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BROCK RIVER MAP-AREA, ABITIBI AND MISTASSINI TERRITORIES, QUEBEC
(Summary Account)

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Illustration

Brock River Map-area, Abitibi and Mistassini Territories, Quebec

INTRODUCTION

Brock River area is north of Lake Chibougamau and west of Mistassini Lake in northern Quebec, and may be reached by water routes from either Lake St. John or from Oskelaneo on the Canadian National Railway. The latter route is the easier water route, with about thirty portages between the railway and either Waconichi or Rush Lakes. A winter road about 130 miles long extends from Roleau Siding on the Canadian National Railway to Opémisca Mines 4 miles south of Opémisca Lake. From Opemisca Lake the entire southwest part of Brock River area is accessible by water routes. During the 1941 season, supplies were brought from Roberval to Rush Lake by aeroplane at a cost of 14½ cents a pound and from Roberval to Waconichi Lake at a cost of 14 cents a pound, plane load lots[1].

[1] A road has since been completed (1950) from Roberval to Lake Chibougamau.

This report deals with the south half of Brock River area, which was examined during the 1941 season. Efficient assistance with the field work was given by student assistants H. W. Little and C. H. Dussault.

The area is normally well forested, but much of it has been burnt off. An old burn has destroyed much of the timber between Brock River and Lac du Sauvage. Early in June 1941 fire swept most of the hills around Cachisca and Opataca Lakes and spread over a wide area to the east, reaching almost to Lake Mistassini. The trees commonly observed include black spruce, white spruce, jack pine, balsam, tamarack, poplar, and white birch. A small number of stunted cedars grow about the shores of Rush Lake. The forest floor is usually carpeted by a thick mat comprised of sphagnum moss and Labrador tea. In the burnt over areas, the moss and shrubs have generally been thoroughly burned off so that bedrock is well exposed where there is no covering of soil.

Lake trout, speckled trout, brook trout, and whitefish are caught in the deep lakes, and the shallow lakes abound with pike and pickerel. There are also several species of sucker and a silver chub. Moose and caribou are occasionally taken by the Indians, but these animals are comparatively scarce. Black bear are found in numbers in rocky, burnt over areas where blueberries are abundant. There is commonly a plentiful supply of rabbits. The Indians trap a wide variety of small fur-bearing animals such as mink, muskrat, marten, fisher, lynx, fox, beaver, otter, and weasel. The lakes are breeding grounds for black ducks and the golden-eye duck or whistler. Both the spruce grouse and the ruffed grouse were frequently seen.

GENERAL GEOLOGY

A belt of folded, Archaean, sedimentary and volcanic rocks having an average width of about 10 miles extends for 45 miles from east to west across the south part of Brock River area. Andesitic flows with intercalated sediments that outcrop on Rush Lake and in the north parts of Barlow, McKenzie, and Roy townships are the oldest rocks in the area. They are part of a greenstone belt that extends south to Chibougamau Lake and west to Opemisca Lake and beyond. A number of good exposures of massive, finely crystalline, grey-green andesite occur on the west side of Rush Lake. A band of tuff 30 feet wide separates two andesite flows on the point north of the McKenzie township line. Here the strata are affected by faulting and strike 140 degrees with a vertical dip, but elsewhere the flows generally exhibit an east-west trend and dip at steep angles.

The volcanic rocks are conformably overlain on the north by well-bedded sedimentary rocks. Some of the lower members of the sedimentary rocks are interbedded with upper volcanic members and the contact was arbitrarily drawn where sedimentary strata constitute 50 per cent of the observed outcrops. The sedimentary rocks are mostly well-bedded tuffs and banded greywacke. Some phases of the greywacke are conglomeratic with subangular to rounded pebbles of granite, chert, porphyry, and greenstone, with the pebbles in some places widely scattered throughout the greywacke matrix. A band of black, rusty weathering slates outcrops on the south side of Blaiklock River 2 miles from its head. Similar

slates were seen along Crinkle Creek close to the west edge of the map-area on the south limb of a synclinal belt. The slates strike northeast and generally dip 75 to 80 degrees northwest, but in some places are overturned and dip 85 degrees southeast. What is probably the same band of slates, outcrops with greywacke at the rapids on Brock River a short distance below the mouth of Crinkle Creek. The black slates appear to occupy a position a little below the middle of the pre-Opémisca sedimentary assemblage. A cross-section of these sedimentary rocks on the south side of Brock River 5 miles east of the mouth of the North Brock, where the strata dip south at angles of 60 to 70 degrees for a distance of 1.3 miles across the strike, discloses their thickness as close to 7,500 feet.

For several hundreds of feet from their contact with the main granite batholith in the vicinity of Brock and Blaiklock Rivers, the greywacke and tuff beds have been altered to hornblende and chlorite schists. Immediately at the contact the sediments are cut by granite sills and have been somewhat granitized. Locally the rocks are converted to quartz-hornblende gneiss. Similarly altered sedimentary rocks form small areas in the granite batholith to the north and are believed to be of the same age. The granite area also contains a few large inclusions of altered andesite.

The Opémisca sedimentary rocks constitute a thick assemblage of boulder conglomerate, pebble conglomerate, greywacke, tuff, and arkose. The conglomerate beds consist of well-rounded boulders and pebbles of granite, gabbro, quartz, andesite, and greywacke closely packed in a greywacke matrix, but at some places the pebbles are scattered from 1 foot to 3 feet apart. The rocks are well exposed along the shores of Lac du Sauvage. Two miles north of the south end of the lake, stratified greywacke and tuff, believed to be pre-Opémisca, outcrop along the east shore. These strata strike south 80 degrees east and are overturned with a dip of 75 degrees south. The basal conglomerate of the Opémisca series outcrops a short distance to the north, strikes east, and dips vertically. The basal conglomerate along with intercalated greywacke beds has a thickness exceeding 1,500 feet and is succeeded to the north by about 2,500 feet of bedded greywacke and arkose, which strikes east and dips vertically except for a few

hundred feet where it is overturned a few degrees to the south. Near the centre of the lake a second boulder conglomerate horizon estimated to be about 1,000 feet thick strike east and dips 80 degrees north. This conglomerate is overlain by about 3,000 feet of greywacke, tuff, and arkose with occasional small lenses of conglomerate. A third major conglomerate horizon, at least 500 feet thick, crosses the lake at the beginning of the narrows, and a fourth conglomerate horizon, possibly 400 feet thick, crosses the lake 2,000 feet farther north. The intervening rocks are greywacke, tuff, and arkose. At the north end of the lake the beds dip 60 degrees north. From observations made elsewhere, the rocks bordering Lac du Sauvage are believed to lie in the south limb of a syncline whose east-west axis probably lies just north of the lake.

In the north part of Richardson township and to the west, along Brock River, where these sedimentary rocks are intruded by hornblende syenite, they are altered to hornblende schists, and quartz-hornblende-mica-epidote schists.

Porphyritic andesite flows in the northeast corner of Opémisca township overlie Opémisca greywacke and tuff. Both flows and sedimentary rocks strike southeast and dip from vertical to 75 degrees southwest. They are in the north limb of a synclinal fold whose axial plane appears to run southeasterly about along the small stream in the southwest corner of the map-area.

The small gabbro stock at the head of Blaiklock River and the gabbro body at the south end of Rush Lake are similar in appearance and composition. Diopside altered largely to hornblende forms 50 to 60 per cent of the rock, and plagioclase almost completely altered to zoisite and chlorite makes up most of the remainder. The rock has an average grain size of about 0.1 inch, but in some places on Rush Lake is pegmatitic with actinolite crystals up to 2 inches long.

Gabbro of the type described above outcrops on the southwest side of the bay on the south side of Lac du Sauvage, 1 mile from the south end of the lake. A small body of diorite is exposed on the shore about 400 feet farther east. Both the gabbro and the diorite are intruded by a boss of porphyritic gabbro. The latter rock probably has considerable areal extent as it outcrops again at the bottom of the south bay of the lake, 1 mile to the southwest. The porphyritic

gabbro is a dark rock that weathers with a rough, cavernous surface upon which resistant, altered, augite phenocrysts stand out. The phenocrysts range from 1 inch to 2 inches in diameter and are distributed from 1 foot to 2 feet apart throughout the rock.

Coarsely crystalline diorite outcrops on the south side of Crinkle Creek, 4 miles south of Brock River. A hornblendite stock about 1,500 feet wide is exposed along the shores and islands of Brock Lake at the head of Brock River. Small dykes of grey granite and a pegmatite dyke 1 foot wide cut the hornblendite on the north side of the largest island. At the east end of Lac Tabac (the lake east of Lac Lemieux) there is an outcrop of hornblendic rock largely altered to actinolite and talc.

A large dyke cutting granite close to Brock River, and two dykes cutting greywacke over a mile south of the river, are of diabase. These dykes range from 40 to 100 feet in width and are comparatively fine-grained. Small dykes of similar composition but finer grained cut the granite farther north. On the most northerly island on the west side of Rush Lake, fine-grained andesite is cut by a 4-foot dyke of biotite lamprophyre. The granite on the west shore of Punichuan Bay is cut by a dark, altered, diorite dyke 50 feet wide.

Granitic intrusive rocks throughout the area are characterized by a high potash and soda content. All contain microcline, either albite or oligoclase, and either hornblende or biotite. They are comparatively fresh and unaltered.

The hills about Cachisca and Opataca Lakes are formed of coarsely crystalline, light pink granite, traversed by narrow pegmatite dykes. The area lying between the north end of Opataca Lake and Lake Mistassini, and south to the sedimentary belt, is underlain by a complex of gneiss cut by fine- to medium-grained, grey, pink, and white granite and pegmatitic granite, the whole being cut by pegmatite dykes. On the south side of Brock River, east of its junction with the North Brock, there are numerous places where a gradation from gneiss through hornblende schist to normal greywacke may be seen. This suggests that most of the gneiss in the main granite area is of sedimentary origin and represents granitized pre-Opemisca sediments.

A hornblende syenite body extends westerly from Waconichi Lake for 18 miles. It is a medium-grained, pink rock speckled with black hornblende crystals. Similar rock was seen along and near Brock River, near the west edge of the map-area. Dykes of hornblende syenite were noted cutting pink granite near the centre of Plamondon township. Opémisca sediments adjoining the syenite in Richardson township are altered to hornblende and quartz-mica-hornblende schists.

Stocks of porphyritic granite intrude Opémisca sediments and older rocks at Rush Lake and on the northwest side of Lac du Sauvage. The porphyritic granite is a grey to pink rock of medium grain with scattered phenocrysts of microline, which range from 0.25 to 1.0 inch in diameter.

Six miles west of the head of Blaiklock River, at a place 2 miles south of Brock River, there is a high ridge of syenite porphyry. The rock holds light pink feldspar phenocrysts having an average diameter of 0.5 inch. At the south end of the ridge the syenite porphyry becomes progressively finer grained as the sedimentary contact is approached.

One mile west of the syenite porphyry ridge there is a boss-shaped hill of granite porphyry. This rock is studded with prominent microcline phenocrysts that range from 1 inch to 3 inches in length and lie in a coarsely crystalline groundmass.

The granite stock that invades Opémisca sediments in the southwest corner of the area is fine- to medium-grained pink rock.

An assemblage of the sedimentary Chibougamau series form a synclinal body on the northwest side of Waconichi Lake where they extend for 7 miles northeasterly along the lake and have a maximum width of 2 miles. For several miles along the lakeshore there are steep bluffs of boulder conglomerate rising from 50 to 100 feet above the lake. The pebbles in the conglomerate average 1 inch to 2 inches in diameter, but some boulders up to 2 feet in diameter were seen. The pebbles are largely of pink or white granite, green, schistose andesite, rhyolite, diorite, and greywacke. The conglomerate passes upwards into and is interbedded with arkose and quartzite, and these grade into fine-grained, laminated greywacke. In some places, scattered pebbles and boulders

of chert, quartz, and granite are present in the greywacke. Its outcrops are confined to an area about ½ mile wide and 4 miles long at the centre of the syncline. On the southeast limb of the syncline the conglomerate has an average dip of about 15 degrees towards the northwest, and on the northwest side the strata dip from 15 to 20 degrees towards the southeast. The total thickness of the Chibougamau series on Waconichi Lake is estimated to be between 1,000 and 1,500 feet, with greywacke comprising the upper 200 to 300 feet.

The unconformity between the Chibougamau conglomerate and the underlying pre-Opemisca sedimentary rocks is exhibited close to the lake about 2 miles southwest of Musset Island. There, on the southeasterly slope of a hill, poorly bedded, feldspathic, sedimentary rocks, containing a few granite and greenstone pebbles, strike north 80 degrees east and dip 65 degrees southeast (upper side of strata undetermined). The basal conglomerate of the Chibougamau series rests on the truncated surface of the upturned strata and strikes north 75 degrees east and dips 20 degrees southeast.

Due north of Punichuan Bay, grey and pink granite with inclusions of hornblende gneiss is overlain by dolomitic limestone of the Mistassini series. The limestone strikes north and dips from 5 to 15 degrees east except where an occasional small fold interrupts the major east dipping structure. The limestone rests upon a peneplaned surface of weathered and jointed granite. In places the limestone penetrates as much as 20 feet into the granite along widened joints and fractures. Closely packed, algal-like structures occur throughout the lowest 8 feet of the limestone. Both the limestone and the underlying granite are cut by veins of black chert and a few narrow beds near the base of the limestone have been almost completely replaced by black chert. Some of the chert is cut by small quartz stringers. Small geodes in the limestone lined with chert and white quartz crystals are of common occurrence, and in places a little sphalerite and galena accompany the quartz. Veins in the limestone contain small amounts of lead and zinc.

There is abundant evidence of glaciation. Glacial striae strike from south 30 degrees west to south 40 degrees west. Ground moraine with chains of kettle-lakes and outwash sand-plains is widespread and eskers are numerous. There are great numbers of drumlin-shaped hills of sand, gravel, and boulders. Most of

the hills, ridges, and eskers trend southwest but a number of small, parallel, morainal ridges, from 5 to 15 feet high, run northwest. A glacial lake covered the area during the time that the district was being freed of ice. The high level of the glacial lake is recorded by boulder beaches and by wave-washed rock areas. Above these the rock is drift and forest covered.

FAULTING

Evidence of regional faulting following a northeasterly direction is widespread. Rocks on the southeast sides of most of the faults have moved up and to the northeast relative to rocks on the northwest sides. The faulting was at least in part of Late Precambrian age, as the faults traverse the Chibougamau series. As dislocation along the major fault is known to be about 1 mile, it is believed that movement occurred over a considerable period of time and probably overlapped the period or periods of mineralization.

The McKenzie Narrows fault which has been traced for over 10 miles in a northeast direction at the north end of Chibougamau Lake, extends into Brock River area, passing through the chain of small lakes in the southeast corner of the area. The rocks along the shores of the lakes exhibit intense brecciation.

The Gwillim Lake fault, which strikes approximately north 60 degrees east along the course of Gwillim Lake (5 miles south of Rush Lake), may extend northeast through Waconichi Lake. Sedimentary rocks of the Chibougamau series at the northeast end of Waconichi Lake are down-faulted on the northwest side of a northeasterly trending fault and rocks of similar age at the southwest end of the lake are probably on the down-throw side of the same fault.

A great many small faults with northeasterly trends were seen along the shores of Punichuan Bay at the head of Lake Mistassini. They are thought to be branch faults connecting with a zone of faulting thought to underlie Punichuan Bay.

On the northwest shore of Little Opémisca Lake, on the north boundary of Cuvier township, a northeast fault separating porphyritic andesite from greywacke is marked by a large quartz vein. This fault is believed to be the northeasterly continuation of a fault to be seen at the north end of Dadson Lake 6 miles southwest of Little Opémisca Lake, where the fault is marked by vein quartz containing

a little chalcopyrite. Eight miles northeast of Little Opémisca Lake the fault is thought to mark the contact between gabbro on the northwest and conglomerate on the southeast. On the north side of Brock River a diabase dyke has a horizontal offset of about 1 mile along the strike of this fault. A number of narrow lakes and creeks are in alinement with the strike of this fault for an additional 40 miles to the northeast, and it is probable that the fault zone underlies their course. This fault zone is hereinafter referred to as Brock River fault zone.

A branch of the Brock River fault zone is believed to diverge from it near the position where the fault crosses the west flowing part of Brock River. The branch fault runs parallel to Crinkle Creek for some miles and is named Crinkle Creek fault. Five miles southwest of its junction with the Brock River fault zone, its outcrop is concealed by drift, but its presence is inferred because the strike of the sedimentary rocks on opposite sides of its theoretical position differ in direction by 90 degrees. Farther southwest the contact between sedimentary rocks on the northwest and a granite stock on the southeast is believed to lie along the Crinkle Creek fault zone. West of Brock River area, the Crinkle Creek fault zone is believed to merge with converging fault zones that run northeasterly from the north end of Lac des Deux Orignaux and east-northeast from the east end of Lac la Treve.

VEIN DEPOSITS

A vein of galena and pyrite is exposed in the wave-washed Mistassini limestone on the west shore of Lake Mistassini about 1 mile north of Punichuan Bay and about 1,000 feet south of the first inflowing stream. The vein strikes north 25 degrees west and dips 65 degrees southwest. It is exposed for 30 feet between the water's edge and the soil-covered shore line. The vein is 3 inches wide at the lake shore. It splits near its north end to form two veins, each 1 inch to 2 inches wide. The limestone is probably not much more than 50 feet thick here as the underlying granite outcrops only a few hundred feet west. A grab sample of the sulphides assayed: gold, a trace; silver, 1.52 ounces a ton; lead, 52.70 per cent.

Six small quartz veins are exposed in the limestone on the west shore of a bay of Lake Mistassini, 13 miles north of Punichuan Bay. These veins lie parallel, have an average width of 2 inches, are from 4 to 5 feet apart, and each is less

than 25 feet long. They strike north 30 degrees east and dip vertically. The gangue of quartz and calcite carries galena and sphalerite. A representative sample assayed: gold, a trace; silver, 0.58 ounce a ton; lead, 11.22 per cent; zinc, 4.46 per cent.

Several hundred feet south of the last described veins there is a flat-lying vein following a bedding plane in the limestone and composed of coarse pyrite. The vein is 1 inch thick and is exposed at intervals for 200 feet along the shore. A representative sample of the pyrite assayed only a trace of gold.

A quartz vein cuts a gabbro stock that intrudes sedimentary rocks on the south side of a small lake at the head of Blaiklock River. This vein ranges from 1 to 3 feet in width and may be seen at intervals for several hundred feet. It occurs along a shear zone that strikes west and dips vertically. The quartz is sparsely mineralized with pyrite. A grab sample of the vein quartz assayed a trace of gold.

A quartz vein about 30 feet wide outcrops on a point on the northwest shore of Little Opemisca Lake just north of the north boundary of Cuvier township. The vein strikes northeast and dips 80 degrees northwest. It occurs along a fault with banded greywacke and black slates on the southeast and porphyritic andesite on the northwest. The quartz is white, somewhat fractured, and traversed by minute, chloritic seams, but no sulphides were seen. The vein has been stripped for a short distance across half of its width. About 1,000 feet to the southwest an 8-inch vein of glassy quartz sparsely mineralized with chalcopyrite traverses a small outcrop of andesite porphyry. A grab sample of quartz from the main vein outcrop assayed a trace of gold.

Small quartz veins ranging from a few inches up to a foot in width were noted in many places throughout the area, particularly in the sedimentary rocks, in the gabbro stocks, and in the syenite porphyry stock.

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