet-biotite-muscovite schist Garnet-hornblende gneiss Grunerite-chlorite-magnetite schist Banded magnetite and/or specularite quartzite Grunerite-carbonate-magnetite quartzite White quartzite Marble
	Biotite schist and gneiss Hornblende-biotite gneiss (Southern part of area) Migmatite and granite gneiss

The transition of the rocks described above into granite gneiss appears as a zone of both metasomatic replacement and injection along the schistosity. The typical granite gneiss is a pink felsic rock composed of microcline, quartz, and green biotite. The occasional occurrence of staurolite indicates the sedimentary origin of these rocks. All gradations from biotite schist, through lit-par-lit injected migmatites and granite gneiss, may be seen.

IRON FORMATION

Like the other rock types of the area, the several facies of the iron formation sequence exhibit considerable variations in thickness and composition along the strike. It is believed that these variations are in part original sedimentary facies changes and in part the result of flowage and thickening during metamorphism.

Two distinct types of sequence are found:

Type 1 - contains all the rock types listed except the specularite quartzite; it is generally thicker than type 2.

Type 2 - contains the sequence:- marble; quartzite; specularite quartzite or any one of these members alone; it is usually thinner than type 1.

Marble:

This is a most distinctive rock, giving rise, in its thicker developments, to steep cliffs. It is extremely variable in thickness, and shows evidence of tectonic thickening by plastic deformation. The rock is a coarsely crystalline calcite-dolomite marble, white on the fresh surface, but weathering to a black-stained rounded surface. Quartzose bands are common, especially towards the top, in the transition zone between quartzite and marble. Boudinage structure is common in this transition zone. The original bedding is commonly marked by diopside-rich and tremolite-rich bands one to two feet thick. In many places the marble is the sole representative of the iron formation sequence and is especially well developed in the area east of Brown and Luck lakes. In places, a carbonate-rich facies of the grunerite-quartzite appears at the base of the iron formation instead of the marble.

White Quartzite:

Normally, where marble is well developed at the base of the iron formation sequence, it is succeeded by an impure white to grey granular quartzite. On the southern side of Turtleback hill the quartzite is a coarsely crystalline, quartz-rich white rock. With increasing diopside and tremolite, it grades into the underlying marble, and, where it underlies the banded grunerite-carbonate quartzite, the transition is marked by coarse garnet and green amphibole. Where silicate-bearing facies of the iron formation are absent, as, for example, east of O'Keefe lake, the quartzite grades with increasing specularite into the "itabirite" type of iron formation.

Grunerite-carbonate-magnetite Quartzite:

This is an extremely variable unit both in thickness and composition. Basically, it is a banded, rusty-weathering rock composed of alternating layers of white to grey quartzite up to a few inches thick, and grunerite bands with carbonate and magnetite. Usually the basal part of this unit is richer in calcite and siderite, forming a massive non-banded carbonate-grunerite-quartz rock, as on Turtleback hill. Commonly, the grunerite is very coarse and on Disc hill one horizon is composed solely of grunerite crystals several inches long. In the typical rock, magnetite occurs within the carbonate-silicate bands, and the rock grades into lens-like bodies of magnetite-quartzite by a decrease of amphibole and carbonate, and an increase of magnetite both within and between the quartzite layers. A green actinolitic amphibole is common in the transition zone.

Magnetite and Specularite Quartzites:

These two rocks represent the iron oxide-silica facies of the iron formation. Although shown on the map as one unit, the two types are distinct.

The magnetite quartzite is a banded rock similar in structure to the banded silicate quartzite, with magnetite-rich bands between quartzitic layers relatively poor in magnetite. This rock occurs as lens-shaped bodies within the banded silicate quartzite into which it grades as described above. Disseminated grains of specularite occur within the magnetite quartzite only where the quartzite lens is large and where the magnetite layers are relatively pure. These relations are well seen on the northern side of Turtleback hill.

The specularite quartzite or "itabirite" type occurs in much more continuous units, being constant in thickness along the strike. It occurs only where the mixed carbonate-silicate-quartzite is thin. The rock is hard, massive and finely banded and is composed of alternations of quartz and specularite grains. Typical exposures are seen west of Luck lake and at the southern end of O'Keefe lake.

On the accompanying map, the continuation of the iron formations in areas of no outcrop and glacial cover, as inferred from preliminary magnetic information, is shown by dashed lines.

Grunerite-chlorite-magnetite Schist:

This facies of the iron formation occurs only in association with the grunerite-carbonate quartzite facies, usually within or near the top of that group. It is well seen at the southern end of the southeastern extension of Tuttle lake and on Turtleback hill. The typical rock is greenish, massive and rough-weathering. It is composed of chlorite, grunerite and disseminated magnetite, with siderite and garnet. With the exception of chlorite, these minerals tend to occur in clots throughout the rock. The grunerite is in large crystals, in places with radiating structure, and the siderite is in brownish-weathering clots. Magnetite is often concentrated in similar clots, but the total iron content of the rock is low. Transition phases between this facies and the grunerite-carbonate quartzite facies are well seen at the southeastern end of Tuttle lake and immediately east of Brown lake.

Garnet-hornblende Gneiss:

A speckled gneissic rock composed of hornblende, garnet, biotite, quartz, and plagioclase occurs immediately above and sometimes within the iron formation sequence. It weathers readily and forms rounded outcrops. As it occurs in association with the iron formations, it is believed that the rock is of sedimentary origin. The fact that at the southeastern end of Tuttle lake the gneiss surrounds the only post-metamorphic gabbro body within the map-area may suggest a relationship between the two rocks, but this is not considered likely.

Garnet-biotite-muscovite Schist:

Within the iron formations, thin bands of pelitic schists occur at various horizons. They contain biotite muscovite in various proportions. Above the iron formations, such schists are somewhat thicker and are characterized by large porphyroblasts of garnet and quartzofelspathic pods and stringers. Such features distinguish these schists from the segregated and injected biotite schist (migmatite). In addition, the brick-like granulated texture of the garnet porphyroblasts and cataclastic effects in the felspathic pods are evidence of physical breakdown.

GNEISSES AND MIGMATITES (Northern part of area):

The central and northern parts of the area are underlain by a complex of biotite schists and gneisses, grading through migmatites into granite gneiss. As in the southern part of the area, the rock types vary in texture and mineral proportions, but are composed essentially of biotite, quartz, plagioclase, and potassic felspars. Hornblende also occurs, particularly where the rock is a felsic gneiss. Lit-par-lit injections of granite gneiss are more abundant here than in the southern part of the area and are progressively more common toward the north. These rocks are well seen in the northeastern part of the area, south and east respectively of Clef and Stakel lakes. It is probable that they underlie the northwestern areas too, under the mantle of glacial deposits.

AMPHIBOLITES:

In contrast with the southern half of the area, several bodies of amphibolite, derived from gabbro, occur in the northern half, notably southeast of Clef lake and immediately east of Stakel lake. These rocks are dark and are composed of hornblende (light green), with plagioclase and epidote. The bodies appear to have been originally sill-like. That immediately southeast of Clef lake is associated with pyritiferous biotite-epidote hornfels and a coarse garnet-chlorite rock.

GABBRO:

The only occurrence of relatively unmetamorphosed gabbro within the area is the small body immediately west of the southeastern extension of Tuttle lake.The rock is purplish-brown, medium-grained, and ophitic. It is composed of labradorite and pyroxene, most of which is replaced by a granular aggregate of garnet and secondary hornblende. The retention of the ophitic texture may indicate that the body was intruded after the regional metamorphism which converted the basic intrusives

of the northern part of the area into amphibolites. On the other hand, no thermal metamorphic effects due to its intrusion are seen in the adjacent rocks, and the garnet and secondary hornblende indicate some degree of metamorphism.

GLACIAL DEPOSITS

During the Pleistocene epoch the area was subjected to continental glaciation. The few glacial striae observed and the consistent trends of boulder ridges and drumlinoid features suggest that the ice moved north-northwest or south-southeast. Crag and tail features indicate that the direction of movement was towards the south-southeast.

Bouldery till and moraine, commonly in ridges, cover much of the northern and western parts of the area. Moraine covers the areas east of Clef lake and south of O'Keefe, Tuttle, and Harvey lakes. Along the southern margins of the area several of the glacially filled valleys are being re-excavated by the tributaries of LIttle Manicouagan river. Two large eskers cross the area; one forms the western side of Clef lake and the other extends from Derby lake to Tuttle lake. Erratic boulders, often of large size, are wide-spread throughout the area.

STRUCTURE

The rocks of the area are characterized by a general northwesterly trend and most of the observed lineations shown by the gneissic structure and axes of minor folds plunge in this direction at angles up to 50^{0}. The general trend of many of the major fold structures is also toward the northwest or north, but several of the structures outlined by the iron formations in the southern part of the area have rather more complex relations. The area as a whole is characterized by very tight isoclinal folds and overturned beds, and dips on bedding and schistosity are rarely a guide to stratigraphic sequence. The rocks in general have deformed by flowage rather than by fracture, and many of the mappable units disappear by attenuation rather than faulting. Tectonic thickening of rock units is common and this seems to have affected the crystalline marbles especially, though it is probably just as abundant in the schists and migmatites. Small-scale isoclinal folds, chevron folds, drag folds and boudinage are all common.

In the southern part of the area, where structural features are best displayed, the iron formations are involved in several complex folds. Turtleback hill is underlain by a semi-recumbent anticline, with the axis trending northeast. This trend is found also in the southeastern part of Tuttle lake, where the structure is believed to be a syncline overturned toward the southwest. These folds suggest that a second folding, with axes trending southwest-northeast, has been imposed on the general northwest-southeast-trending structures. These two episodes possibly may be correlated with the "Labrador Trough" and "Grenville" trends. The structure of Disc hill appears to be a simple syncline, but this too may be more complex.

A few faults were mapped in the southern part of the area. They are of high angle and small displacement, and are probably somewhat later than the main folding.

ECONOMIC GEOLOGY

The principal economic interest of the area rests in the iron formations. It is believed that these formations are the southwesterly continuation of those of the Mount Wright-Wabush Lake region. Magnetic and outcrop information indicate that no iron deposits of value occur in the northern part of the area, but the iron-bearing belt does extend southward from the southern margin, and several companies hold claims in the southern half of the area.

The economically valuable ore occurs as magnetite-quartzite, magnetite-hematite quartzite and hematite (specularite) quartzite. The magnetite quartzite occurs as lenses of small extent within the banded grunerite-quartzite facies, as in the areas east of Brown lake, along the southeastern extension of Tuttle lake, and on Turtleback hill. The specularite quartzite deposits are larger and more continuous along the strike and appear to be the more economically valuable. Several grab samples containing 50 per cent, or more, iron oxide were obtained.