GEOLOGICAL SURVEY OF CANADA
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REPORT

ON THE GEOLOGY OF THE

BASIN OF NOTTAWAY RIVER

WITH A MAP OF THE REGION

1900

BY

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The present report relates to the geology of the extensive region lying to the south-eastward of James bay or between the upper Ottawa and the Rupert river, which was explored and partly surveyed by myself and assistants in 1895 and 1896. My summary reports for those years, already published, contain general descriptions of this region, including its topography, physical features, character of its rivers, soil, timber, climate, geology, &c. Since the publication of these reports, a map, on a scale of ten statute miles to an inch, has been prepared, showing the results of our surveys and explorations, and on this I have laid down the distribution of the various kinds of rocks observed, with as much accuracy as our examinations permitted, together with notes on their characters, the dips, strikes, directions of glacial striæ, &c.† It is considered desirable to supplement the outlines of the geology contained in the above mentioned summary reports by a general description and it is the object of this report to supply this. Before doing so, however, I shall briefly recapitulate the means by which our surveys and explorations were accomplished.

Region S.E. of James bay.

Map.

Those portions of the topography shown upon the map which have not been compiled from our own surveys and explorations are taken from the maps of the Crown Lands Department of the province of Quebec, and represent field-work done by Provincial Land Surveyors Henry O'Sullivan, John Bignell, Lindsay Russell, and others. The resulting map, herewith presented, shows both the geography and the geology in sufficient detail to obviate the necessity of lengthy descriptions.

Acknowledgments.

Grand Lake Victoria, on the Upper Ottawa river, was made the starting point of our work both seasons. In 1895 I was accompanied by six voyageurs and by Mr. Alexander Barclay as a non-professional assistant.

*This word is pronounced Noddaway by the natives of the region, but the government geographic board has decided to call it Nottaway.

†This information will not be repeated in the text of the present report.

In the southern part of the region explored, the height-of-land dividing the waters of the St. Lawrence from those flowing to Hudson bay runs in an easterly direction, passing within two miles of the northern extremity of Grand Lake Victoria. From this divide we descended a stream, small at first, but increasing rapidly, with a general course due north, astronomically, for a distance of about 150 miles in a straight line. At the end of this distance it terminates in a lake called Mattagami, which lies east and west, or at right angles to the course of the river, and has a length of twenty-five miles, with a large bay or arm extending to the northward.

Descend river.

Cochrane's survey of 1887.

In 1887 this stream was followed for upwards of sixty miles downward from its source and a track-survey of it made by my assistant of that year, the late Mr. A. S. Cochrane. At that period and up to the time of my tracing the stream to the sea, it was supposed to be identical with or to form part of a river which flows into Hannah bay at the head of James bay, and it had no recognized name of its own.

O'Sullivan's survey of 1894.

In 1894 Mr. H. O'Sullivan, inspector of surveys of the province of Quebec, made a track-survey of the course of this river for about thirty miles beyond the point which had been reached by Mr. Cochrane in 1887. My own work of 1895 included a new track-survey and a geological examination of the portion which had been gone over by Mr. Cochrane, and beyond this the work was continued as a careful micrometer and compass survey of all the rest of the river.

Survey of 1895.

Survey of 1896.

In 1896 I employed five voyageurs, and had Mr. R. W. Brock and Mr. J. M. Bell as assistants. At the start, we followed the same route as I had taken in the previous year and used the main river as a surveyed base. Mr. Brock ascended and mapped three of its branches and followed one of them, which comes from the east side and is called the Migiskan, and one of its tributaries, up to a local watershed which he crossed and thence descended another stream to Lake Waswanipi. Meantime I devoted myself to making track-surveys and geological examinations of nine other branches of the main river.

Waswanipi to Mistassini.

After these operations, Mr. Brock proceeded eastward from Lake Waswanipi to Lake Mistassini by way of a large stream which we recognized at the time under the name of Waswanipi river, while I made a track-survey and a geological reconnaissance of a chain of lakes and rivers northward to the Rupert river at Namiska lake. The general course of this chain runs due north from the south end of

Waswanipi lake to the northern extremity of Namiska lake and the distance, in a straight line is 140 miles. Waswanipi lake, sixteen miles long, discharges north-westward by a stream, eleven miles in length, which is swift, but with uninterrupted navigation, into Gull lake. The latter extends north with a length of thirty miles and is divided by narrows into three parts, the southern being the largest, the middle next and the northern the smallest. The middle division receives the Mai-kask-sagi from the east and the northern division the Tchen-sagi from the same direction. Waswanip and Gull lakes.

Near the north end of Gull lake, I crossed the watershed between the Broadback and the Nottaway rivers and soon entered upon Lady Beatrix lake. A short 'narrows' or strait connects this with Opatawaga lake. Six miles below the latter we entered Long lake, twenty-four miles in length. Two large streams, the Ni-puck-a-ta-sé and Victoria rivers, enter this lake from the east. From the northern part of Long lake, the Broadback river flows out at right angles and after a westerly course of sixteen miles, broken by many rapids, it falls into the east side of Lake Evans. This is the largest sheet of water in the region, its length being thirty-two miles and its breadth in the middle about twenty miles. Its largest affluent is Mill river, which comes from the east. From Lake Evans, four miles of river, with two portages, brought us to Sandy lake, thirteen miles in length. The Broadback river flows out of the north end of this lake with a westward course and a rapid descent to Rupert bay. From a point on this river, three miles below Sandy lake, we made a portage three miles and three quarters long to Wettigo lake, two and a half miles in length, and only half a mile from the south shore of Rupert river, to which the last mentioned lake discharges. Other lakes and rivers. Broadback river.

By an inspection of the map it will be seen that the above chain of lakes and rivers intercepts all the streams from the east, six of which are of considerable size, and that it receives none of any consequence from the west. This circumstance illustrates the fact that the whole country slopes westward. The Nottaway river in its course from Lake Mattagami, the Broadback river in that from Sandy lake and the Rupert from Namiska lake, all descend more rapidly than do the rivers above these lakes, showing that the great plateau above them is more nearly horizontal than the tract between the lakes and the sea. Country slopes west.

While making either instrumental or track surveys, my positions were frequently verified during both seasons by observations for latitude, and the compass bearings were checked by numerous observations Instrumental checks.

for the magnetic variation. All the data agreed very well, so that the resulting map may be regarded as tolerably accurate. We are indebted to the Honourable Commissioner of Crown Lands of Quebec and to Mr. Henry O'Sullivan for copies of maps showing the surveys of the latter in this region in 1897-98, and we have used them in addition to our own in compiling the accompanying map.

Three large lakes.

A short distance to the east and south-east of Mattagami lake are three other good sized sheets of water, discharging into the former, namely Gull lake, already mentioned, which is thirty miles in length, Lake Olga, sixteen miles long and Lake Waswanipi also measuring sixteen miles. Mattagami lake thus lies in the lowest part of the whole region, except that stretching to the northward, and it collects the waters of all the country to the southward and eastward as far as the water-shed of the St. Lawrence.

Nottaway river.

The great stream which flows from the north side of Lake Mattagami and discharges all these waters into Rupert bay is called the Nottaway river, and my Indian guide informed me that the river from Lake Waswanipi, which is larger than the one we descended from the height-of-land near Grand Lake Victoria, had the same name, and Mr. O'Sullivan, who, since his work of 1894, above referred to, has made further explorations in this part of the country, writes me that he considers it to be the natural upward continuation of that river. Lake Waswanipi receives a stream from the south, which I named the O'Sullivan river, in honour of that gentleman, who was the first to map its course, and it also receives a larger one from the east, which, for convenience at the time of our visit to that region as above stated, we recognized under the name of Waswanipi river, although I am not aware that it had been generally known by this designation. The western branch, which we surveyed from the height of land near Grand Lake Victoria to Mattagami lake had no name, and since my survey of it in 1895 it has become known as the Bell river.

Bell river.

The entire length of the Nottaway river, from Lake Mattagami to its mouth in Rupert bay, as well as this bay itself, as far as Rupert House, were surveyed by micrometer and compass by myself in 1895.

Instrumental survey.

The whole region under description has a generally level character with the surface covered by drift and soil, interrupted in some sections by isolated hills and short ridges of rock. The most noteworthy of these occur on the southern sides of the three largest waters of the territory, namely Mattagami, Gull and Evans lakes. Mount Laurier, the highest point of the east-and-west range running along the south

side of the first mentioned lake, was found by the barometer to have an elevation of 670 feet above its surface. Dalhousie mountain, to the south of Gull lake, appears to have an altitude of nearly 1,000 feet, while Mount Reid and Mount Middleton, two isolated knobs on the south side of Lake Evans, may be equally high. Mount Hugh and two or three other hills on the east side of this lake appear to have similar elevations. A group of hills called the Rabbit mountains at the north end of Long lake and Mount Scott and Dome mountain, in the same neighbourhood, are probably from 400 to 600 feet high. Hills of less height occur near the shores of Lakes Millie and Shabogama and also among and around the group of lakes about the head of Bell river. Isolated conical and dome-shaped hills of no great height were seen here and there at a greater or less distance from this river and also at intervals along the Nottaway river, but, with the above exceptions, the region, as far as we could judge from our explorations, is of a generally level character. Names of mountains.

GEOLOGY.

The following account of the geology of the whole country explored in 1895 and 1896, covers Mr. Brock's traverse from Lake Shabogama to Lake Mistassini in 1896, although his results were fully described in the Summary Report of that year.

The fundamental rocks of the region consist of gneisses, crystalline schists, granites and greenstones, together with exceptional occurrences of some other rocks, such as dolomite, quartzite, arkose, conglomerate and agglomerate. The gneisses are of the ordinary types of the older or primitive Laurentian system, and constitute a class easily distinguished from all the other rocks of the district. The latter are here grouped together as Huronian, although some of the eruptives among them may be of somewhat later age. The crystalline schists are apparently the oldest rocks of this group, and the granites and greenstones, which are associated with each other, may have been erupted among them, although constituting a large proportion of the whole. Various rocks.

HURONIAN AREAS.

The Huronian rocks, as thus defined, occur principally as a large area near the centre of the region and this constitutes the leading feature in its geology. The only other Huronian rocks known to occur

in this part of the country consist of two areas of much smaller extent, lying north of the centre of the region, and the Lake Wakonichi band, south of Lake Mistassini in the eastern part.

Huronian boundaries.

If we draw a straight line from the point where our route crossed the height-of-land, two miles north of the extremity of Grand Lake Victoria, in a true north bearing for a distance of 150 miles, or to the northern arm of Mattagami lake, it will pass over Huronian rocks entirely, with the exception of the points of two spurs of Laurentian gneiss which extend into this great Huronian area from the westward. If we draw another line from the same starting point, north-eastward to the southern extremity of Lake Mistassini, but with a moderate outward curve towards the north-west, it will have a length of 240 miles, and will mark approximately the south-eastern boundary of the large Huronian area. A straight line drawn east-by-north, astronomically, from the west end of Lake Mattagami to the southern extremity of Lake Mistassini measures 180 miles and lies not far from the northern boundary of this area. This large tract of Huronian rocks forms part of what I have elsewhere designated as the Great Belt of the system, which extends continuously from the eastern side of Lake Superior to Lake Mistassini, a distance, following its axis, of more than 700 miles. The portion within the region explored and mapped has an area of about 7,000 square miles.

The Great Belt.

Two other areas of Huronian.

To the northward of this main belt of Huronian rocks, as already indicated, there are two smaller areas of the same formation. One of them occurs along the section of the Broadback river which runs west from the junction of Victoria river to Lake Evans, and I have called it the Lake Evans area. The length of this part of the river, along which these rocks were actually examined is seventeen miles in a straight line. Judging from the probable structure or arrangement of the strata within this area, as deduced from the strikes and dips and what is known of its apparent limitations by the surrounding gneiss, these Huronian rocks are supposed to extend from the south bay of Lake Evans for about forty miles in an east-north-easterly direction, with a breadth of about thirty miles at right angles to this bearing. The rocks of this area as seen along the Broadback river consist of schists of various shades of green and dark gray, sometimes much disturbed and passing into massive greenstones, also of gray feldsites and dove-coloured arkose, with one occurrence of bluish-gray dolomite. Granular iron pyrites, sometimes stained by "copper greens" was found in several places, at one or two of which it may be in sufficient quantities to be of economic value.

Adjoining this Huronian area at its north-west angle is one of light gray hornblende-granite which is exposed on the shores at the narrows between Crow bay and the main body of Lake Evans. It appears to be nearly circular in outline, and to have a breadth of about six miles. Within it are several isolated rounded and conical hills or mountains, the southern and most conspicuous of which I have called Mount Hugh after Dr. Hugh Robert Mill. Granite area.

Huronian rocks occur, as a band running nearly east-and-west, on the course of the Nottaway river at the outlet of Lake Kelvin. The last Laurentian gneiss observed to the southward of the first appearance of this band was about the middle of the lake, and gneiss was not seen again for two miles to the northward of the outlet, so that this belt may have a breadth of between three and six miles and it may be of considerable length. On the island at the outlet of the lake, the rock consists of dark gray micaceous schist with quartz inclusions and it holds a good deal of disseminated iron-pyrites. The strike is N. 80° W. <90°. Lake Kelvin Huronian.

Since the Huronian rocks constitute the great metalliferous system of Canada, east of the Mississippi-Mackenzie depression, the discovery of the above mentioned three areas belonging to the system in this part of the Dominion and the work done in the way of subdividing the rocks of the Great Belt are of considerable importance as one of the geological results of the two seasons devoted to the survey and exploration of the region. Importance of discovery.

THE GREAT BELT.

As above stated, the rocks of the great Huronian belt in the region explored may be grouped in three classes, namely (1) crystalline schists, together with some other rocks forming a comparatively small proportion of the same series, (2) massive greenstones and (3) granites. The schists embrace a considerable variety, but the greater part of them are dark green and hornblendic or dioritic, and they often pass into more or less massive greenstones, so that it becomes difficult to map the two varieties separately. In laying down the distribution of the rocks upon the accompanying sheet, when the massive greenstones are found in minor quantity among the schists they are included with the latter in the colouring, and only the larger occurrences of distinctly massive greenstones are shown separately. These latter are intimately associated with the granites, especially in the region around Lake Mattagami and Gull lake, comparatively small bodies of the former penetrating the larger ones of granite and vice versa. Huronian of three classes.

Southern part of Huronian area.

The most southerly contact of the Huronian rocks with the gneiss is in the vicinity of the height-of-land, where it passes close to the northern extremity of Grand Lake Victoria. These rocks are found on the shores of all the five lakes of the group at the sources of the Bell river, folded among the sinuosities of the boundaries of the gneiss which latter occurs on all sides of this area except to the north-west. Around Lake Simon, the uppermost one of the group, the rocks consist entirely of dark-green dioritic schists, having a westerly strike. They are of the same character on the lower part of Obaska lake, but here the strike is northwesterly. Schists of the same kind with nearly the same strike occur at both extremities of Christopherson lake. Red granite is found on the north side of Mutchi-manito lake, but elsewhere around this sheet of water the rocks consist of green schists, with one occurrence of gray glistening mica-schist on the east side, all striking westward. Bluish-gray mica-schist, striking nearly west, was found all along Sleepy river as far as the uppermost lake, where micaceous Laurentian gneiss comes in, striking northeastward or at a large angle to that of the Huronian schists close by. A considerable area of massive greenstone occurs at Obaska lake as represented on the accompanying map.

Crystalline schists.

From the outlet of Lake Shabogama to the middle of Ka-ni-kwa-ni-ka island, a distance of 36 miles in a straight line, crystalline schists of various kinds, but mostly green or dioritic, constitute the prevailing rocks, both on the main Bell river and along the various branches which we explored. The strike in this interval varies in different localities to all points of the compass, but the general trend of the whole belt in crossing the river-valley is southwestward. An area of greenstone occurs on Lake Shabogama and another on the river just below the junction of the Kiask branch.

Granite areas.

The granite area which extends northward from Mutchi-manito lake crosses Bell river just above Shabogama lake and it is found again on the upper part of Coffee river. Another area of granite extends from the mouth of the latter river to the Kiask river, and a third is met with at Granite narrows. From Clay river to the bend in the main stream below Rain lake, both gneiss and granite occur and these rocks are believed to form the point of a Laurentian spur from the westward. The river crosses similar rocks, supposed to be a second Laurentian spur from the west, between the middle of Ka-ni-kwa-ni-ka island and the outlet of Taibi lake. Below this point, green schists were the only rocks seen all the way to the Island portage. All along the river between this portage and Lake Mattagami and around the greater part

of the lake itself, as far as the widening of the North arm, the rocks consist principally of a mixture of massive and schistose diorites. These are followed to the northward by Laurentian gneiss, which appears in the north-west bay of Lake Mattagami, and by red granite at the east end and again on the North arm just beyond the diorites. Crystalline schists occur along the south side of Lake Mattagami and at the northern extremities of Lake Olga and Gull lake. The greater part of the shores of the latter lake and all the southern part of Lake Olga are surrounded by red granite. This rock was the only one found on Lake Waswanipi, excepting at one place, where schists occur apparently as a continuation of those crossing the upper part of Ka-ni-kwa-ni-ka island.

Contact of gneiss.

Various Huronian rocks.

THE LAURENTIAN ROCKS.

On the Twenty-one mile bay of Grand Lake Victoria the gneisses are much disturbed so that no general strike can be determined. At the head of Sleepy river the gneiss strikes N. 36° E. and at its contact with the schists to the south-east of Mutchi-manito lake it runs N. 16° E. On the west side of Shabogama lake opposite the mouth of Migiskan river, it is from N. to N. 15° W., but around the lower or wide part of the lake it is north-north-eastward. About the foot of Ka-ni-kwa-ni-ka Island and around Taibi lake, the general strike is south of west. Along the Nottaway river, all the way from Mattagami lake to its mouth and also along the route we followed from Gull lake to Rupert river, the prevailing strike is between west and west-north-west. The gneisses along these two traverses consist of both the mica and hornblende varieties and they are mostly gray in colour.

Gneisses.

The dips, strikes and all other bearings given in this report have reference to the true meridian.