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DEPARTMENT OF MINES
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BUREAU OF ECONOMIC GEOLOGY
GEOLOGICAL SURVEY

MEMOIR 197

Little Southwest Miramichi-Sevogle Rivers Area, New Brunswick

BY

E. W. Shaw

OTTAWA
J. O. PATENAUDE, I.S.O.
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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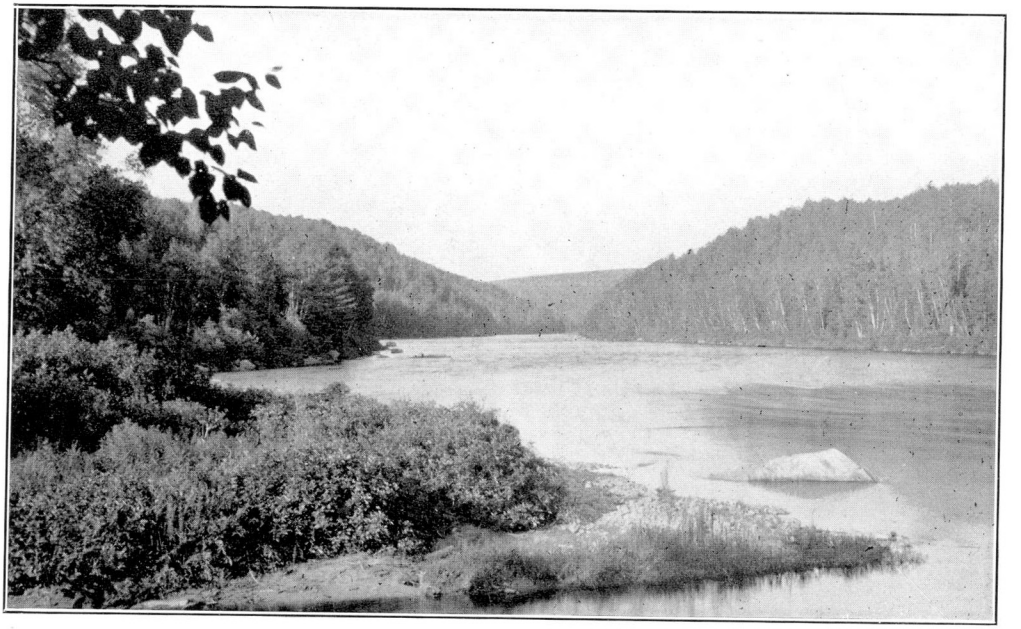

Little Southwest Miramichi river from "The Forks."

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Little Southwest Miramichi-Sevogle Rivers Area, New Brunswick

INTRODUCTION

The area described in the present report comprises about 700 square miles lying between longitudes 66°00′ and 66°30′ and latitudes 46°53′ and 47°10′. It includes the greater part of the drainage basins of Little Southwest Miramichi and Sevogle rivers, Northumberland county, New Brunswick.

The only previous systematic work on the consolidated rocks of this region was done by Ells[1] in 1880. He divided the great series of metamorphic rocks into two groups, the first, which he called Precambrian, occupying a central zone elongated in a northeast direction, and the second, which he classed as Cambro-Silurian (Ordovician), underlying bordering areas. He also defined with some accuracy the limits of the Carboniferous sediments and the granite batholiths.

Other reports that refer to the area are as follows:

Ells, R. W.: Report on the Geology of Northern and Eastern New Brunswick and the North Side of the Bay of Chaleur; Geol. and Nat. Hist. Surv., Canada, Rept. of Prog. 1880-81-82, pt. D.

Bailey, L. W.: Report on Explorations in Portions of the Counties of Victoria, Northumberland, and Restigouche, New Brunswick; Geol. and Nat. Hist. Surv., Canada, Ann. Rept. 1886, pt. N.

Chalmers, R.: Report on the Surface Geology of Northeastern New Brunswick; Geol. and Nat. Hist. Surv., Canada, Ann. Rept. 1887, pt. N.

Ells, R. W.: The Geology and Mineral Resources of New Brunswick; Geol. Surv., Canada, Pub. No. 983, 1907.

Field work was done by the writer during the summer of 1935. The main rivers, streams, and larger brooks were surveyed by compass and stadia, and all rock exposures along their courses were examined and located. Practically all the wood roads and trails in the area were traversed in a search for rock exposures.

The most convenient point of entry is the town of Newcastle on the Canadian National railways, from which good highways lead to the east and southeast borders of the area. The area itself is traversed fairly well by poor, but passable, wood roads and trails. Little Southwest Miramichi river and Big Sevogle river can be navigated throughout the greater part of their courses by canoes, or boats equipped with poles. Maps of the area, prepared from forestry surveys by the Crown Land Department of New Brunswick, were found very useful. The map accompanying this report is a compilation of information secured by the present survey and these forestry surveys.

[1]Ells, R. W.: Report on the Geology of Northern New Brunswick, Embracing Portions of the Counties of Restigouche, Gloucester, and Northumberland; Geol. and Nat. Hist. Surv., Canada, Rept. of Prog. 1879-80, pt. D.

Field work was done under the general supervision of B. Rose, who spent several days in the field with the writer and at all times kept in close touch with the work.

Thanks are due to Dr. W. J. Wright, Provincial Geologist of New Brunswick, whose co-operation in this work was greatly appreciated.

The writer was efficiently assisted in the field by J. B. Lunam, T. S. Wilson, and S. B. Thomas.

To many residents of the district the writer is under obligation for courtesies extended to the party.

GENERAL CHARACTER OF THE REGION

The greater part of the area may be described as a fairly level plateau averaging about 1,000 feet in elevation. The plateau slopes gently to the east away from the elevated and rugged granitic area of the central part of the province towards the low-lying Carboniferous plain bordering the Atlantic ocean. The plateau is deeply and rather sharply dissected by the river valleys, which form a well-established drainage pattern. The area, with a large number of interfluvial ridges, is well drained, as is shown by the scarcity of lakes and swamps. Viewed from a prominence, the country presents a rather monotonous lack of relief and an even skyline.

In detail, however, the above generalization does not everywhere apply. For example, the boundary line between the Carboniferous and older rocks is more or less coincident on either side of Little Southwest Miramichi river with a relatively abrupt rise to the west, a topographic feature that is referred to locally as Catamaran ridge on the south side of the river, and Tomahawk ridge on the north side. The western fringe of the area is occupied by granites and in this part the topography is more rugged, and the elevation is greater, than elsewhere. The highest peak, mount Kagoot,[1] one of a series of high summits that form the divide between Big Sevogle and Nipisiguit rivers, reaches an elevation of 2,175 feet.

The main rivers of the area are Little Southwest Miramichi, Big Sevogle, and Little Sevogle. They are among the swiftest rivers in the province, and have practically continuous rapids and small falls along their courses. The valleys are deepest about midway between source and mouth. The maximum depth of the valley of Little Southwest Miramichi river is in the vicinity of Devils brook and is about 400 feet. The rivers generally follow a zig-zag course, alternating between the directions parallel to, and normal to, the strike of the rocks.

Lumbering has been the chief industry of the region for many years. Continued exploitation and the ravages of fire and bud worms, however, have decidedly reduced the reserves. The principal trees are red and white pine, jackpine, spruce, balsam, birch, white poplar, beech, hemlock, and maple.

The streams abound in trout and salmon, and in the woods, deer, moose, bear, and partridge are abundant. The area on this account attracts a large number of sportsmen, principally from the United States. Catering to these provides a livelihood for many of the residents of the adjoining settlement.

A limited amount of trapping is done during the winter. The chief fur-bearing animals are muskrat, mink, beaver, and fox.

[1]Locally known as "Big Bald mountain."

GENERAL GEOLOGY

Since rock exposures are practically confined to the valleys of the larger streams, the working out of the correct stratigraphical succession is difficult. The following table summarizes what is believed to be the succession:

Table of Formations

Pleistocene and Recent		Till, gravel, varved clay, alluvium
Pennsylvanian		Grey, incoherent sandstone, conglomerate
		Dull red conglomerate, impure sandstone, shale, and limestone. Thickness—50 to 75 feet
		Unconformity
Middle Devonian		Biotite granite, aplite
		Granite-gneiss, quartz diorite
		Intrusive contact
Pre-Silurian	Metamorphic group	Division 4. Varicoloured slates and tuffs
		Division 3. Acid and intermediate lavas and tuffs, metargillites
		Unconformity (?)
		Division 2. Feldspathic quartzites, cherts, quartzo-feldspathic schists, metargillites, and some volcanic rocks
		Division 1. Quartzo-feldspathic paragneiss, with local intercalations of schist and quartzite. Thickness—1,100 feet (?)

DESCRIPTIONS OF FORMATIONS

METAMORPHIC GROUP

The greater part of the area is underlain by the rocks of this group. They are characterized particularly by a medium to high degree of metamorphism, induced by rather intense regional dynamic and local contact metamorphism. The metamorphic agencies were effective at more than one time. The strata are in general greatly deformed, with overturned folds a common feature.

Division 1

Rocks of this division are confined, so far as known, to four areas:

(1) A northeast-trending band, roughly 3 miles wide, extending from the mouth of Libbies brook on the southwest to Sheephouse brook on the northeast. The northeast part of this area has been intimately intruded by granite.

(2) A small, presumably lenticular-shaped area which is traversed by Little Southwest Miramichi river about 2½ miles below the confluence of the north and south branches.

(3) A small, northeast-trending area, presumably lenticular in outline, which is crossed by Mullins stream about 7 miles from its mouth.

(4) An area of doubtful size and outline which is indicated by exposures on Little Southwest Miramichi river in the vicinity of, and downstream from, the mouth of Mains brook.

The rocks consist predominantly of sedimentary gneiss (or granulite), and subordinately of mica-chlorite schist and feldspathic quartzite. The typical gneiss is a grey or greenish grey, coarse-grained rock which is usually jointed into large rectangular blocks; it is indistinctly foliated where dips are low and distinctly so where dips are high. In some places the gneiss is very massive, giving it a granitic appearance; in other places it grades into a mica-chlorite schist or a feldspathic quartzite. As a rule, these rocks show gentle warping rather than intense drag-folding, a fact that indicates that they form a relatively competent unit.

The typical gneiss, as determined by microscopic study, approximates the following composition: quartz, 40 per cent; andesine, 30 per cent; orthoclase and untwinned or discontinuously twinned albite, 20 per cent; with the remaining 10 per cent made up of biotite, sericite, chlorite, carbonate, sphene, occasionally hornblende, and other accessory minerals. Andesine, albite, and quartz occur as large altered crystals embedded in a fine-grained mosaic of quartz and feldspar. Micaceous minerals show a general parallelism in their arrangement. Close to the gneissic granite, as on Big Sevogle river, the andesine feldspar has apparently been altered to albite, with a resultant increase of calcite.

The gneiss is quite clearly of sedimentary origin. On Little Southwest Miramichi river, about 1½ miles below the confluence of the north and south branches, exposures on both banks show the typical gneiss crossbedded against mica-chlorite schist. The large percentage of quartz occurring with andesine is additional evidence of a sedimentary origin. The gneisses are regarded as having been derived from an arkose or a very pure feldspathic sandstone. It should be emphasized that these gneisses are regarded as a stratigraphic unit and not as rocks that have been grouped together because of a similarity induced by contact metamorphism.

Where the river crosses the axis of a low anticline one-half mile above the mouth of North Branch Little Southwest Miramichi river, the gneisses grade downwards into, and in places are interbedded with, relatively pure, fine-grained quartzites and mica-chlorite schists. These quartzites and schists should perhaps have been grouped as a separate unit. On the other hand it was felt that they may represent merely a local development within the gneisses.

The gneisses are overlain conformably by the quartzites and schists of Division 2. The contact zone is exposed at a number of localities, and at each one an interbedded relationship exists.

Division 2

Rocks of this division underlie nearly one-half of the total area. Except for the small areas of gneiss already described, and for three small areas of sheared granite, they occupy all of a northeast-trending belt

roughly 17 miles in width. In addition to this main area, two small, presumably lenticular-shaped areas, which are indicated by exposures on Little Sevogle river, lie within the southeastern volcanic belt.

These rocks include a wide range of types predominantly of sedimentary origin. Mineralogically they are characterized by the constant (?) presence of albite and titanium minerals. The close association of diverse lithological types has rendered these beds differentially incompetent, with the result that contorted structures and anomalous relationships of strata are common.

The most abundant type is a greenish grey, fine-grained quartz-albite-sericite schist. It normally consists of crenulated bands, from 1 mm. to 3 mm. thick, of a fine-grained, recrystallized mosaic of quartz and albite. These bands are separated from each other by films of sericite, imparting a distinct wavy foliation to the rock. In most cases the bands appear to be roughly parallel to major changes in lithology and they are probably parallel or nearly so to original bedding laminæ.

The remaining sedimentary rocks of the division may be broadly classified into those that have been derived from less argillaceous sediments and those derived from more highly argillaceous beds than the quartz-albite-sericite schists. The former includes feldspathic quartzites and chert. The feldspathic quartzites vary in colour from greyish green, bluish grey, and light grey, are in most cases fine grained to glassy in texture, and occur in beds from a few inches to 3 feet thick. The individual beds are usually sharply separated by highly metamorphosed argillites and have not retained any original structures whereby their orientation might be ascertained. Microscopic examination shows them to consist of about 75 per cent quartz, about 20 per cent feldspar (albite-oligoclase), and the remaining part sericite, iron oxides, sphene, etc. Most of the quartz and feldspar occur in a fine mosaic, but a few larger relic crystals are generally present.

The rocks that have been derived from the more highly argillaceous sediments are collectively termed metargillites. They include a variety of rocks such as: quartz-mica-chlorite schists, quartz-albite-chlorite-epidote schists, chlorite-carbonate schists, sericite phyllites, etc. The dark lead-grey schists or slates are in many cases studded with pale cubes of pyrite and outcrops are stained by iron and manganese solutions.

A few recognizable acidic lava flows and tuffaceous beds occur. In many cases, however, the degree of metamorphism that the rocks have undergone makes it difficult to distinguish between volcanic and sedimentary products. The unusual abundance of ilmenite and sphene suggests that volcanic material was a widespread constituent of the sediments.

Division 3

Rocks of this division are found in two main zones.

(1) An area averaging about 3 miles in width extending in a general northeast-southwest direction along the southeast border of the large area of Division 2 rocks.

(2) An area lying along the northwest border of Division 2 rocks, as indicated by exposures in the upper part of North Branch Big Sevogle river and on the wood road that leads to Bald Mountain lookout tower.

These rocks are predominantly of volcanic origin. Since interbedded, dark, slaty rocks and pillow lavas are present, it is thought that they were

deposited largely under water. The rocks can be studied best on Little Sevogle river. On the whole the lavas have suffered less recrystallization than their associated tuffs or the sediments of Division 2.

The lavas that can be determined include andesites and sodic rhyolites. The former on Little and Big Sevogle rivers are of the augite variety. They occur in places in the form of amygdaloidal flows and pillows with the amygdules made up of spherulitic chlorite. A medium-grained augite-hypersthene rock with ophitic texture, regarded as andesitic lava, is exposed on Little Southwest Miramichi river 1¾ miles below Devils brook. Excellent examples of brecciated flow tops are exposed on the same river about 2,000 feet below the mouth of Devils brook. The andesitic rocks are locally carbonatized and epidotized, and in most cases are stained by iron.

Rhyolitic rocks are perhaps more abundant than the andesites. They are usually fine grained, with phenocrysts of albite and quartz scarcely perceptible to the naked eye. A high excess of albite over orthoclase is characteristic of those examined microscopically.

The tuffs appear to be at least equal in volume to the lavas. Lavas and tuffs are interbedded to some extent throughout, but tuffs are more abundant towards the top. A common type of tuff is a medium-grained, fairly massive, greyish green rock made up largely of angular and poorly sorted fragments of quartz, feldspar, slate, and cherty material. Spherulitic penninite occurs in little, rounded masses. Wherever found this type of tuff is interbedded with a dark-coloured, highly cleaved, titanium-rich, slaty rock which is probably also tuffaceous in origin. A number of tuff beds exposed have a general ashy appearance. They are usually highly schistose and the original bedding is indicated by slight colour changes. In some cases they contain large, subangular grains or crystals of quartz and albite enveloped by sinuous strings of secondary minerals.

The relationship between Divisions 3 and 2 is not definitely known. Where representatives of the two are found together they give the impression of being interbedded throughout a contact zone. Unfortunately, however, wherever this zone was examined the structure was so complicated and rock types so difficult to distinguish that closely spaced repetition of beds could be mistaken for interbedding.

The relationship of the division to the overlying rocks will be discussed later.

Division 4

Rocks of this division are exposed on Castor brook, McNeil brook, and Northwest Miramichi river for 2½ miles above Wayerton post office. It is assumed that they constitute a more or less continuous band lying between the southeast area of volcanic rocks and the Pennsylvanian rocks.

The rocks consist of varicoloured, commonly banded, slates intimately interbedded with coarser grained, greyish green and ash-coloured tuffs. The slates are purple, red, greenish grey, yellowish brown, or black, and usually exhibit colour banding parallel to the bedding planes. Purple and red-coloured slates with an ochreous streak are very common on Northwest Miramichi river up to 2 miles above Wayerton post office. A few seams and nodular concretions of hematite were seen in these slates just below Wayerton.

The interbedded tuffs are usually of medium-grain size and break with a hackly fracture rather than in cleaved plates. In many cases they contain fragments of slate up to 2 inches across, in which case a better term for them might be volcanic breccias. The high iron and titanium content of the fine-grained slates described in the previous paragraph suggests that they, too, may be largely of tuffaceous origin.

The typical rocks of the division are found, together with those of No. 3, on parts of McNeil brook and on Little Sevogle river about 200 feet above the mouth of McNeil brook. From the evidence at these places there is little doubt that the two divisions are conformable.

The Pennsylvanian rocks overlie the rocks of No. 4 Division unconformably.

Structural Features of the Metamorphic Group

Folding and Faulting. The distribution of the rock divisions, with the older rocks in the middle and younger rocks on either side, indicates that the major structure is a great northeast-trending, and northeast-plunging anticline or anticlinorium which has its limits far beyond the boundaries of the present area. Of chief interest within the area itself, however, are the complicated structural features that are superimposed upon this great regional anticline.

The general structure of the rocks of the Little Southwest Miramichi River system will be considered first. From the edge of the Pennsylvanian rocks on the southeast to just over 2 miles below the confluence of the north and south branches, the attitude of the beds with few exceptions alternates between steep dips (70 to 80 degrees) and moderate dips (50 to 60 degrees) to the southeast. This indicates a series of folds overturned to the northwest. It will be noticed from the map that over this distance older rocks are progressively exposed. This does not mean that there is no repetition of smaller units of strata, but that higher folds are progressively encountered and the axial region of the great regional anticlinorium is being approached in this northwest direction. Several small faults were noted along this part of the river, but on the whole faulting movement has been well distributed, as evidenced by the abundant glossy cleavage planes.

From 2 miles below the confluence of the north and south branches of the river northwestward to the edge of the large granite batholith there is quite a different set of conditions. A low, northeast-striking anticline, the axis of which crosses North Branch Little Southwest Miramichi river just above the mouth, brings the gneisses of Division 1 to the surface in a belt about 3 miles wide. On the northwest of this band of gneiss, the quartzites and schists of No. 2 have low (0 to 30 degrees) regional dips to the northwest, but locally they are highly contorted and overturned. The overturns are in most cases to the southeast.

At the point referred to, 2 miles below the confluence of the north and south branches, a stretch of 1,000 feet with no exposures separates the two different types of structure. In this short distance there is a change from the very steep-dipping gneisses of Division 1 and varied schists of No. 2 on the southeast, to almost flat-lying gneisses of No. 1 on the northwest. This anomaly was recorded by Ells[1], who regarded it as evidence

[1]Ells, R. W.: Report on the Geology of Northern New Brunswick, Embracing Portions of the Counties of Restigouche, Gloucester, and Northumberland; Geol. and Nat. Hist. Surv., Canada, Rept. of Prog. 1879-80, pt. D, p. 29.

of an unconformity between "Precambrian" and "Cambro-Silurian" rocks. The writer believes, however, that the gneisses on either side are to be correlated and, therefore, cannot accept Ells' interpretation. Since an unconformity at this point cannot be admitted, the assumption of a northeast-striking fault appears to be necessary. The northwest overturning of the strata on the southeast part of the river at once suggests a southeast-dipping thrust fault. Such a fault by itself, however, would not account for the gneisses being at the surface on its northwest side. On the other hand, a northwest-dipping thrust fault would explain the existing relationship. It is probable, therefore, that an upward and outward thrust was exerted by the intrusion of the great masses of Devonian granite to the west and northwest.

The structural features as revealed on the Little and Big Sevogle River systems are less definite. On the southeast part there is a series of asymmetrical or overturned folds with their steep sides commonly to the northwest. In this respect the conditions are generally similar to those on Little Southwest Miramichi river. In detail, however, the structural conditions on the Sevogle rivers differ in that strikes and dips are less uniform, as if the pronounced folds on Little Southwest Miramichi river open out to the northeast and resolve themselves into numerous smaller and steeply plunging folds. One prominent asymmetrical fold strikes northeast and crosses Mullins stream about 7 miles from the mouth.

The locality of the "Square Forks" on Big Sevogle river represents a pivotal point about which there is a general change in the strike of the rocks from northeast to approximately northwest. The general northwest strike is exhibited by the strata exposed on the lower part of North Branch Big Sevogle river, the upper part of South Branch Big Sevogle river, and Clearwater stream. The low, northeast-trending anticline that crosses North Branch Little Southwest Miramichi river just above its mouth crosses Big Sevogle river just below the mouth of Clearwater stream, but here it has a granitic core and is complicated by what appear to be cross-folds which strike northwest. This general northwest strike of the rocks in the north part of the area may have been induced by the intrusion of a granite body to the northeast of the area, the granite being now concealed by Pennsylvanian rocks.

Drag-folding, Cleavage, and Bedding. The rocks of Divisions 2 and 4, particularly, show an extraordinary amount of drag-folding. In many places, especially where regional dips are low, it is difficult to conceive how once flat-lying strata could be so intensely deformed. Where such conditions prevail the regional attitude of the strata can be determined only approximately.

Fracture cleavage is well developed in the softer rocks, but is less prominent in the quartzites and gneisses. Cleavage planes in the schists are characteristically lustrous and commonly present a ribbed effect. Two large exposures of ash-coloured tuff on Big Sevogle river, 1¼ miles above the mouth of Whitney brook, show well-developed cleavage at 126 degrees, less prominent cleavage at 46 degrees, and bedding planes parallel to neither. Exposures of reddish, banded slates and purple and green tuffs of Little Sevogle river just above the mouth of McNeil brook show a pronounced fracture cleavage in a direction normal to the axis of folding, and minute thrust faulting of the beds.

Structural History. The complexity of folding and faulting suggests that the present structure of these rocks was produced by variable orogenic forces. The same general features are described by Alcock[1] in the Tetagouche formation of Chaleur Bay region where Ordovician rocks have been deformed by both the Taconic and Acadian orogenic movements. Although it is admitted that the Acadian orogeny, if considered to have been spasmodically active over a long period of time, with variable influencing factors, could have in itself produced the existing structural features, the writer believes that the rocks of the area have been powerfully affected by both periods of orogeny. He would attribute the great northwest overturned folds of the lower part of Little Southwest Miramichi river largely to Taconic diastrophism.

Quartz Veins of the Metamorphic Group

Quartz is well distributed in extraordinary volume in the rocks of the group, particularly in the schists of Division 2. Two types occur. First, generally milky quartz in veins that occupy distinct fractures. Second, generally rose-coloured quartz in the apex of drag-folds and in discontinuous sheets and lenses in the schist. The first type shows little evidence of having been subjected to dynamic metamorphism. Characteristic veins of this type are exposed on Little Southwest Miramichi river above the mouth of Libbies brook, where they are normally barren. The second type, where it occurs in the apex of drag-folds, is commonly concentrically fractured, as if it had been subjected to rotational stress, subsequent to its deposition. Where it occurs in the schist it is commonly enveloped by black, glistening, micaceous material and encloses little nests and sinuous strings of chlorite. In some cases minor amounts of feldspar and calcite are associated with the quartz. The quartz does not normally carry more pyrite than the adjacent rock; that which it does carry is usually in slickensided seams.

The quartz of the first type is probably of metasomatic origin, genetically related to the great Devonian granite batholiths. The origin of the second type is less certain. It is definitely related to the structure of the rocks and yet it has been subjected to great dynamic metamorphism, suggesting that the quartz may be older than the batholithic granite. This possibility and also the great volume of the quartz suggest that the greater part of it may be a segregation from the acidic rocks of the area, produced by intense dynamic metamorphism.

Age of the Metamorphic Group

As no fossils were found in any of the rocks of the group, their age is not definitely known. It has already been stated, in the section dealing with the structural features, that the writer believes that these rocks have been affected by the Taconic orogeny. If this be true, then they must be pre-Silurian in age.

The slates and volcanics of Divisions 3 and 4 bear a close resemblance to the Middle Ordovician Tetagouche series of Chaleur Bay region as

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[1]Alcock, F. J.: Geology of Chaleur Bay Region; Geol. Surv., Canada, Mem. 183, p. 16 (1935).

described by Ells[1], Young[2], and Alcock[3]. This resemblance of strata is significant because the two areas are not far removed from each other in a direction more or less parallel with the general strike of the rocks. Ells, who worked in both areas and also in the intervening area, considers the slates of both areas to be contemporaneous. It may be regarded then as probable that the rocks of Nos. 3 and 4 are Middle Ordovician in age.

As previously stated, the relationship between Divisions 2 and 3 is not definitely known. The rocks of No. 2 bear a general likeness to the Precambrian (?) Cambrian (?) Macquereau group of Chaleur Bay region.[4] Other strata that might be likened to those of Divisions 1 and 2 are the Ordovician (?) Gagne Brook series[5] of Lake Aylmer, Quebec, and the Ordovician (?) metamorphics of Lesseps area,[6] Gaspe peninsula.

MIDDLE DEVONIAN

Granite-gneiss

Granite-gneiss occurs in three separate areas. (1) An area roughly 13 miles long and 2 miles wide crossed by the upper part of Mullins stream, by Big Sevogle river below the mouth of Clearwater stream, and by Sheephouse brook. (2) A small area indicated by exposures on North Branch Big Sevogle river just below the mouth of Lake brook. (3) A dyke-like body exposed on Little Southwest Miramichi river about 3 miles above the mouth of Devils brook.

The first and largest of these areas is made up of an intimate mixture of sheared granite and gneissic sediments. The granite-gneiss varies from distinctly pink to grey, and varies also in its mineralogy. Quartz, orthoclase, and albite are present in all the thin sections examined. Microcline and oligoclase are common minerals. Peripheral albite on orthoclase and oligoclase, and quartz-albite and orthoclase-albite intergrowths are common petrographic features. Other minerals are biotite, sericite, chlorite, ilmenite, leucoxene, apatite, and tourmaline.

The granite-gneiss on North Branch Big Sevogle river is of similar composition to the rock just described, but is not so highly sheared. It has a border phase of light grey, finer grained granite carrying small inclusions of mica-chlorite schist.

The dyke-like body of granite-gneiss on Little Southwest Miramichi river is parallel to the schistosity, but cuts across the bedding planes of the rock that it intrudes. The granite is grey, and is composed essentially of quartz, orthoclase, albite, sericite, and chlorite (penninite).

Quartz Diorite

A small body of quartz diorite of which the boundaries were not found is indicated by exposures on the north bank of Little Southwest Miramichi river for 2,000 feet below the mouth of Mains brook. In hand specimen it appears fresh, but microscopically it is seen to be much altered.

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[1]Ells, R. W.: Report on the Geology of Northern New Brunswick, Embracing Portions of the Counties of Restigouche, Gloucester, and Northumberland; Geol. and Nat. Hist. Surv., Canada, Rept. of Prog. 1879-80, pt. D, pp. 24-25.

[2]Young, G. A.: Bathurst District, New Brunswick; Geol. Surv., Canada, Mem. No. 18-E, pp. 28-32 (1911).

[3]Alcock, F. J.: Geology of Chaleur Bay Region; Geol. Surv., Canada, Mem. 183, pp. 15-18 (1935).

[4]Alcock, F. J.: Personal communication.

[5]Burton, F. R.: Vicinity of Lake Aylmer, Quebec; Rept. Quebec Bur. of Mines, 1930-31, pt. D, pp. 101-145.

[6]Jones, I. W.: The Lesseps Area, Gaspe Peninsula; Rept. Quebec Bur. of Mines, 1930-31, pt. D, pp. 195-226.

Age Relationships

The amount of alteration and shearing, and the generally more basic composition of this group of intrusions compared with the granite of the large batholiths, suggest that they represent an early phase of Middle Devonian intrusion. Conversely, their sheared and altered condition show that the intrusion of the large batholiths was accompanied by diastrophism.

Biotite Granite

The eastern edges of the large batholiths that form the central axis of the province infringe upon the western side of the area. At the nearest point to its border where it is exposed the granite is pink in colour with pale blue quartz " eyes," and is slightly altered. Farther in from its border, as exposed on the lower mile of North Pole stream, the granite is coarse grained, grey, and porphyritic. The principal minerals, in the order of their abundance, are quartz, albite, orthoclase, and biotite. Aplite was found cutting the granite itself and cutting the sediments on Little Southwest Miramichi river about 2¾ miles below the mouth of Mains brook.

F. J. Alcock[1] refers this granite to Middle Devonian time.

PENNSYLVANIAN

Rocks considered to be of this age cover the southeast corner of the present map-area, and all the country east of it to the Atlantic coast. Several erosion remnants, generally flat lying, were found on Clearwater stream and North Branch Big Sevogle river.

The lower 50 to 75 feet are generally dull purple-red conglomerates, shales, and impure sandstone with local lenticular beds of limestone. The conglomerates are made up largely of subangular quartz pebbles, but in addition include representative pebbles from the metamorphic series and the Middle Devonian intrusives, indicating that erosion of the pre-Pennsylvanian rocks had progressed to almost its present extent by Pennsylvanian time. Many pebbles and a few boulders of a mottled limestone foreign to the area occur in the red conglomerate on Big Sevogle river about one-half mile below the mouth of Whitney brook. According to B. Rose, who saw these exposures, the limestone erratics are almost identical in appearance with limestone presumed to be of Windsor age which occurs in the vicinity of Plaster Rock, New Brunswick.

These lower, predominantly red rocks are succeeded conformably by generally grey mottled with purple, impure, crossbedded sandstones and fine conglomerates. This upper, grey division is distinguished from the underlying red division by colour alone.

A few indeterminate plant remains were found in the grey rocks on Little Sevogle river. The rocks in general bear a close resemblance to those of the Pennsylvanian Bathurst and Clifton formations[2] of Chaleur Bay region. W. A. Bell and F. J. Alcock regard these rocks as of Pennsylvanian age.

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[1]Alcock, F. J.: Personal communication.
[2]Alcock, F. J.: Geology of Chaleur Bay Region; Geol. Surv., Canada, Mem. 183, pp. 94, 95 (1935).

PLEISTOCENE AND RECENT

The greater part of the area is covered by a mantle of glacial till containing an unusual preponderance of boulders. The till is very thick in the area drained by Little Southwest Miramichi river and generally thin on the north of Big Sevogle river. A low-lying plain through which runs the lower part of Big Sevogle river is underlain by a yellowish green, banded clay, covered in most places by a mantle of coarse gravel and soil. A 25-foot section of the clay is exposed on Big Sevogle river about 1½ miles above the mouth. The clay is varved, but is mapped by Chalmers[1] as a stratified marine deposit.

Recent alluvial material occupies the lower parts of the valleys of Northwest Miramichi and Little Southwest Miramichi rivers.

The area appears to have been glaciated, except for the tops of mount Kagoot and neighbouring summits. A few local diversions of stream channels were noted, but in the main the river courses have not been greatly altered by glaciation. Glacial striæ striking southeast were observed on Little Southwest Miramichi river one-half mile above the mouth of Libbies brook.

ECONOMIC GEOLOGY

GOLD

Quartz occurs in fissure veins, in the apex of drag-folds, and in closely spaced sheets and lenses throughout the area in great abundance. In most cases it is barren, but occasionally carries pyrite, rarely pyrrhotite, and very rarely chalcopyrite and arsenopyrite. Sulphides where present are usually equally abundant in the host rock. The large quantity of quartz in the area has from time to time encouraged prospecting. Ells in his report of 1880 refers to a story of gold occurrences on Little Southwest Miramichi river. This and others are still told today, but none of them has been verified. In a recent year a local syndicate was organized for prospecting and development work. Diamond drilling was done on a showing on North Branch Little Southwest Miramichi river 1¼ miles below the mouth of Guagus stream, and trenching was carried out on a showing on Guagus stream ½ mile above its mouth. Samples taken by the writer from both showings gave no returns in gold. In all, ten different localities in the area, considered by the writer to have the greatest possibilities, were sampled. Six of these samples carried a trace of silver and none carried gold.

Rock exposures are largely confined to the stream valleys and it is safe to say that 90 per cent of them were observed by the writer or his assistants. Though the general conditions for gold occurrence cannot be regarded as unfavourable, the possibilities of a discovery being made would appear to be slight.

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[1]Chalmers, R.: Geol. Surv., Canada, Ann. Rept. 1887, pt. N, Map-sheet 2, SE.

MANGANESE

The oxide of manganese occurs locally in the area as a botryoidal incrustation on the pebbles of the lower conglomeratic beds of the Pennsylvanian, and as a stain or thin incrustation on the slates and schists of the metamorphic group. It was also found as a small bog deposit in the drift near the northwest corner of the Indian reserve about 500 feet from Castor brook. The deposit is not of economic significance.

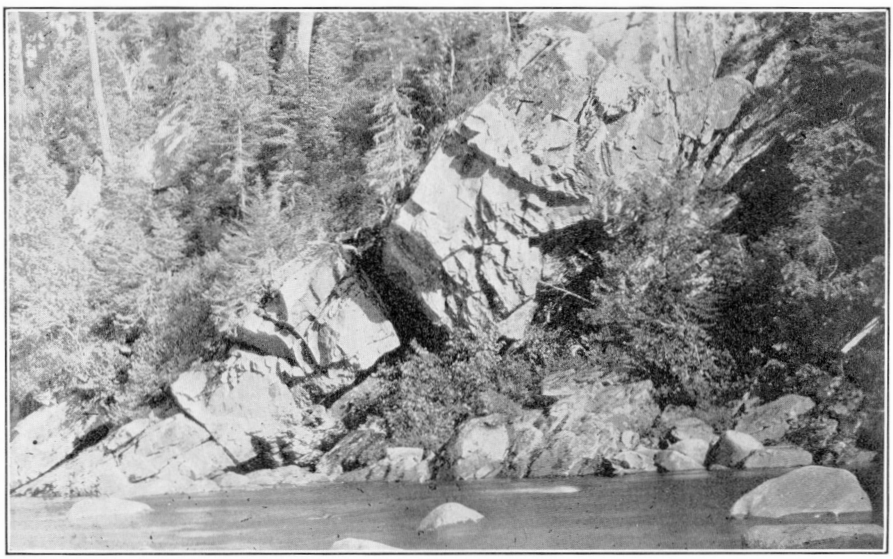
MINERAL PAINTS

Ochreous seepages from the purplish red pre-Silurian slates and from the red slates of the Pennsylvanian are to be found in wet weather at intervals along the lower 15 miles of Northwest Miramichi river. This material, or merely the ground-up purple and red slate, is used locally as a base for paints.

GRAVEL AND CLAY

Coarse gravel and sand suitable for road building occur over the flat plain through which the lower few miles of Big Sevogle river flows.

A sample of the varved clay, already referred to, on Big Sevogle river 1½ miles from the mouth, was tested by the Ceramics and Road Materials Division, Mines Branch, and found to be unsuitable for use in the manufacture of clay products.



A. Sedimentary gneiss on Big Sevogle river 2½ miles below Clearwater stream.

B. Red Pennsylvanian conglomerate with boulders and pebbles of limestone on Big Sevogle river one-half mile below Whitney brook.