

PROVINCE OF QUEBEC
CANADA

DEPARTMENT OF COLONIZATION, MINES AND FISHERIES

MINES BRANCH

HONOURABLE C. R. DEVLIN, MINISTER; S. DUFAULT, DEPUTY MINISTER;
THEO. C. DENIS, SUPERINTENDENT OF MINES

GEOLOGY AND NATURAL RESOURCES

OF THE BASINS OF

Harricanaw and Nottaway Rivers

NORTHWESTERN QUEBEC

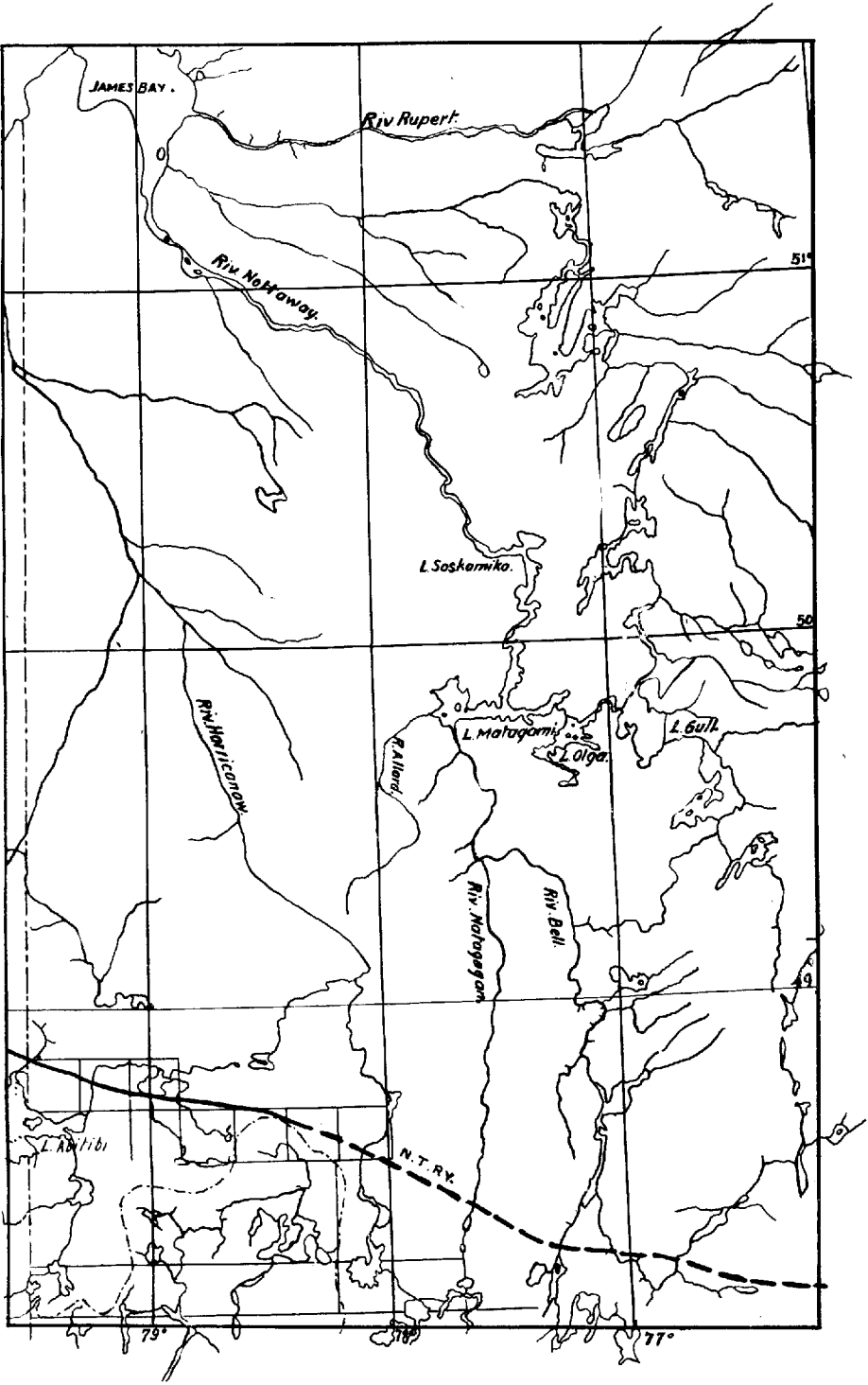
BY

J. AUSTEN BANCROFT, Ph. D.



PRINTED BY L. V. FILTEAU,
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QUEBEC

1912



Sketch map showing route of Dr. J. A. BANCROFT's exploration in 1912.
Scale 35 miles to the inch.

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LETTER OF TRANSMITTAL.

To THEO. C. DENIS,

SUPERINTENDENT OF MINES,

QUEBEC, P.Q.

Sir,

I beg to submit a short preliminary report on the geology and natural resources of portions of the drainage basins of the Harricanaw and Nottaway rivers in Northwestern Quebec. These notes are the result of two months exploration work in the region.

J. AUSTEN BANCROFT.

McGill University,

Montreal, November 2nd, 1912.

NOTES ON THE GEOLOGY AND NATURAL RESOURCES
 OF PORTIONS OF THE DRAINAGE BASINS
 OF THE
 HARRICANAW AND NOTTAWAY RIVERS
 NORTHWESTERN QUEBEC.

INTRODUCTION

Under instructions from Mr. T. C. Denis, the Superintendent of Mines, about two months were spent in making a rapid trip of geological reconnaissance to the north of the Transcontinental Railway in northwestern Quebec. The chief aim of the expedition was to collect data bearing upon the possibilities of the occurrence of valuable minerals in that portion of the region traversed; but in addition, certain observations with reference to other natural resources may prove to be of interest. This report is of a very preliminary nature.

The writer was fortunate in having the assistance of Mr. A. O. Dufresne, a graduate of the Ecole Polytechnique, Montreal.

Itinerary: The railroad crosses the Harricanaw river at Amos, 141 miles eastward from Cochrane and 62 miles due east from the western boundary of the Province of Quebec. Leaving Amos on July 8th, the expedition followed the Harricanaw northward for about 72 miles, where a portage extends to the headwaters of the Allard river, which flows into the western end of Matagami lake. Upon reaching this lake the party was divided, Mr. Dufresne passing eastward to explore Gull and Olga lakes, while the writer descended the Nottaway river for 100 miles to a point 10 miles below Kelvin lake and about 34 miles from the tidal water of Rupert Bay. Returning to Matagami lake, the party united in a careful examination of its shores, and after ascending the Bell river for about 50 miles, came up its large tributary, the Nataganagan river, arriving at the railway on Sept. 4th. A track survey was made of the Nataganagan river from its mouth to a point about 17 miles from the railway downstream, to which point a survey of the river was made by W. J. Wilson of the Geological Survey of Canada in 1906.

Previous Work: The Bell and Nottaway rivers, Matagami, Olga and Gull lakes had been previously examined from a geological point of view by Dr. R. Bell, formerly Acting-Director of the Geological Survey of Canada.*

* Summ. Report, Geol. Survey of Canada, 1895, pp. 74-84A.
 " " " " " " 1896, pp. 64-74A.

Geology of the Basin of the Nottaway River—Geol. Survey of Canada,
 vol. XIII., 1902, pp. 1-11K.
 Geological map of Basin of Nottaway River, 10 miles to 1 inch, 1900.

CHARACTER OF THE DISTRICT

Topography: This area lies within what is frequently and appropriately called "the clay belt of the North." It is a portion of a vast plain sloping gradually from the height of land to sea-level at James Bay. In crossing the Harricanaw, Natagagan and Bell rivers, the Transcontinental Railway traverses the southern portion of this plain at an elevation of approximately 1,000 feet above the sea, and at a distance of from 180 to 190 miles in a straight line from the nearest portions of James Bay. Within 120 miles northward from this railway, the surface of the plain descends about 400 feet, while in the remaining 60 or 70 miles the slope becomes more readily perceptible with a descent of 600 feet. Below Soskumika lake, which occupies an elevation of 600 feet above the sea, the rapids and chutes become heavier and more numerous on the Nottaway river.

It is an extremely level or slightly undulating region, underlain by a heavy blanket of stratified clays, from beneath which a few low rocky hills and ridges protrude to elevations which very seldom exceed 200 feet above the surrounding country. In fact, elevations of much less than 100 feet above the average level form very prominent landmarks. The highest points in the whole region are situated in the range of mountains about five miles long to the south of Matagami lake, where Mt. Laurier, the highest point, attains an elevation of 670 feet above this lake, or 1,285 feet above sea-level, and in the Dalhousie mountains south of Gull lake. From the summit of Mt. Laurier one gains a wide horizon within which no mountains of similar altitude can be seen; from its southern margin low land, much of which is swampy, extends to a great distance. In general, the rocky ridges represent some of the more resistant portions of the rocky basement upon which the stratified clays rest.

Were it not for its widely scattered, low, rocky hills, its shallow lakes—some of which are very large—and the presence of numerous rapids along its rivers and streams, this country would be very monotonous. In the major portion of the area, the land stands but a few feet above the waterways, but locally, as along certain portions of the Allard and Nottaway rivers, banks of stratified clays and sand, often 10 to 35 feet high, rise quite abruptly. Widespread swamps or muskegs are of frequent occurrence, especially toward the head waters of streams, as along the upper waters of the Allard river and in the vicinity of the two unnamed lakes which discharge into the northern arm of Soskumika lake on the Nottaway river. In general, the land is better drained than in the vicinity of the height of land. Apart from expenses in connection with bridge construction, it should be possible to extend a railroad in almost any direction within this region at a comparatively low cost of construction.

The origin of the level character of the topography may be stated briefly. During that very recent chapter in the geology of the region when the northern portion of North America was covered

with a great thickness of glacial ice, the pre-glacial rivers flowing into James Bay ceased to exist. When, through amelioration of the climate, the margin of the ice-sheet had receded to a position north of the height of land, a lake came into existence between the height of land and the retreating ice-front. With continued recession of the ice this lake became progressively larger, until rivers could once more flow into James Bay, when the lake became drained. The level surface of the plain of to-day corresponds to the bottom of this old englacial lake. The stratified clays and sands, which are present as an almost universal covering, have been deposited from the waters of this historical lake, masking all the irregularities of the rocky floor upon which they rest, with the exception of those of such prominence that they to-day rise above the blanket of lacustrine silts. Locally, the stratified clays may be seen to rest upon boulder clay.

The maps of this region, on a scale of 4 miles to the inch, are very deficient in detail and, locally, are distinctly and seriously wrong.

Drainage and Water Powers: It is a region of very large rivers and lakes with smaller tributaries. Southward from Soskumika lake long stretches of the rivers and streams possess little or no current, winding sluggishly over this old lake bottom, while descent is chiefly accomplished by rapids or chutes. Twelve miles below Lake Obalski the Harricanaw river becomes a succession of rapids and small cascades for a distance of about three miles. At certain points these rapids could be improved to form efficient water powers without flooding much, if any, of the low-lying land above. Since they are only about twenty miles in a straight line from the railway at Amos, they may be of some immediate importance. The Natagagan river affords a superior canoe route northwards. For the first fifteen miles of its course below the railway it is comparatively narrow, becoming rapidly wider below this until at its mouth it is two to three chains in width. In this distance of approximately ninety miles there are no lakes and but seven short portages, of which the longest is half a mile. For fifty-five miles northeastward from the portage to the Harricanaw river, the waters of the Allard river are very much clearer than those of either the Harricanaw or the Natagagan. In its course of 74 miles from the long portage to Matagami lake only four portages are necessary, three of which are very short, and a fourth of three-fourths of a mile.

Below Soskumika lake, rapids and cascades are numerous on the Nottaway river, there being others in addition to those located on any existing map. The river is so rough that it is avoided by those knowing the district, unless it be desirous to reach James Bay quickly. Although very much longer, the preferable route follows eastward from Matagami lake to Olga and Gull lakes, thence northward through an excellent chain of waterways to Lake Evans, subsequently either down the Broadback river, or across the Nemiskau portage, and down the Rupert river. The Rupert river is preferred by the authorities of the Hudson Bay Company in transferring supplies from Rupert's House to their post on Waswanipi lake.

The best water power in the region traversed is that known as Iroquois Chute where the Nottaway river, at a point about 35 miles below Soskumika lake, makes an almost direct plunge of about 35 feet. Five miles below Kelvin lake a continuous succession of heavy rapids, within a distance of four miles, produces a drop of about 130 feet. At Bull rapids, about 20 miles above Iroquois Chute, at the smaller cascades about two miles below Soskumika lake and those about five miles below the outlet of the northern arm of Matagami lake, as well as at other points on the Nottaway, improvements could be made to produce important water powers. All of these water powers are subject to great fluctuation in volume ; although much rain fell last summer, between July 23rd and August 19th the Nottaway river fell about six feet.

Red Chute, situated at the outlet of Olga lake, is also a water power of importance.

The waters of Matagami, Olga, Gull and Soskumika lakes, which are usually clear, and their long sandy beaches, form a pleasing contrast to the muddy waters and clay shores of the lakes near the height of land. That for the most part these lakes are very shallow is evidenced by the fact that during a storm their waters soon become muddy. Especially is this true of the western end of Matagami lake, the southern portions of Olga lake and the whole of Soskumika lake. Matagami lake (25 miles in length, having a maximum width of eight miles near its western extremity), with its long sandy beaches and a picturesque mountain range along its southern shore, must be one of the most beautiful of the Laurentian lakes.

Soil and Climate: Apart from those comparatively small areas where rocky ridges are closely congregated, where extensive swamps have been developed, or where the surface soil is sand and gravel, the land is very suitable for agricultural purposes. From a very general point of view it may be said that the land between the Transcontinental Railway and Matagami lake is better than most of the land further northward ; that below Soskumika lake, in the vicinity of which there is much excellent land, areas of arable land are of less extent, owing to the presence of more numerous rocky ridges and to areas where the stratified clays are capped by stratified sands and gravels often containing numerous boulders. On the west side of Kelvin lake, these sands have been cemented together by the deposition of iron oxides from percolating waters, so that locally a post-glacial sandstone has been formed. Southward from Matagami and Gull lakes bare rock is exposed over very considerable areas.

In many localities the soil is lighter and better drained than in the vicinity of the N. T. Railway. In such localities, the clays are either somewhat sandy or are interstratified with thin layers of sand, so that the surface soil is sandy loam and not of the stiff clay type. The most continuous stretches of fertile land that were encountered during the traverse are situated along the Allard and Natagagan rivers, especially along the former. In crossing from the muddy waters of the Harricanaw to the clear waters of the

upper Allard, the verdure becomes of a brighter green, and wild flowers, as the rose, honeysuckle, orchids, etc., grow more profusely.

The climate is an even more important factor than the soil. The region examined lies between latitudes $48^{\circ} 30'$ and $50^{\circ} 51'$. Fortunately the decrease in elevation offsets the increasing latitude, so that throughout the larger part of this area the mean annual temperature must be approximately the same as in the vicinity of the National Transcontinental Railway. The erratic occurrence of frosts is the most dangerous feature from an agricultural point of view. During the nights of July 16th and 19th, spent on the upper waters of the Allard river, frosts were so heavy that in the morning everything was covered by hoar frost, while films of ice were formed over water in pails. On August 16th, while camped on the margin of a very extensive swamp about eight miles south of the northern arm of Soskumika lake, a heavy frost was experienced.

It is remarkable that during these frosts the more delicate forms of natural vegetation simply droop a little, while they are looking as fresh as ever after the sun rises for an hour or two. No more frosts were noticed until the first of September while ascending the Natagan river. Within this region frosts frequently occur in the vicinity of widespread tracts of low lands or swamps, at a time when slightly higher lands and those in the neighbourhood of the large lakes do not experience them.

Throughout this whole region settlement should be encouraged, first in the vicinity of the largest lakes, where the range of diurnal temperature is subject to the least fluctuation and where even the faintest air currents have a chance to circulate more freely. Potatoes and other vegetables are successfully raised at The Hudson Bay Co.'s Post on Waswanipi lake, situated in latitude $49^{\circ} 36'$, about 100 miles north of the National Transcontinental Railway and at an elevation of 680 feet above the sea. In 1911 seed was planted on the last day of May, and during the latter days of September yielded 180 bushels of excellent potatoes, and during that time frost never injured their growth. At the time of my visit to this Post on August 5th, potatoes gave every promise of another large crop, while a few peas and turnips were also flourishing. Last spring the ice began to break up on this lake on May 5th and had almost completely disappeared on May 21st.

Dr. Robert Bell, in describing his visit to this Post on the 12th of August, 1896, writes as follows:—"Mr. D. Baxter, the gentleman in charge of Waswanipi Post, kindly agreed to make some experiments with wheat, oats, barley and a variety of other seeds which I obtained from Dr. Saunders of the Central Experimental Farm and sent to him during the past winter. When we visited his Post the various grains looked well. They had headed out some time before and would soon be ripe. New potatoes were as large as hens' eggs, turnips six inches in diameter, and carrots and some other vegetables ready for use. Indian corn was showing

its silk, tobacco plants were growing well, and almost every kind of garden crop grown in an average district of Canada was flourishing under Mr. Baxter's care."

During the past summer, at the mouth of the Bell river, Messrs. Taberner and D. H. Moore, who were engaged in prospecting for diamonds, were successful in growing both lettuce and radishes. Frosts seriously injured potatoes and other crops on the Harricanaw river near the National Transcontinental Railway at a time when no frosts were experienced in the vicinity of these large lakes of the north. With the felling of the bush and the consequent draining of some of the swamps, and with the ploughing of fields, which will deter the rapidity of nocturnal radiation, the danger of frosts even in the vicinity of low lands will be greatly lessened. Personally, I believe that the antiquated but more or less popular conception which considered this region to be a part of the "Frozen North," has preserved a heritage for present or future, in many parts of which potatoes, turnips and other vegetables, hay, oats, barley and rye can be raised successfully. When its long winters are considered, it is a country which will demand thrift and endurance from its inhabitants, two qualities which never have proved to be injurious to public welfare. If at some time in the future the Government decides to open these lands for settlement, it would be advisable, somewhat in advance, to establish a few experimental farms in suitable localities and under competent management.

Flora: Viewed from some elevation, the whole landscape has a most sombre aspect, owing to the comparatively small number of deciduous trees. Black spruce, white spruce, jack pine and balsam comprise apparently much more than ninety-nine per cent. of this forest. Of these, black spruce is by far the most numerous, while south of Matagami small areas, occupied chiefly by jack pine, are of frequent occurrence. Immediately along the Nottaway river north of Matagami lake no jack pine were observed, although eastward from here its occurrence is known to extend far northward into Ungava. White spruce is much less abundant than either black spruce or jack pine, yet this species was noticed to attain a maximum diameter of 32 inches.

Gnarled and stunted white cedar occurs in places along the margins of the rivers, but especially in the vicinity of lake shores. Poplars, often up to slightly more than 20 inches in diameter, grow chiefly along the margins of rivers and streams. Locally, the white birch is an important tree, occasionally having a diameter of two feet. In descending the Allard river for 74 miles to its mouth not more than two dozen white birches were noticed. In some areas which have been burned some years ago, as to the south of Matagami lake, there has been a profuse second growth of small poplars and birches. A widely scattered growth of young tamarac is appearing, but all large trees of this species were killed by the ravages of the grub of the larch saw-fly from 1893-96. No white or red pine were observed within the region.

It is impossible to mention in detail those areas where the forest is especially valuable. From experience gained in making traverses through the bush in the vicinity of the height of land, it frequently happened that when poor along the streams, areas of good timber occur at variable distances from the waterways. There is a tremendous wealth of most excellent pulpwood, and there are large and small areas where especially the spruce and jack pine are suitable for lumbering purposes. Such areas are very much less numerous on the Nottaway river below Soskumika lake. Here a few patches of fairly good timber were noticed, but apart from areas where the trees are suitable for the manufacture of pulp there are many localities where the trees are very scattered and are tufted toward the top, as if the struggle for existence has not been easy. At the most northerly point reached on this river, spruce trees were noticed up to 14 inches, balsam 13 inches, white birch 12 inches in diameter.

A small collection of flowering plants was made during the summer and has been submitted to Prof. C. M. Derick in the Department of Botany, McGill University, for determination. In making this collection a record of dates and locations was kept, and it is hoped that these data may be useful in comparing this region with those to the south.

Forest fires have devastated large areas. Some of the areas which apparently have been burned over during the past six or seven years may be mentioned. At intervals of about 5, 16 and 22 miles below Obalski lake, burned zones cross the Harricanaw river, the widest of which extends for 5 or 6 miles along the river. About 26 miles below the railroad on the Natagan river, large burned areas appear; and upon descending about 5 miles further, a *brulé* begins, which extends for 12 miles either along or near the river. It seems probable that these *brulés* on the Natagan and Harricanaw rivers are connected inland. In its length of 74 miles northeastward from the long portage, the Allard river is crossed by four *brulés*. Within the past three years a fire burned over a wide area, eastward from Matagami lake to Olga and probably to the northern end of Gull lake. Along a stream entering the eastern end of Matagami lake, which was ascended for 12 miles, there is scarcely a green tree to be seen. Here, this fire has been so vigorous that it would require comparatively little labour to make the land ready for cultivation. Mount Laurier, to the south of Matagami lake, and the Dalhousie mountains, south of Gull lake, have been swept by fire. An extensive *brulé* crosses the Nottaway river in the vicinity of Bull rapids. Other burned areas within the region might be mentioned, but sufficient has been written to emphasize the serious damage that has been done. During the past summer the region has been practically free from fires. Three very small bush fires had been started from abandoned lunch fires along the Nottaway river, two of which were extinguished by rain and the third by members of our party.

Fauna: From a few miles to a distance of sixty or seventy miles north of the National Transcontinental Railway moose are numerous, but farther northward they are not very frequently seen. Signs of the presence of a few caribou were noticed northward from Matagami lake. The black bear is very abundant in the vicinity of Matagami, Olga and Gull lakes; although never hunting for them, members of the party saw eleven bears. Fur-bearing animals are not as plentiful as might be expected. Either specimens or traces of the presence of marten, mink, otter, beaver, fox, wolf, ermine and muskrat were observed by those connected with the party. Marten are fairly numerous, and the quality of their fur in the northern portions of this region is especially prized. During the past winter, only a few red foxes were trapped by the Indians of Waswanipi Post, while in the previous winter five silver foxes were taken. The lynx and a few wolves are said to be present. Ground hogs and rabbits are quite plentiful.

Ducks, especially the black duck and varieties of the merganser or saw-bill, are more abundant than in the vicinity of the height of land to the south. Very large numbers of both varieties were seen along the river connecting the two unnamed lakes which discharge into the western arm of northern Soskumika lake. Partridges are scarce. Of other large birds, gulls are numerous, while a few loons, fish-hawks, owls, three bald-headed eagles and two heron were seen.

Fish are abundant in all the waters. The most edible varieties are white fish, pike, pickerel and sturgeon, while suckers and chubs are also abundant. Sturgeon are present in large numbers along the lower course of the Allard river and in Matagami and Waswanipi lakes, while it is probable that they are also present in the other large lakes and at least some of the rivers. Matagami lake is known by some of the Indians as "Sturgeon lake." Pike frequently attain a size of from 6 to 12 lbs. Whitefish are very abundant; large numbers of them were noticed playing in the foam of some of the rapids on the rivers connecting Matagami, Olga and Gull lakes. Apparently trout and bass do not exist within the region.

GENERAL GEOLOGY

In common with many other extensive areas of the Laurentian plateau, the bed-rock of this area carries us back to the very earliest chapter in the geological history of North America. Almost the whole area is underlain by the Keewatin and Laurentian formations. A band of partially metamorphosed sedimentary rocks, about half a mile in width, which may possibly belong to the Lower Huronian formation, outcrops upon certain prominent points on the northern shore and on some of the small islands on Matagami lake, and extends eastward to Gull lake. These sedimentary rocks have been intruded by granite, while included within this band are layers of conglomerate containing numerous

pebbles of granite. The youngest rocks within the area are olivine-diabase, quartz-diabase and syenite porphyry, which in the form of dykes intersect all other rock-types.

Although subject to local variation in the vicinity of the intrusive batholiths of granite and granitoid gneiss, the regional strike of the schistose and gneissoid rocks is nearly east to west.

It is somewhat difficult to explain the origin of the boulders of yellowish-gray or buff-coloured limestone which are strewn in abundance along the lower course of the Allard river, along the shores of the Matagami, Soskumika, Olga and Gull lakes, and less frequently along the lower course of the Bell and on the Nottaway river. Fragments of this limestone up to 3 feet across and 1½ feet in thickness are washed out from the banks of stratified clays. They contain fossils which show them to be of Silurian age, probably from the Niagara formation. Either they have been carried here from a northwesterly direction by ice floating in the lake from whose waters the stratified clays were deposited, or beneath the blanket of clay there may be inliers of this limestone in some of the more basin-like depressions within this area.

CHARACTER AND DISTRIBUTION OF THE GEOLOGICAL FORMATIONS

Keewatin: The oldest rocks within this region belong to this formation. They comprise a complex of igneous rocks, both extrusive and intrusive, together with bands of highly altered sedimentary rocks. Ancient lava flows, chiefly quartz porphyries, porphyrites and andesites, have been metamorphosed to different varieties of schist. Where massive, as along the lower course of the Allard river and especially in the vicinity of the mouth of the Bell river on Matagami lake, they display a most wonderful development of pillow structure. This structure is often preserved more or less after the rocks have become schistose. The intrusive rocks include diorites, hornblendites, gabbros, diabase, quartz-porphry and other types. Some of these intrusive rocks have also been rendered schistose. They appear usually in the form of large dykes and small stocks, but in certain localities the intrusions of gabbro have attained the dimensions of batholiths. In ascending the Bell river, from a point about two miles above the first rapids to the Island rapids, a distance of about 20 miles, the exposures are of a gabbroid rock, the most common type being coarsely crystallized and quite light in colour. A somewhat similar rock apparently forms at least the greater part of the Dalhousie mountains to the south of Gull lake. In mapping, these large areas of gabbro may be separated from the rest of the Keewatin into which they are intrusive.

The major portion of that area lying between the N. T. Railway and Matagami lake is underlain by Keewatin rocks.

Laurentian: This formation includes granites and granitoid gneisses together with other rocks of plutonic character, which have been evolved by processes of differentiation. The most common types are biotite-granite and biotite-gneiss, the one passing gradually into the other. As in other areas of the Laurentian plateau, these plutonic rocks are in igneous contact with the Keewatin formation.

Northward from a line passing in a direction slightly north of east through the northern arm of Matagami lake, about two miles north of its entrance, there is a wide expanse of these Laurentian rocks extending to the mouth of the Nottaway river. Here and there, they are traversed by very narrow and unimportant bands of hornblende and biotite schists. Along its southern margin, by differentiation and undoubtedly also by absorption of the rocks with which it is in igneous contact, there have been developed a great variety of dioritic types which have been broken across by dykes of granite, aplite and pegmatite.

Other areas of granite lie toward the eastern end of Matagami lake and the southern half of Olga lake, and surround the major portion of Gull lake. The Bell river, from the mouth of its tributary, the Natagan river, to a point two miles below Lake Taibi, traverses gneissoid granite. From a point about 11 miles below Lake Obalski, the Harricanaw river flows over granite for 13 miles farther northward. For five miles northward from the portage, three-fourths of a mile long, on the Allard river the country is underlain by granite. Numerous exposures of granite were seen while ascending the Natagan river.

Lower Huronian (?) : This includes the narrow band of sedimentary rocks which occupies some of the prominent points on the northern side of Matagami lake and strikes eastward to the northern portion of Gull lake. Conglomerates at the base of this series are followed by dark gray arkose and greywacke, with some slaty bands. The conglomerate contains pebbles of granite, biotite and hornblende-schist and different dioritic types of rock similar to those occurring along the southern margin of the great area of granite and gneiss to the north. The pebbles are very irregularly distributed. In certain localities they are very abundant; in others they are widely separated. In some places the series displays very little evidence of metamorphism, and in others the pebbles of the conglomerate have been compressed into elongated lenticular forms, while the arkose and greywacke have been converted into quartz-biotite schists. From the fact that these sedimentary rocks have been injected by granite, it is to be anticipated that when the area is more thoroughly studied, batholiths or intrusive bodies of granite of different ages may be distinguished.

Post Middle-Huronian (Keeweenawan ?): Large dykes of the newer diabases were frequently noticed within this area. Those of quartz-diabase are similar in general character and subject to the same petrographical variations as the diabase of Cobalt, Gowganda, etc. Large dykes

of olivine-diabase are also present. It would be inadvisable to occupy space with a detailed discussion of the distribution of these dykes. They were noticed on the Harricanaw, Allard, Bell and Nottaway rivers and on Matagami, Olga and Gull lakes. A very large dyke of newer diabase intersects the Lower Huronian (?) rocks on the point marking the eastern entrance of the great northern bay towards the western end of Matagami lake. This dyke extends across a number of the islands to the western shore. A small intrusive body of syenite porphyry on the east side of the Allard river, eight miles from its mouth, should be correlated with this period of igneous intrusion.

POSSIBILITIES OF THE DISCOVERY OF VALUABLE MINERALS.

Long experience accumulated by those engaged in geology, mining and prospecting in other portions of the Laurentian plateau has proved that, in general, those areas underlain by Keewatin, Huronian and the newer diabase are worthy of careful prospecting. As may be learned from the above description of its geology, there are extensive areas of these rocks within this region.

In the vast area of gneiss and granite lying between Matagami lake and James Bay, a mere possibility remains that valuable minerals may be discovered in the neighbourhood of some of the narrow schistose bands. These ribbons and bands of schist were frequently noticed to be somewhat impregnated with pyrite, but not to such an extent as to attract too much attention. While large areas of "promising country" remain untouched, it is advisable for the prospector to avoid large areas which are underlain by Laurentian granite and gneiss.

Systematic and intelligent prospecting of the areas of other rocks should be finally attended by the discovery of minerals of value; but, unfortunately, over by far the major portion of this region efficient prospecting will always be a very arduous task. Owing to the heavy and almost universal overburden of stratified clays, outcrops of rock are very widely separated. Inland from the waterways the country is covered by a heavy blanket of moss, and rock exposures are confined chiefly to the very sparsely distributed low hills and ridges; but frequently, in making a traverse of the bush, one will find outcrops of rock when least expecting their presence. Along the rivers and streams, the occurrence of large exposures of rock is restricted almost entirely to the rapids and cascades. Usually rock outcrops are more numerous and continuous along the southern than the northern shores of lakes; while on projecting points and the majority of the islands, rock is exposed best upon the northern side.

The following two statements are extreme examples of the scarcity of rock outcrops. Along the Allard river for sixty miles northward from "the Harricanaw portage" only twelve small outcrops of rock peep out from beneath the heavy cover of clay,

and three of these are of granite. For twelve miles up a stream entering the eastern end of Matagami lake from the northeast, only one exposure of rock occurs.

In the vicinity of Obalski lake on the Harricanaw river, and in the neighbourhood of portions of Matagami, Olga and Gull lakes, considerable areas of Keewatin rocks are quite easily accessible. With this description in hand, the energetic prospector should not shun other areas where similar rocks outcrop less frequently, but he will enter upon his task with a knowledge of the difficulties attending his work.

During the summer, in connection with our work in mapping, search was made for minerals of economic value. Quartz veins, often containing some pyrite, frequently traverse the exposures of Keewatin rocks in all parts of the area. It is to be hoped that a continued search of these veins will lead to the discovery of some which carry gold. In some localities, especially on the western and southern shores of Matagami lake, bands of the Keewatin schists were found to be very heavily impregnated with pyrite and pyrrhotite. At a point about four miles eastward from the mouth of the Bell river, at the contact between intrusive quartz porphyry and chlorite schists, the latter have been heavily impregnated with pyrrhotite. An assay of a sample from this locality yielded only a trace of gold. Assays of numerous samples from other localities have not yet been made. A few specks of copper pyrites were occasionally noticed in the Keewatin schists, and also at the contacts of some of the dykes of newer diabase.

Diamonds: Last summer six or seven men, under the guidance of Mr. Taberner, were prospecting for diamonds in the blue clays and sandy gravels of the vicinity of the mouth of the Bell river on Matagami lake. They performed much work, and their methods are to be commended; but it is plain that diamonds will not be discovered in this locality. In the vicinity of Matagami lake, no rocks occur which are related closely to those bearing diamonds in other parts of the world. During the summer, other parties were engaged in searching for diamonds in similar clays in more remote parts. It is *not* to be anticipated that diamonds will be discovered in these stratified blue clays of the Clay Belt of the North. The celebrated "blue clays" of Kimberly, South Africa, have been derived from the decomposition of very basic igneous rocks within the pipes or necks of old volcanoes. The blue clays of this northwestern portion of Quebec have been deposited from the muddy waters of the historical lake which has previously been described in this report.