

GEOLOGICAL SURVEY OF CANADA  
G. M. DAWSON, C.M.G., LL.D., F.R.S., DIRECTOR

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REPORT  
ON THE  
COUNTRY IN THE VICINITY OF  
RED LAKE  
AND PART OF THE  
BASIN OF BERENS RIVER  
KEEWATIN

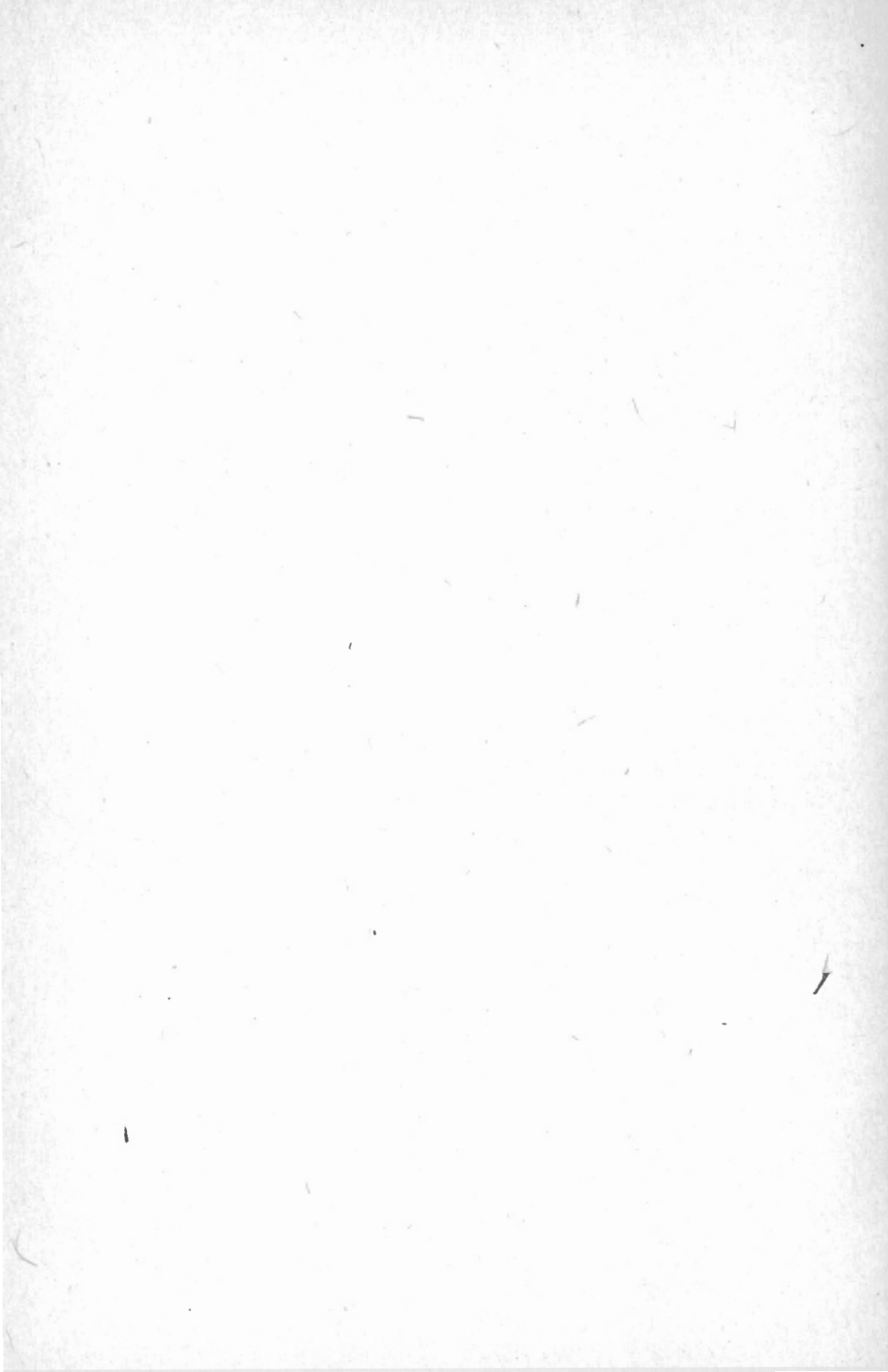
BY  
D. B. DOWLING, B. AP. SC.



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TO GEORGE M. DAWSON, C.M.G., D.S., F.G.S.,

Director Geological Survey of Canada.

SIR,—I beg to present herewith a report on the country explored during four months of the summer of 1893. It is necessarily of a preliminary character, as the exploration was intended as the commencement of further examinations of the area lying between Lac Seul and the Berens River, and from Cat Lake westward to the Winnipeg map-sheet.

No published maps of this district give more than rough sketches of any of its details, and the geological features have been previously known only from cursory explorations.

The map accompanying this report is compiled from careful log-surveys of the lakes and estimated traverses of the streams, checked by latitude observations. The base to which the whole is referred, is founded on a micrometer and transit survey of the English River made by Mr. Thos. Fawcett, D.T.S., in the summer of 1885.

I was assisted during the above period by Mr. J. C. Gwillim, then a student at McGill College, and to him are to be accredited the surveys of several of the smaller lakes shown on the map.

Besides showing many lakes and streams not hitherto mapped, the outlines of the Red Lake Huronian band, as well as part of the newly discovered Woman Lake Huronian area, are indicated, and these areas are briefly described.

I have the honour to be, sir,

Your obedient servant,

D. B. DOWLING.

NOTE.—*All the bearings mentioned in this Report are with reference to the true meridian.*





# REPORT

ON THE

## COUNTRY IN THE VICINITY OF RED LAKE AND PART OF THE BASIN OF BERENS RIVER, KEEWATIN.

The present report contains a summary of the results of an exploration undertaken during the summer of 1893, in the southern part of the district of Keewatin. The area comprised in the report lies just to the east of the eastern boundary of Manitoba and north of the Province of Ontario. It extends from the English River and Lac Seul, northwards to Berens River, the eastern branch of which forms approximately, the northern limit of the area. To the east, the exploration includes the heads of streams flowing eastward to Cat Lake, and on the west the White River, a southern branch of Berens River, with the western end of Red Lake, confine its extent in that direction.

The map which illustrates the area, shows it to be situated between latitude  $50^{\circ} 30' N.$ , and  $51^{\circ} 50' N.$ , and between longitude  $92^{\circ} 40'$  and  $94^{\circ} 15'$  west of Greenwich, an area of 6300 square miles.

A sketch map\*, showing the position of this area and its principal streams and lakes accompanies the Summary Report of the Geological Survey for 1893, in which is also a brief description of the routes followed.

### PHYSICAL FEATURES.

The larger part of the area forms a basin draining to the south to English River, and thence to Lake Winnipeg. In this are situated the largest lakes of the district, comprising Red Lake, Trout Lake, Gull Rock Lake, and Shallow Lake. The northern portion drains northward to Berens River and thence westward to Lake Winnipeg.

A small area containing a few lakes on the east side, is found to drain to the eastward, forming a part of the Albany River basin, which empties into Hudson Bay.

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\*Annual Report, Geol. Surv. Can., vol. VI. (N.S.) 1892-3, p. 22 A.

*Southern Basin.*

Southern or  
English River  
basin.

The basin drained by the streams flowing south to English River, is almost an amphitheatre in form, facing the south. The several streams converge to the convex line followed by the valley of the English River. The watershed forming the outer boundary or rim of this area, rises gradually from the west toward the east, having, probably, its highest point between the waters of Cat Lake River and Lac Seul. To the west, in the vicinity of Long-legged Lake, it rises to 1200 and 1300 feet, or sixty feet and upward above Lac Seul. North of Red Lake, the portage at the height-of-land to White River is at 1300 feet, while north of Trout Lake it is considerably higher, as this lake itself stands at nearly 1300 feet. The Woman Portage, between Sha-boomene and Woman lakes, is estimated to be at 1350 feet above sea-level.

The general surface of all this basin, is of a rough, rocky character, with small areas between the ridges, of alluvial and glacial deposits. Across the north-eastern part, a strong ridge of glacial material forms a long and nearly straight line, through which two streams have cut. It is much more strongly marked near Trout Lake, and there clearly forms a dam, retaining the waters of that lake. All the other lakes are evidently in rock basins, surrounded by rocky hills.

The higher parts of the rocky country forming the remainder of the basin, show very little covering of drift material of any sort, except a few boulders, with sand in the valleys. North of the Trout Lake ridge, the most noticeable feature is the enormous number of boulders on the shore of the lake.

Topography  
of two classes.

*Effect of geological conditions on the topography.*—In general, that part of the country in which the surface is of gneiss and schist, is lumpy, with hills aligned in ridges, but the surface-level is more or less a sloping plane. In areas in which light-coloured intrusive granite prevails, the surface is, however, considerably raised above this plane. The Huronian areas here, as usual, show more pronounced denudation and greater irregularity in surface feature. The narrow, crooked lakes in the Woman Lake region, occupy gaps and gashes between high ridges. The high angle at which these rocks stand, admits of a greater disintegration of the softer beds, such as limestones and chloritic schists.

These areas can hardly be described as forming basins. The general surface of the country is apparently higher than elsewhere, but it contains deeper depressions, which are occupied by lakes. In tracing out the line of contact of the granite with the green Huronian schists of

Red Lake, it is found that nearly half the area of the lake is underlain by granite, so that this lake is not properly described as a basin in the Huronian rocks, though the greater part of its northern arms and bays are entirely within that area.

It will be noticed on reference to the map that, although the Hur- Trout Lake. onian areas are evidently well sprinkled with lakes, still the largest basin of all, Trout Lake, is altogether beyond them and is most probably not a rock basin at all, the southern side being a dam of morainic material. The suggestion that this is the case arises from the fact that not only are there but one or two low rock-exposures along the northern foot of this ridge, but, that the lake lying only three or four miles to the south of Trout Lake, over this ridge, is estimated to be about one hundred and fifty feet below, and is fed by two small streams having their origin in the hills between, and carrying relatively more water than the small area they are supposed to drain, would naturally produce.

*Relative heights of lakes.*—In order to obtain a relative scale of heights for the lakes and hills in the district, an estimate of all the various falls in the rivers and on portages was carried from the railway through to Berens River by both routes followed. The aneroid barometer was used on long portages and in measuring the height of hills.

The estimated heights above sea-level of the principal lakes in this area, obtained in the above manner, are as follows:—

	Feet.
Lac Seul.....	1140
English River at Mattawa.....	1105
Shallow Lake.....	1105
Little Shallow Lake.....	1106
Sand Bar Lake, English River.....	1035
Wilcox Lake, English River.....	1030
Long-legged Lake (Lower).....	1173
Long-legged Lake (Upper).....	1175
Gull Rock Lake.....	1146
Red Lake.....	1148
Little Red Lake, or Little Vermilion Lake.....	1173
Lake at height of land north of Red Lake.....	1250
Bug Lake, south of Red Lake.....	1266
Upper Medicine Stone Lake.....	1210
Lower Medicine Stone Lake.....	1200
Trout Lake.....	1295
Snake Lake.....	1270
Little Bear Lake.....	1310
Woman Lake.....	1315

	Feet.
Fly Lake.....	1356
Bluffy Lake.....	1220
Sha-boom-ene Lake, draining to Cat River.....	1330
Head of eastern branch Berens River .....	1350

Long-legged  
River.

*Long-legged Lake and River.*—A small stream enters the western end of Wilcox Lake, draining a series of closely connected lakes known collectively as Long-legged Lake. The lower part of the stream flows through low swampy country gradually rising to the west. The channel is wide and deep, with sluggish current, and the course is crooked, but with long bends. This character continues for five miles, where a fall of eighteen feet over a ledge of dark gneiss is reached. At the time of our visit (August 30), very little water was running, forming a thin veil the whole width of the ledge, but in high water it must be a fine fall. A portage of one hundred yards is on the east side.

The stream above the fall continues of about the same character, but flows through a sandy country with few rock exposures. The timber is mostly Banksian pine of small size. Between the falls and short rapids there is a very light current, so that it is easily navigated, except that in the upper part, near the lake, there are numerous short portages which take time to surmount. Two miles beyond the eighteen-foot fall, is another of twenty feet, with a portage of seventy yards, this is followed in a quarter of a mile by a fall of thirty feet, with a portage of one hundred yards.

From a short distance below this fall to near a small lake expansion two miles above, the borders of the river are fringed with rushes and wild rice, with sandy country behind covered by a close growth of slender Banksian pine. Occasionally, on lower ground small patches of spruce and tamarack occur, in which are seen a few trees over eighteen inches in diameter.

Sediment-  
filled basin.

The small lake which the river passes through has originally been a basin of two miles in length and a quarter of a mile in width, lying in a trough between gneiss ridges running east-and-west. The river-valley enters this basin on the middle of the northern side, and flows out at the eastern end. The sediment brought down and deposited by the river has formed a delta, by which the lake has been divided into two parts, separated by a low, marshy flat through which the river now winds in a very irregular course. The older part of the delta is higher ground and produces fine wild hay, while the immediate banks of the stream are lined by rows of ash and elm, as commonly found in Manitoba.

Upper part of  
river.

Above this lake the river bears north-westward, through level country, and in a mile turns westward, winding in the bottom of a low

flat valley or depression between higher ridges and knobs of gneiss. The stream passes near a high steep rock of gray gneiss, in vertical beds running to the west. The banks are clay, and on the north side of the valley half a mile east of the steep rock, the stream has cut into a hill which shows sixty feet of stratified clay.

The river now becomes irregular in its course to the outlet of the lake, descending in a distance of two miles over several ledges of gneiss, in falls and rapids, successively of 1 foot, 5 feet, 3 feet, 30 feet, and 3 feet, or aggregating seventy-two feet, at all of which short portages are necessary in low water, and in high water at five of them.

The lakes, forming a group at the head of this stream, are all of irregular shape, but generally lie north-east and south-west, or across the general direction of the drainage, following somewhat the strike of the rocks. Long bays run in the same direction on either side of the lakes. The ridges or hills of the surrounding country also mainly run with the strike of the gneiss.

The first lake of the series is four miles long and one and a half wide. Two large islands are found in the northern half. A long narrow, of nearly two miles, connects this with the second, which is of the same length in a north-east and south-west direction, but a mile wider, having few islands in the central portion but a number scattered along the shores. A crooked narrow lake, running from the western side towards the north, and then turning west, brings us to the north end of a small lake terminating at the south end in three long finger-like bays. On the north western side, at an opening leading to a small lake, we find a swift current with a fall of a foot over gneiss rock. Here the Indians have constructed a fishing weir or dam, to which they resort in the autumn. After crossing a small bay or lake expansion, half a mile in diameter, a narrow opening admits to the upper or most western lake of this series. Lower Long-legged lakes.

This is the largest of the Long-legged lakes, but still is of no very great extent. It might be called a rectangle in shape, with one diagonal running east-and-west and having sides of three miles each. The river leaves by the eastern end, just north of which runs a narrow arm of a mile and a half in length to the north-east. At the south end, a short bay breaks the regularity of the shore, but at the west end there are two bays, the one forming a small lake with a narrow entrance. This bay is a mile in diameter, while the one on the north is smaller and likewise nearly cut off from the main lake. The islands are mostly narrow ridges of gneiss running north-east and south-west. The hills surrounding this western lake are much higher than to the east, and it appears to be at Upper lake.

the extreme western limit of the watershed. A stream enters the west bay, but it is a very small one fed by two or three large muskegs and small lakes lying immediately behind the first ridge, west of which again higher ridges are seen.

We climbed several hills to the west of these two bays and found them to be principally composed of horizontal beds of gneiss, broken and fissured by large dykes of pinkish granite. The most western hill was almost entirely granite, sending out wide dykes of pinkish coloured granites through the broken gneiss to the eastward.

Mattawa  
River.

*Mattawa River.*—The largest stream joining the English River on the north side, below Lac Seul, is the Mattawa. This enters at what was formerly an Indian reserve, but where there is now only a Hudson's Bay Company's trading post called Mattawa. The river to which the name applies, is but a short strip of sluggish water connecting the English River and Shallow Lake. Above this there are two streams whose waters discharge by the Mattawa. The Trout Lake River empties into Little Shallow Lake lying to the east and thence flows to the north-east corner of Shallow Lake. At the extreme northern end of this lake is found the mouth of Red Lake River. These two are both fair sized streams, so that the flow of water in the Mattawa is considerable, but, owing to the large size of the channel, the current is very slight. From the river to the lake, a distance of four miles and a half, this strip of water occupies a wide valley enlarged into lake-like expansions, which apparently often serves as an overflow channel from the English River, at times of high water. As an example, during the summer of 1893, between June 30th and July 17th, the waters in the Shallow lakes and English River at Mattawa rose six feet; this rise was not occasioned by increased flow in the Trout Lake and Red Lake rivers, but altogether to the increase of volume in the English River, showing that the formation of the large channel of the Mattawa has been aided by the ebb and flow from freshets on the English River.

Occasional  
reversal of  
flow.

This channel is cut through soft stratified beds of sand and clay which occupy the lower country between the hills. The English River, below the junction, is held back by a rocky barrier of gneiss, which striking to the west, forms ridges running generally in that direction.

Shallow Lake.

*Shallow Lake.*—Shallow Lake is a long narrow strip of water, ten miles in length, lying north-and-south. From the south-western angle, a narrow arm runs westward about two miles, widening out and terminating in a round bay containing two small islands. In the main



body of the lake, a number of islands are scattered in irregular order, numbering in the aggregate about thirty.

The shores of the eastern side are in general of easy slope, the country behind rising gradually to the high land lying north of English River. The narrow strip separating the two Shallow lakes is generally low, but rises in a high narrow ridge to the north, which, with a similar one lying to the west, but starting from the north end of Shallow Lake, forms a valley. Through this the waters draining into the smaller lake reach Shallow Lake, in a wide sluggish stream bordered for the most part by grassy and rush-grown flats with a fringe of small willow bushes. Its shores.

The same gap or valley continues to the north-east, and down it a small stream flows. A continuation of the eastern ridge which forms a prominent point just west of the mouth of Trout Lake River, parallels the course of that stream for some distance.

The low-lying country on the east and south-east of these two lakes is found to be underlain by gray gneiss, while the change to steeper slopes and higher hills running parallel to the shores on the south and west, is principally due to the change in the character of the rocks. Those on the west are mainly a series of fine-grained dark gneisses.

Lying across the mouth of the valley of Red Lake River, are two prominent hills, which on examination were found to be morainic, or of glacial origin. These are very noticeable and are seen for a long distance down the lake.

*Red Lake River.*—This stream empties into a bay at the north end of Shallow Lake. A short rapid or fall, of a foot or more, is found at its mouth caused, by a ledge of dark fine-grained, rusty, green slate or schist. In high water in the lake, this rapid is drowned out. Red Lake River.

Above this, the river makes a long bend to the west, to the north of the prominent hills just mentioned. The hills take the form of narrow ridges, of no great length, lying west-south-west, and east-north-east, with an altitude of one hundred and seventy feet above Shallow Lake. The slopes are thickly wooded with small Banksian pine and spruce. The sides of the hill show no rock in place, but everywhere pebbles and boulders of loose rock are seen. The material of the hill is apparently a mass of fairly well rounded pebbles and boulders, with sand and gravel filling the interstices. On the southern slope large blocks and angular boulders are occasionally seen on the surface. Most of this material is of grayish gneiss and granite with a few scattered pieces of the green felsites and schists of the Huronian. Morainic hills.



Falls.

Northward, the river passes through a low strip of country gradually rising, and at a mile and a half the banks are twenty to thirty feet above the water. Here the first heavy fall occurs, caused by a band of dark schists. The portage past this, leads up a steep bank of clay and sand on the west side, to thirty feet above the river, and along a level terrace, descending with a more easy slope to the river above. The distance is 250 yards, and the fall in the river fifteen feet.

At about half a mile above this, there is another small fall of ten feet. Although rock in place is seen at the foot of the fall, the obstruction seem to be occasioned by a great accumulation of boulders, and in the river, just above, large angular boulders of granite nearly fill the channel. Their presence is accounted for by the fact that the river here cuts through a ridge of morainic material, which is seen to be a spur from a high ridge running off to the north-east. The portage is on the east side, and is one hundred yards long.

Farther up, the stream is wide and has little current to the next fall, the general course being to the north-west, but including a long curve to the south. Here an accumulation of boulders in the bed of the stream causes a rapid with a fall of twelve feet, to pass which there is a portage road of 170 yards on the west side.

The upper part of the river to Gull Rock Lake, is a succession of small lake-stretches, with a wide river-channel connecting them, in which the current is appreciable in one place only, where there is a hollow bar.

Timber.

The timber on the banks is mostly poplar of a fair size with a sprinkling of birch and black spruce. The birch average twelve inches in diameter, but only a few of the spruce trees were found over eighteen inches.

Just to the east of Gull Rock Lake, a small lake-expansion of less than two miles in diameter is crossed. On this a light granite with slight foliation is seen, and the same rock is probably to be found on the river below, though no exposures were met with.

Gull Rock  
Lake.

*Gull Rock Lake.*—This lake, which lies immediately to the east of Red Lake, with its longest diameter north-and-south, has a total length of eight miles.. The inlet and outlet are on the south-west and south-east sides respectively. The northern part is narrow, but towards the south the lake widens out to four miles. A string of islands runs across south of the middle, and others are scattered along the eastern and southern shores. To the south, the shores are high and bold, but to the north more gradual slopes prevail, while on the western side

one bold hill of granite is conspicuous. A small creek at the north end, leads to another lake of three miles in extent, occupying the same trough, beyond which is a high ridge separating these waters from Trout Lake.

A deep channel joins Gull Rock Lake with the western end of a small lake called Keg Lake, lying to the north-west, and a short portage connects the two, saving about three miles of travel by the river.

*Red Lake.*—About three miles west of Keg Lake by the river, is Red Lake. the entrance to Red Lake. No idea of its size or shape can be formed on inspection, as from the great number of islands and the irregular shape of its shores no great view of any extent of water is seen, and it is only by traversing the whole of its shores that its area can be appreciated. The largest open part is that which is entered first. From this to the west, extends a long narrow arm, which contracts in several places to less than a quarter of a mile. At the western end, a narrow, crooked channel connects with what is called Pipestone Bay, a small expansion of two miles in diameter, where the Indians obtain stone for making pipes. This is a soft compact chlorite and the pieces they use are from loose boulders, though the rock was seen in place in a thin band, in the narrows. Pipestone Bay.

An arm or long bay runs to the north-east from the main body of the lake, and connects by a narrows with a long lake lying about parallel to its course, on the east, joining it at about two miles from its northern end. This addition is about six miles long and less than a mile wide, and lies in a trough in the Huronian, the shores following in the main the strike of the rocks. East Bay.

The total distance from the extreme north-eastern end of this bay to the western end of Pipestone Bay, is twenty-seven miles in a west-south-west direction. At right angles to this, the greatest breadth, which is from the outlet northward to the end of a bay on the north side, is roughly seven miles. Size of lake.

The forest about this lake is somewhat varied, spruce and Banksian pine alternating as the dominant trees. On all the dry and sandy ground a thick growth of slender Banksian pine is found, and no trees of large size are apparently to be seen in such areas; but in the valleys and near the lakes, black spruce is occasionally met with, forming small groves scattered through the forests of deciduous trees. Individual trees of larger size are common on the islands and points over which forest fires have not run, and such trees may attain in some instances a diameter of twenty inches, but the average is under eighteen inches. Forest.

Birch and poplar are almost always present wherever the soil admits. On the richer and lower ground, between Red Lake and Gull Rock Lake, and farther down the river, the poplar trees are well grown and appear in groves in which nearly all the trees average eighteen inches in diameter near the base. Farther to the westward on the higher ground, the soil being sandy, the Banksian pine is more abundant, and near the western end of Pipestone Bay, some trees of red pine form a small grove, which appears to be the northern limit of the species in this basin.

Tributaries.

*Streams flowing to the Red Lake basin.*—The streams flowing from the south to Gull Rock Lake and Red Lake are all rather small. The first one examined was a small stream draining Stone Lake, and emptying into the south bay of Gull Rock Lake. This proved to be very shallow, and the lake is of small size lying between hills of granite, with occasionally fragments of Huronian rock caught up in it, showing at a few points on the lake.

Stream from  
Bug Lake.

Another lake lying further to the west, called Bug Lake, drains by a small creek to the western extremity of the south bay of Gull Rock Lake. The valley in which this lake and stream lie, runs west by south-west from Gull Rock Lake, following the strike of the gneisses and altered rocks. The distance from lake to lake by the river is about four miles, with two miles of the western part over a lake connected with Bug Lake by a short reach of sluggish river. The upper part of the stream is very shallow and is overhung by tall gray willow bushes, making travelling along it difficult. Two portages were made past rapids. The fall at the lower one is seventy feet and at the next forty feet, so that the lake lies at an elevation of about one hundred and twenty feet above Gull Rock Lake.

From a bay on the south-west, a portage leads to a small lake draining to Red Lake. The road is through scrub pine bush with mossy floor, over a slight rise for about 600 yards—the terminal points being at about the same elevation.

Stream from  
Medicine  
Stone Lakes.

The stream which rises here flows through several large lakes, and reaches Red Lake about a mile east of a narrows near the middle of the lake (Middle Narrows). The small lake at the head waters is bordered by mossy muskeg, and is about one-third of a mile in length. The stream flowing from its western end is too small for canoes, and the portage to the next lake is through spruce bush for 1000 yards. The fall is about fifty feet to a lake less than half a mile in length. Two small portages and an intervening pond, lie between this and the Upper Medicine Stone Lake, which is a long narrow strip of water

running to the south-west. Its total length is six miles, with a breadth averaging half a mile. The north-west shore is bold and is of granite, while the south-east is lower and shows fewer exposures, principally altered rocks and dark-green eruptives, with granite in a few places. Between the points the shores are mostly of angular boulders.

Upper Medicine Stone Lake.

The gneisses of the southern part of the lake run in about the average direction of the length of the lake. The stream enters at the eastern end and the outlet is from a bay on the north shore about two miles to the west.

From the south-western end, there is a portage of a mile to the south, to a small lake draining to the upper part of Long-legged Lake.

*Lower Medicine Stone Lake.*—A short stream connects the two Medicine lakes falling into the eastern end of the lower. This is somewhat similar in character to the former, in that it is a long narrow lake, but it runs more toward the west. It is about the same length, but broadens out to nearly a mile at the western end. On the southern shore, which is low, is to be found only drift material, but the north side is bold with hills of gneiss running to the west and rising steeply.

Lower Medicine Stone Lake.

At its outlet, at the eastern end, on a low point surrounded by trees, is a tall boulder of gneiss, left standing on edge by the ice. The dimensions of this stone are : height above surface fifteen feet, length fifteen feet, breadth or thickness near the top, eight feet, narrowing near the ground to five. This stone was of course an object of wonder to the Indians, and offerings of tobacco, pipes, and other valuables have been made at its base for years. This lake has evidently derived its name from this, "medicine stone."

Remarkable boulder.

The elevation of the upper lake is about sixty feet above Red Lake, that of the lower one about fifty feet, and that of a long crooked lake below, near Red Lake, about fifteen feet.

The stream leaves Lower Medicine Stone Lake near the eastern end, and in half a mile reaches a small pond, on an island in which is found an exposure of light green porcellaneous rock, which is similar to some in the Huronian area. The band must be narrow, as on the next small lake to the north, granite is seen, and this continues to near Red Lake. The long crooked lake lying near Red Lake is in a basin in the granite, and the fall at the outlet is across the contact with the Huronian.

In the angle formed between the two streams just described, are several small lakes which drain to the river between Keg Lake and Gull Rock Lake, but they were not examined. At the

Stream at Trout Bay.

extreme west end of Red Lake, a small stream falls with heavy rapids into the long arm or bay south of Pipestone Bay, called Trout Bay. This drains a long crooked lake of clear water about seventy feet above and 700 yards south of the above arm, and like the one to the east, lies in an area of granite, the river, as in the former case, falling in rapids from the contact line. The upward extension of this stream, which flows through several small lakes, passes through an area of apparently altered Huronian which has been split off from the Red Lake band. The upper lake reached is altogether surrounded by granite.

Whitefish  
Spawning  
River.

The streams entering the northern side of Red Lake are all of small size, with the exception of one near the north-east corner. This was ascended to near its source, where there is a portage to the headwaters of the southern branch of Berens River. Atick-o-meg wam-en-ekan Sepi (whitefish-spawn river), is the Indian name for this stream, and it is much the largest entering Red Lake. A short distance above its mouth rapids commence, and between Red Lake and Little Vermilion Lake, there are four portages in a distance of less than two miles. These are all short, and at falls, in ascending order, of eight, six, six and three feet, respectively.

Little Ver-  
milion Lake.

Little Vermilion Lake is about four miles in length, in a north-west direction, and is divided into two parts by a narrows. The western part is much the larger, and contains many islands. Two small streams drain to this lake. The smaller enters at the north-east corner of the lower part, rising to the north-east in a large lake named Pine Lake, while the other rises in several small crooked lakes lying to the north-west, and empties into the north-west corner. Pine Lake was not seen, but the Indians describe it as a fair-sized lake, having very few rock-exposures on its shores, with a surrounding country very sandy in its nature, and clothed with scrub pine. The stream entering Little Vermilion Lake on the north-west, forms part of the through route northward to Berens River. For a couple of miles west it is wide and deep, to a small lake divided by a narrow passage in the middle, the western part containing a number of islands. Above this, the river is very crooked, and in its upper part it falls in a number of rapids at which there are short portages. Gradually the hills approach the river, sandy ridges covered with scrub pine being succeeded by hills of granite. The stream is then a series of dead water stretches, separated by short falls. The average course up to the lakes at the height-of-land is north-west, and the distance from Little Vermilion Lake to the portage at the height-of-land is about fifteen miles. The estimated fall from its source to Red Lake is 100 feet.

Route to  
Berens River.

The trail leading to White River, the southern branch of Berens River, is one mile in length, crossing ridges of granite and gneiss, fairly well covered by spruce and poplar. By readings of the aneroid barometer, the lakes on either side are at about the same elevation, while the ridge rises thirty or forty feet higher.

*Trout Lake River.*—To the east of the high point, on the north side of Little Shallow Lake, lies the mouth of this river in a low marshy bay. To the north-east, for seven miles, the country is low, so that the river runs with wide channel in a fairly straight course. The banks are from four to eight feet, rising gradually from the lake, where they are very low. The trees near the river are mostly poplar, with slender spruce on the lower land just behind. Occasionally Banksian pine is seen on the dryer parts. The first fall met with is over an accumulation of boulders, derived from a ridge of sand and boulders through which the river has evidently cut its way. At the foot of the fall the Indians form large camps in the autumn to catch whitefish as they are ascending the river to the spawning grounds. The banks immediately above are of sand with boulders at the bottom. These are found of all sizes and colours, the largest being of dark green rock, probably transported but a short distance. The obstruction formed by these boulders, there being no rocks seen in place, causes a fall of ten feet.

For two miles and a half above the first fall, the country seems low, and the river runs in a fairly even course from the north-east, but at this distance a heavy series of falls is encountered. Near this are exposed in the banks dark-green rocks, which at the fall are cut by light reddish granite. These are crossed by the river above, and evidently cause the fall which is estimated at sixty feet, and a portage of four hundred yards is made on the north-west side. Above this a short distance, is another series of short rapids round a long bend, amounting to a fall of ten feet. A portage of two hundred and fifty yards is made across the bend. A quarter of a mile north-west is the Manitou Fall, where the channel contracts, and the water pours over a band of fine-grained gneiss, making a perpendicular fall of fifteen feet.

The direction of the river between these last two large falls is nearly at right-angles to its general course, and in this distance it appears to cross a wide band or area of intrusive granite. Above the Manitou Fall, after a few irregular bends, it regains its former course. Cat Fall, the next above, is a narrow chute between dark-green hornblende rock of eruptive origin. The descent is about four feet, and a portage is seldom made. Above this the river broadens and the current



is sluggish. Two miles up, the stream divides, the western branch coming from Trout Lake, the eastern from Woman Lake.

Branch from  
Trout Lake.

The stream from Trout Lake leaves it by a bay at the south side, passing by a long narrow lake-expansion to the south-west, and turning east runs through Little Trout Lake, following a course parallel to the strike of the gneisses. The outlet from this lake is at the east end where the river follows a gradually narrowing channel ending in a heavy rapid. Below, it becomes irregular, making a course of about three miles to reach a point two miles south-east. In this distance the river falls eighty feet and four portages are made, all rather short, the longest being about 300 yards. At the lowest one, the trail runs over a ridge rising thirty feet above the river at the upper end, and by exposures on the trail the hill seemed to be principally of boulder-clay. Between this point and the junction with Woman Lake River, the course is directly south but with many minor bends and little falls through a swampy tract, in which hills of granite appear.

Branch from  
Woman Lake.

*Woman Lake River.*—The stream joining Trout Lake River from the north-east, is of about the same volume as that from Trout Lake. Just above the junction, it comes rushing through a narrow rocky gorge in the granite and gneiss, falling fifty feet, past which there is a portage-road of half a mile in length. A quarter of a mile above, a small fall of fifteen feet is passed by a portage of 160 yards, when we reach Snake Lake, the first of a series connected by short river-stretches, ending with Fly Lake, which lies east of Woman Lake near the head-waters of the stream. The second in the chain is Little Bear Lake, about thirty-five feet above Snake Lake, the ascent being distributed among six small falls, in a stretch of a mile in length. A narrow and crooked lake, six miles in length, succeeds the expansion called Little Bear Lake, and by a reach of river a mile in length is connected with the southern end of Woman Lake.

Woman Lake.

*Woman Lake.*—A long narrow lake expansion extends to the north-east for seven miles. Turning north, the lake widens to much larger dimensions, having an average width of a mile, for five miles of its course. This part is thickly dotted with islands, while the shores are bold, rising in high hills behind. The total length is about fourteen miles. At the northern end, a small stream leads to a couple of lakes lying to the north-east. This is the most northerly point of the Woman Lake basin, as a portage of a mile, from the upper lake brings us to the waters flowing north-east to Cat Lake River and ultimately to James Bay.

Lakes to the  
north.

Three lakes to the south, lying east of Woman Lake, drain directly north to this point. The first two are called Clearwater Lakes, and

the last, Fly Lake. They are long, narrow strips of water, with many islands, and are similar in character and surroundings to Woman Lake. The fall from Fly Lake, the head-waters of this branch, to Woman Lake, is estimated at forty-two feet, or from Fly Lake to the English River, at Mattawa, 451 feet.

It is found on passing through these lakes, that they occupy a trough or troughs in dark Huronian rocks. Their narrow basins closely follow the strike of the beds.

*Trout Lake.*—The position of this lake is to the north-east of Red Trout Lake. and Gull Rock lakes, but a few miles from them. Its extreme length is sixteen miles and its breadth thirteen, with an average width of eight miles. Its greatest diameter lies about east-north-east or almost parallel to that of Red Lake, and nearly in the same general line. It is not, however, of the same broken and irregular character. Numerous islands are scattered through it, but in the central portion is a large open sheet of water. On the northern side are two large bays, the western one being a long narrow arm, stretching to the north-east, with a group of islands at its mouth. At the northern corner another large bay is found, almost filled with islands, and across its mouth a string of long islands extend from the eastern shore. The river leaves the lake at the south-west corner of a large bay on the south side. Eastward, another arm stretches for three or four miles, leaving a long peninsula, on the extreme end of which, in former times, the Hudson's Bay Company maintained a trading establishment.

The south-western shore is regular and is determined by a long Morainic ridge of morainic material, chiefly sand and boulders, which extends in a continuous line from the western extremity of the lake south-eastward, bordering the south-western shore of Little Trout Lake, and apparently running in the same direction till it crosses the river at the lowest rapid. The height of this ridge just opposite Cat Island on Trout Lake was found by aneroid readings to be 270 feet above the lake.

Cat Island, the only large island in the lake, rises in a high dome-shaped hill about 200 feet and seems to be covered with sand. The shores, especially of the southern part of the lake, differ materially from those of all the other lakes in the district, in that they are almost everywhere piled high with boulders. The peninsula lying between Cat Island and the outlet is covered mainly with sand and gravel. The site of the Trout Lake trading establishment is at the outlet, on a high ridge of this material about thirty feet above the lake.



Good soil seems to have been found there for gardens, on a small space near the foot of the slope. The place is now practically abandoned, except in the winter.

Entering  
streams.

The streams entering Trout Lake appear to be rather small. A little creek enters the bay at the western end, but a larger one entering at the extreme north of the lake is sometimes used by the Indians as a means of getting to Pine Lake. The river is small and only light canoes are used. At the east side, a small stream is ascended, and a long portage made, to a long lake draining eastward to Woman Lake.

Timber

The timber in the vicinity does not appear to be of importance, as the size is generally too small for commercial purposes. Banksian pine is the prevailing tree, and this generally grows in thick masses, so that the trunks are very slight. On the ridge to the south the undergrowth is of this scrub pine, and so close that it is difficult to find a way through. A few fair sized spruce trees are occasionally seen, and on the portages on the river below, wherever there is sufficient soil, a thick forest of small birch and poplar is found growing. Much of the low rocky country is covered by muskegs, with stunted spruce and tamarack.

The elevation of Trout Lake is estimated as 1295 feet above the sea, or one hundred and ninety feet above Shallow Lake, and eighty feet above the forks of the river.

Wenassaga  
River.

*Wenassaga River.*—The streams flowing south to Lac Seul are none of them as large as Trout Lake River. At the Manitoba narrows, a small stream enters from the north, called Manitou or Manitoba River. This was not explored, but is reported to be navigable for a short distance only.

At a mile from the western end of the lake a larger stream is found. This rises to the north-east, near the head-waters of a branch of Cat Lake River, and by means of a portage made from one to the other, a short route to Rat Portage is formed. The lower part and the western branch were traversed in our trip through from Trout Lake via Woman Lake and Fly Lake. The eastern branch was not explored, but a few notes on it are given by Mr. Fawcett in his report to the Surveyor General, from which the following extracts are taken.\*

Description  
by Mr. Fawcett.

“Having heard of a canoe route from Cat Lake to Lac Seul, which could be travelled in a short time, I determined to return that way at once, and started amid a violent snow storm and before a driving

\*Annual Report of the Department of the Interior, 1885, part II., p. 37.

wind, against which, had it been in our faces, we could not have made any headway. We retraced our route until Gull Lake was reached, and following a channel for about two miles, which enters the lake on the west side, we came to another large lake, also called Gull Lake, as it forms a part of the same body of water, and it is about the same size as that part of the lake crossed by the traverse line, or about five miles in diameter. The shores of that part crossed by the line are pretty regular, but the westerly shores are deeply indented with large bays and offshoots from the lake. Ascending a small creek from Gull Lake for about six miles, we reached the height-of-land portage, the first part of which was about three-quarters of a mile in length, and muskeg most of the way. We then came to a small lake which was frozen over, and were delayed for a time breaking a channel through the ice. After crossing two small lakes and three portages we reached a small stream, which, after a day's travel attained the dimensions of a fair sized river, called by the Indians Wenassaga Measibi, which we followed to Lac Seul. By this route there are altogether twenty-seven portages from Cat Lake to Mattawa varying from one chain to about a mile in length. The highest single fall would not exceed thirty feet of a direct descent, but altogether the stream from its source to Lac Seul must fall from 400 to 500 feet; and as the stream is a large one, with a plentiful supply of water, it would afford any amount of force in the form of water-power, which could be utilized should the country ever become a manufacturing one. In a few places I noticed soil of vegetable mould and clay loam, which would be well suited for the growth of grain and vegetables should the climatic conditions be favourable. I also observed here that the best soil generally produced a growth of poplar, and wherever it appeared large and thrifty, good soil might be looked for, comparatively free from rock. On the rocky ridges, as usual, scrubby pine was the prevailing timber, while the flats and muskegs were invariably covered with spruce and tamarack. The good land noticed seemed to be in belts three or four miles wide and extending north and south for a considerable distance, as might be expected from the geological formation, the depressions and elevations succeed each other in very regular order and much in the same direction. In places the spruce and tamarack would attain a growth of two feet in diameter and a good height, but this was not the rule—ten or twelve inches was about the average.”

Soil and timber.

In its lower part this stream passes through two moderate sized lakes. The first, Wen-âste-ga-o Lake is situated at a couple of miles from Lac Seul at an elevation of sixteen feet above it. This fall in the river occasions three rapids, the first of which has a fall of six feet

Lakes on lower part of river.

and is a mile from the mouth. A small rapid just above, is next tracked up, above which to near the outlet of the lake the river is deep and easily navigated. Just at the outlet, a band of micaceous gneiss forms a barrier and the river falls three or four feet. A short portage on the west bank leads to the lake which is three miles long and one broad. On the west side runs a high ridge of hills, of granite and gneiss. On the east the hills are lower, and the exposures of rock form flat glaciated surfaces, while in one locality the waters of the lake have worn into a bank of sand, laying bare fifteen feet of stratified beds. For some little distance up this river and past the next lake, a small stratified deposit of sand fills the narrow valleys and depressions between rocky knolls. In the river above, the course of the stream is between ridges of gneiss running south-west. The river breaks through from one ridge to another, but the older valleys between these ridges appear to be filled in with the sand deposit.

#### Bluffy Lake

The two lakes through which the river runs, are of much the same character, except that the upper one, Bluffy Lake (Kah-mini-ta-gwa-qui-ack Sakahegan), is dotted with several islands, and one, a mile in length, divides it into two portions. The difference in level between these lakes is about sixty feet, which is found at two heavy falls near the outlet of the upper one. The first or lower rapid has a fall of nearly forty feet, then, at the outlet, is another of twenty feet over a ledge of mica schist. On the portage at the lower fall the rocks are very much twisted and broken into by dykes of reddish granites. At the upper one, less disturbance was noticed, while on the lake the beds are not contorted but show considerable squeezing.

#### White-mud River.

The total length of Bluffy Lake is four miles and a half, with a width of one mile. The timber on the islands and surrounding hills is principally black spruce, with Banksian pine showing occasionally on sandy tracts in the river-valleys. At the upper end of the lake a stream from the east enters by a wide mouth. The volume of water coming in is not great, as the channel soon contracts to a small stream with muddy water evidently draining from a valley with soft clayey deposits. This stream was not explored, but with small light canoes it might be ascended for some distance. It is called White-mud River (Wab-an-un-ki-Sepi).

#### Main river above Bluffy Lake.

The main stream for two or three miles above, flows in a wide channel through a low country, with the borders of the stream rush-covered, and in many places wild rice is found growing thickly. A band of mica-schist crosses a bend in the river, causing falls of three or four feet at two places, between which is a small lake or pond. To the east,

and connected by a narrow opening, lies a lake of over a mile in length, at the eastern end of which the Sand-bar River enters. This is said to drain several lakes lying further to the east.

To the south are some sharp hills that have the appearance of being of the same nature as the ridge of gravel and sand, seen at the north end of Shallow Lake.

From the pond above mentioned to the forks, a distance of five miles, there are four small falls, one with a fall of three feet; two about half way, aggregating five feet; and one of four feet, half a mile below the forks.

The general direction from Lac Seul is north-east, but the main branch from near Cat Lake River seems to be coming more directly from the east, while the smaller branch is from the west-north-west, the two branches meeting in the same valley and the united stream leaving at right-angles to the branches. The western stream flows in a deep channel, bordered by a tall forest of poplar and birch. At two miles west, a small lake is entered which has been gradually filling with silt and sand brought down by the stream from above. The inlet is on the western side, where a delta has been formed, stretching nearly across the lake. This is at present only a low grass and rush-covered flat, but shows clearly the effect of a settling basin for a small stream carrying fine sediment. Western branch.

A series of falls or rapids amounting to twenty feet, just above the lake, is avoided by making a portage from the extreme northern end 1300 yards, to the river above. The upper part of the stream becomes very crooked, winding back and forth in the bottom of a valley between ridges of dark green schists running west of south. The immediate banks are low and generally composed of fine silt, the slope back being gradual, through swampy moss-covered ground to a terrace of sandy material. Occasionally the stream cuts into the sides of the valley and shows stratified sands and silt.

The portage to Fly Lake, leaves this stream at a bend just below a Fly Lake. heavy rapid where the river turns more to the east. An estimate by barometer readings, gives the elevation of Fly Lake as fifty feet above the stream at the foot of the portage, and the distance by pacing is half a mile.

#### *Berens River Basin.*

The lower part of this stream was explored and surveyed by Mr. Survey by Mr. A. P. Low, of this Department, during the summer of 1886, while pas-  
Low.

sing through to Hudson Bay via the Severn River.\* His route to the head-waters of the Severn, led by Berens River to Fishing Lake, just above the Grand Rapids of Berens River. Thence he turned up a small branch coming from the northward, and by a number of portages reached the Severn River. Mention is made in his report of a large branch called the Mattawa, which rises near Cat Lake, falling in at the south side of Fishing Lake. From the fact that this branch apparently occupies the central position and is longer than any of the streams flowing in the basin drained by Berens River, it would seem that it should be considered the main part of the river. The lower portion is described as being a succession of chutes or short falls, with quiet water-stretches resembling the locks and reaches of a canal.

Lakes on  
Berens River.

The larger lakes found on the course of the river to the eastern head-waters are, in ascending order, as follows: Family Lake, on which the main Hudson's Bay Company's trading post for the inland district is established; Fishing Lake, just above, the waters of which fall to Family Lake by a heavy rapid called Grand Rapids, giving the name to the Hudson's Bay post. Above this, on the Mattawa branch, the first large lake is Eagle Lake. This is followed by Rocky Island Lake, Sandy Narrows Lake, on which a Hudson's Bay post was at one time established, and Moose Lake. These are generally connected by short river stretches, forming a chain lying in an average east-and-west direction. A long reach of river from the south, in which there are several rapids, drains Pekan-gi-kum (dirty water narrows) Lake. Above this are Goose Lake, Fairy Lake and Upper Goose Lake.

Survey by Mr.  
Cochrane.

The detailed description of part of the river above Family Lake, to Moose Lake is taken from unpublished information, the notes of the late Mr. A. S. Cochrane, who explored it in 1882. A rough sketch of the part above Moose Lake to Pekan-gi-kum was made by A. W. Ponton, D.L.S., in 1888, while *en route* to the latter lake to locate and survey an Indian reserve.

Family Lake  
to Eagle Lake.

The canoe route from Family Lake eastward to Eagle Lake, leaves the main river and follows a string of small lakes in a more direct line, avoiding the long portage at the Grand Rapids, and also the difficult navigation of the short stretch of river between Eagle Lake and Fishing Lake. By following an eastward extension of Family Lake and ascending a small stream, with three short portages, a long, narrow lake is reached, which connects by a swampy channel with Eagle Lake. The estimated difference in height between these two large

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\*Annual Report, Geol. Sur. Can., vol. II. (N.S.), 1886, part F.

lakes, Eagle Lake and Family Lake, is about fifty feet, and in time of high water it is reported that an overflow from Eagle Lake takes place down this valley. Eagle Lake is very irregular in the outline sketched by Mr. Cochrane. The northern part, near the outlet, is full of islands, while the many channels around islands, render it difficult to mark the eastern end.

The first rapid above, is on one, of a possible two channels, and has a fall of three feet. Further up, the river expands into another lake, likewise full of islands. Mr. Ponton calls this Rocky Islands Lake (Ka-sah-pah-wa-ka-muck Sakahegan). Isolated knolls situated near the shores are estimated to attain heights, of one hundred and twenty-five and one hundred and fifty feet above the lake. This lake gradually contracts to river dimensions to the east, and a series of rapids occur at which four portages are made, rising twenty-six feet to another expansion, which forms perhaps the largest or longest lake of the series—Sandy Narrows Lake. This, like Rocky Island Lake, is of very irregular shape. The route followed, was mainly near the north shore, which maintains a fairly continuous line to the east-north-east. Bays running to the south-east, or large expansions partly inclosed by islands, are indicated on the sketch. On a point near the Sandy Narrows was some time ago located a trading post of the Hudson's Bay Company. This may have been the "Albany House" marked on previous maps near this latitude. The extreme length given by Mr. Cochrane for this lake is thirty miles, in an east-north-east direction. The shores are flanked by hills averaging one hundred and fifty feet high.

Eagle Lake to  
Sandy Nar-  
rows Lake.

The river enters at the north-east corner and comes from Moose Lake, eight miles above, by the course of the river. In this distance the falls aggregate forty feet, with portages at four points. The northern branch above this, Crooked-mouth River, forms a route to Trout and Deer Lakes, to the north, and enters Moose Lake at the north-west corner. The portage at the head of this branch, over the height-of-land, is in direct distance five miles north of Moose Lake.

Crooked-  
mouth River

The main stream appears to enter at the south and comes from Pekangikum Lake, at a distance of thirty miles. In this distance the river widens out in several narrow lake-like expansions, dotted with islands. Nearing Moose Lake, it makes a long detour to the westward and back again, finally falling into a narrow arm at the south end, at the Eye Rapids. There are four other rapids and portages on this stretch of river. The portages are mostly under a quarter of a mile, except one which is three-quarters of a mile long.



Mr. Coch-  
rane's notes.

Mr. Cochrane passed down by the northern branch through Moose Lake, Sandy Lake and Eagle Lake to the Grand Rapids. A few extracts from his notes serve to show the appearance of the country, on this route, at that time.

Height of  
land.

"The height-of-land portage (from the basin of Severn River) crosses a very low hill (about forty feet), at the south end, but it is for the greater distance over low marsh ground with some muskeg; and until Moose Lake was reached the Crooked-mouth River continued to pass through low swampy ground. The only change in the country noted to Sandy Narrows Lake is in its timber, which is mostly better, owing, no doubt, to some good soil being near the river. Indeed, in two or three places good clayey soil was seen, but only in small patches.

Moose Lake.

"The shores of Moose Lake have all been burned over long ago, and are now characterized by brulé and second-growth. On other parts of this river to Sandy Lake some good tamarack has been seen, occasionally twelve to fourteen inches in diameter. Spruce is about the same size, while Banksian pine is not larger than ten inches.

Sandy and  
Rocky Island  
Lakes.

"Sandy Lake, through which we passed (and at the foot of which I obtained a very satisfactory observation for latitude, 52° 04' 54") is generally speaking surrounded by rocky hills averaging 100 feet, now fairly covered with the usual second-growth, amongst which is a good deal of green timber. The shores of this lake, as also those of the next below (Rocky Island Lake) are mostly rocky, though an occasional short sandy tract is to be seen between the rocky points. About three-quarters of the way down the lake, is what is called the Sandy Narrows, at which the lake becomes constricted and is bordered on both sides by low sandy banks. The bottom, except for a narrow channel at one side, is also sand, and the water too shallow for canoes.

"The river connecting these lakes is a tolerably large one. The portages are made mostly at falls and chutes with steep tracks. They are, however, all short ones and in good order. Soil of good quality was seen at only one point, viz., the second portage below Sandy Lake, where it is a stiff grayish-clay with a slight covering of dark sand. It does not, however, appear to extend beyond the point across which the portage has been made."

Notes on  
rocks.

The notes relative to the rocks of this part of the river and lakes traversed, are given below :—

Moose Lake, south side : Coarse, dark-gray, massive granite ; glacial striae, S. 85° W.

Eastern end of Sandy Lake: Dark-gray and grayish-brown gneiss; dip, N.  $< 30^{\circ}$ ; striæ, S.  $75^{\circ}$  W.

Two miles from east end of above lake: Dark-gray gneiss containing large quantities of hornblende and some iron; highly polished surface.

Sandy Lake two miles east of Sandy Narrows: Very coarse dark and light brownish-gray gneiss, containing a few small transparent amber-coloured grains of quartz and much hornblende; dip, N.E. at a high angle; striæ, S.  $75^{\circ}$  W.

Western side of Eagle Lake: Coarse dark and light gray micaceous gneiss; dip, N.  $< 20^{\circ}$ .

Eastern end Family Lake: Dark gray gneiss; dip, E.  $25^{\circ}$  N.

Dark gray gneiss seems to be the prevailing rock of all this region.

The land reserved for the Indians on the upper part of this branch of Berens River, is a small tract situated on the north side of a long arm or narrows, running to the eastward, from a lake to which the name Pekangikum is given. The river enters at the eastern end of this area, coming from Sturgeon Lake by a short stretch of river half a mile in length, in which there are two rapids. The Indian reserve appears fairly well timbered—principally with Banksian pine of slender growth and some spruce. The Indians have been able, in building their houses to obtain timber of suitable size for the walls and rafters, and spruce of a diameter of fourteen inches is fairly plentiful. The shores of the lake are rocky, but strips of country inland appear, on which there is probably a fair quality of soil, though the surface is generally sandy. On one of the islands in the larger part of the lake, soil of good quality (clay) was seen, on which the Indians were growing potatoes. No doubt there is better land for this purpose on the reserve they have selected, but as they make their summer camp on a small island near the deeper part of the lake for the purpose of fishing—by which they mainly subsist—they naturally utilize the nearest land for their summer gardens.

Indian reserve.

The Dirty-water Narrows, which runs eastward from the reserve, is about eight miles in length, and averages very little over a quarter of a mile in width. The shores are mostly rocky, but not very high and generally moss-covered, with a thick growth of small spruce and Banksian pine. At the end of the bay or arm, an abrupt turn south is made to the first rapid above the lake. This is in a narrow gorge, but at ordinary water there is very little fall (three feet, 8th July, 1893), and the portage is ten yards across a low rocky barrier, stretching into the channel. In high water, this rock would be



covered and the river must fill the whole width of the gorge. Half a mile south of this, at the south-east corner of a small basin, there is a fall of eleven feet over a wide ledge at the western end of Sturgeon Lake. The high-water mark in the basin between the falls, was six feet above the actual level, an effect due to the contracted channel at the lower fall, compared with the wider one of the upper.

Sturgeon  
Lake.

The lake above this is a long narrow one, with a great number of islands scattered along its length, which is nearly seven miles. The width does not average over a mile. The direction of the length of the lake, is, for the first half east by south, then north-east. The shores are mostly high rocky hills, in many places burnt over, and the timber is small. Near the north-eastern end, the shores along the southern side become low and better wooded. The river enters on the west side, one mile from the extreme end of the lake, flowing through low land, evidently a delta deposit. It is now well timbered with spruce, poplar and birch, of fair size.

Berens River  
above Stur-  
geon Lake.

The river makes three long bends before any swift current is encountered, and at about seven miles the first rapid is met. This is situated about three miles in a direct line north-east from the lake, and is called Mick-kai-ame Pow-estick. There is here a fall of thirty feet over gneiss, very much broken by veins and dykes of red granite. The portage is on the north side, 350 yards in length, over a steep hill of sand and boulders. This appears to be a ridge of drift material which crosses the river at this point, and, by Indian report, continues to the southward to the Trout Lake ridge.

Timber.

Above this the river turns more to the east, and several small rapids occur, up which the canoes are handed, till at three miles the stream divides, the northern branch, Throat River, being the one followed on the route to Cat Lake, the southern, the route toward Woman Lake. These two branches are of much the same size. Half a mile up the southern branch is the Otter Fall, of fifteen feet, where there is a portage of two hundred and thirty yards. Above this the river, to the next fall, comes from the south; the banks are mostly low and rocky and the timber is a mixture of spruce, tamarack, poplar and birch. After following a crooked course of two miles of this nature, there is another fall of eight feet, Pin-un-ge Pow-estick, or Child Falls, with a portage of seventy yards on the south side, through small spruce.

From this fall to the mouth of Windfall Creek, eight miles in direct distance to the east, the river gradually rises by small rapids, there being three portages, the first at two miles across a sharp bend

through woods of Banksian pine to avoid a rough rapid with fall of five feet, the second at a long rapid, and the third a short distance above, where an island on which is the portage, divides the channel. The banks are mostly low and swampy to past Windfall Creek, and with sluggish current to Hair Lake. Tamarack and spruce are the principal trees, small in size, growing in low, swampy ground. Occasionally a small knoll is seen, with poplar and willow scrub. The channel from the mouth of Windfall Creek to Hair Lake is nearly straight, running about east and west, the distance being about eight miles.

Owl Creek, a small stream, enters a mile below Hair Lake, coming from the south-east. Hair Lake is about one mile and a half in length, lying north-and-south. The river enters at the south-east corner and leaves by the south-west. The distance across the southern end is about a mile, and the shore, there low, slopes gradually to the lake, of which the bed appears to be shallow, as most of the southern part of the lake through which we passed, is dotted here and there with slender rushes, possibly suggesting the name to the natives. In the northern portion there is deeper water, and whitefish are said to have been caught there.

A distance of only a mile separates this from Goose Lake, and at half the distance, is the White Dog Fall, a descent of eighteen feet.

Above Sturgeon Lake, on this branch, there are but three lakes of any size, namely, Goose Lake, Fairy Lake, and Upper Goose Lake. These are all situated near together, separated by short river-stretches. The first is four miles in length, by one mile wide, lying east-south-east and west-north-west. The river enters at the east end and leaves at the west. The Hudson's Bay Company had an outpost established at the eastern end in former years, but it is long since abandoned. A short length of river connects with Fairy Lake to the south-east. At a mile up this is Woman Fall, the highest on this part of the river. Here there is a drop of forty-five feet, in a narrow gorge, over ledges of gneiss forming a series of steps. The portage is on the north side, of one hundred and twenty yards, through poplar and spruce woods. A little further on, another fall occurs, of twenty feet, with a portage of two hundred yards. This ends at a small lake, from which a wide channel to the south connects with the north end of Fairy Lake, which is thus at least sixty-five feet above Goose Lake. We entered at the north, and travelled a mile and a half along the eastern shore to the mouth of the incoming river. The main body of the lake stretches away to the south, as a narrow area of less than a mile in width and perhaps five miles total length. The south-eastern shores

Upper Goose  
Lake.

are low, the higher land bordering the western side. The third lake of this series is called Upper Goose Lake or, more literally, "the lake where they kill geese," and is three miles east of Fairy Lake. The river connecting them is broad, deep and sluggish. The lake is less than five miles long and is slightly wider than the last. The longer diameter lies east-and-west, the river entering at the western extremity.

Head-waters  
of Berens  
River.

Above this are two small lakes through which the river passes, and between them is a fall of four feet at the "Eagle Rapid." A mile above the upper one, the river divides, the eastern branch being the Whitefish River while the southern one is the main stream. This then turns south and passes through a low swampy tract for three miles, when, nearing some rugged hills, it becomes less sluggish and small rapids are met with. The main part of the stream then turns to the west, coming from a series of lakes in the hilly region. A small branch falls by a series of shallow rapids to this stream, which branch was followed in order to reach the height-of-land to the east, making two portages of one hundred and eighty yards each, rising ten feet to a swampy tract in which the stream is deep and sluggish but very crooked. Portages are made at several shallow rapids, to the height-of-land. The direction of this latter part is to the south-south-east and a distance of twelve miles, the estimated fall in which is over eighty-five feet.

Height-of-  
land portage.

White River.

*Southern Branch of Berens River or White River.*—The largest of the tributaries of Berens River, coming from the south, is the White River which enters at Pekangikum, at the extreme southern end of the lake. This stream comes from a point directly south at a distance of twenty-five miles, and passes through two or three crooked lakes, falling in that distance over two hundred feet. This estimated fall is merely the sum of the falls on the river with an estimate for current. The greatest is that at the first long portage where it is sixty feet, the rest being made up of a number of smaller rapids and chutes. There are twelve portages to reach the height-of-land, mostly short. The last is the longest, being over a mile in length. In following this small stream upwards, it gradually contracts in size, until near the head-waters it is so small that the whole distance between the last two lakes has to be portaged. This portage, over a mile in length, starts in a tamarack and spruce muskeg, moss-covered, but eventually reaches higher ground with mixed timber, mainly hills of sandy, boulder-strewn material. The prevailing tree is Banksian pine, and towards the eastern end of the trail this has been thinned out by fires and wind storms, leaving a grove (at the far end) averaging ten to twelve inches in diameter.

Just below the lake-stretches, near the height-of-land, the river cuts through sand hills, forming a deep valley, and at one of the portages clay was noticed resting directly on the rock, the sand evidently lying above it.

*Estimated Heights of Lakes.*—A series of estimations of the falls and rapids in the river was carried through from Lac Seul to Pekan-gi-kum, on Berens River via White River, and thence up the eastern branch to the head-waters of Cat Lake River, and south by Trout Lake River to Lac Seul. Lakes of Berens River basin.

The results are given for those lakes in the area drained by Berens River, and are the estimated heights above sea-level in feet, assuming Lac Seul as being 1140 feet.

	Feet.
Lake at height-of-land, White River.....	1250
Lake at latitude 51° 25', on White River .....	1225
Lake at latitude 51° 33' " .....	1175
Below Long Portage, latitude 51° 37', White River.....	1100
White Lake, White River .....	1040
Pekan-gi-kum Lake, Berens River.....	1037
Sturgeon Lake, " .....	1051
Hair Lake, " .....	1178
Goose Lake, " .....	1196
Fairy Lake, " .....	1261
Upper Goose Lake, " .....	1262
Lake at height-of-land to Cat Lake River.....	1350

#### GEOLOGICAL FEATURES.

In the country under consideration, the rocks exposed are all Archæan, consisting of gneisses and associated granites, classed generally as Laurentian, and folded schists and greenstones of the Huronian. In many respects these rocks are counterparts of those found in the districts further south on the Lake of the Woods and Rainy Lake. The northern boundary of the large Huronian (Keewatin) areas already explored there, is roughly on a line from Rat Portage to the foot of Minnietakie Lake. North of this a] band of gneisses occupying the shores of Lac Seul and the English River, is succeeded by a similar series to that on the south. The irregular form assumed by these Huronian areas in both districts, is no doubt the result of simultaneous crustal movements. The Laurentian gneisses are the prevailing rocks of the whole region, and their association here with the folded schists, greenstones and rocks of apparent sedimentary origin, is of special interest in view of the auriferous nature of many Archæan rocks only found.

of the quartz-veins found cutting similar rocks in the vicinity of Rainy Lake and Lake of the Woods.

Previous geological observations.

*Former Explorations.*—A part of the area has been briefly referred to in former reports of this Survey :—

Notes by Dr. Selwyn.

Dr. Selwyn,\* in 1872, in describing a journey from Lake Superior to Lake Winnipeg, passing by English River through Lac Seul, calls attention more particularly to the soil and drift deposits, and instances the sands and clays in the valley of the English River as being of greater extent, than further south and west on the Winnipeg River, except perhaps on the lower part near Lake Winnipeg. In speaking in a general way of this district he says† :—“There are no prominent hills or even ridges ; the highest elevations do not probably exceed four or five hundred feet above the intervening waters ; and I think it is no exaggeration to say that the latter occupy fully one half of the whole surface area of the region. The surface is gently broken and undulating, and often rocky, but occasionally both lakes and rivers, are bordered either by extensive swampy flats or by banks of stratified sand, silt and clay, which often rise terrace-like at a short distance from the water's edge. The point on which the Lonely Lake Post stands is formed of these deposits, and to the westward of the post, along the north shore, they are exposed in cliff sections for several miles. At the junction of the Mattawa [Shallow Lake River] and English Rivers, where a small Indian village and trading post is situated, presided over by Chief Pierre, there are similar banks of sand and sandy clay, resting on the ordinary gray Laurentian gneiss, which is exposed along the water's edge. The banks here rise steeply to about thirty feet above the water, and for some distance inland the country seems to be tolerably level, and the soil on this part of the river appears to be generally of fair quality.”

By Dr. Bell.

Dr. Bell,‡ who accompanied Dr. Selwyn on this expedition, reports more fully on the rocks met with. Of those seen on Lac Seul or Lonely Lake he says § :—

“The rocks observed around the shores of the western section of this lake consist entirely of Laurentian gneiss, all having a west-south-westerly strike. We noted many varieties among these rocks, but none of them are remarkable or require special description. \* \* \* About the outlet the gneiss is very micaceous, and is cut by numerous granite veins, mostly running with the strike which is here nearly due west. The granite, as in many other places, may here indicate the

\*Report of Progress Geol. Surv. Can., for 1872-73, pp. 8-18.

†Ibid., 1872-73, pp. 87-111.

‡Ibid., p. 16.

§Ibid., p. 103.

proximity of a band of Huronian schists. The Indians at the mouth of the Mattawa [or Shallow Lake] River showed us specimens of a soft, gray, uncrystalline slate, which they carve into pipes, and informed us that they obtained it from the solid rock at Onimini Saganigan or Red Paint Lake, which, from their description, would appear to lie about five miles north of the junction of the two rivers. These facts appear to show the existence of another band of Huronian rocks, which, judging from the strike, would be identical with the one observed before the junction of the English with the Mattawa River."

In 1883 Dr. Bell again visited this region and made a survey of the Mattawa and Red Lake Rivers to Red Lake. In the Summary Report for that year, he gives a short account of his route to Red Lake. The notes bearing on the geology of this area are contained in the following paragraph.\*

"A very careful track-survey was next made of Red Lake itself, as its shores proved to be of great geological interest. The whole lake (which is of considerable size) lies within a wide belt of Huronian rocks, among which several of the rarer varieties are well developed, and they were found to contain some interesting minerals. The narrow belt of Huronian rocks, which, in 1872, we conjectured would pass a few miles to the northward of the junction of the English and Mattawa rivers, was actually found in the position and strike it was then supposed to have."

### *The Laurentian.*

Gneisses referred to the Laurentian were seen on the White and Berens rivers, on Lac Seul and on the English and Mattawa rivers. At the head-waters of Berens River, large masses of unfoliated granite seem to break into the gneisses and in other parts similar granite cuts the darker rocks of the Huronian. In the Lac Seul area the strike is very uniform, generally trending to the west, but this extends northward only a few miles from English River. On the river from Long-legged Lake the western trend is maintained to near the outlet, and on Shallow Lake, to a point about one-third the distance up the lake. Up the Wénassaga River this uniformity of strike does not seem to continue far from Lac Seul, as on the portage below Bluffy Lake the rocks become very much crumpled up. This crumpling is seen in the rocks on the east side of Shallow

Laurentian  
Gneisses.

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\*Report of Progress, Geol. Surv. Can., 1882-83-84, p. 5.



Lake and shows a line of weakness running from south of Bluffy Lake to Shallow Lake and thence to the outlet of Long-legged Lake.

Rocks of Lac Seul.

*Rocks of Lac Seul or Lonely Lake.*—The beds from the outlet eastward are generally gneisses and mica-schists, with interbedded light-coloured granites all trending about east and west. Near Big Island they run west-south-west and east-north-east, and at the narrows at the western end of the island, many red granite veins break into the beds, altering them to a slightly lighter gray. On the south side of the island is a long exposure of a reddish granite which breaks easily, like a sandstone. This is, however, found to be cut by the red veins of granite which also cut the gneiss. At the Shanty Narrows, the rock is a light granite or slightly foliated gneiss interbedded with garnetiferous mica-schists, and the strike bends from west-south-west to south-west, but quickly turns again to an east-and-west direction. At the Manitou Narrows the rock is a whitish granite, with a few streaks of dark foliated rock made up of fragments flattened out and somewhat rounded at the ends. Near the long point west of Stony Point, a small island is found to be composed of light-coloured crystalline granite, with slight signs of foliation.

Brecciated contact.

Three miles east of Stony Point, a small island, connected by a gravel bar to the mainland, is composed of dark-green bedded rocks. They are standing on edge, striking about east-north-east and are found on several of the islands lying on that line. The main shore to the north is of granite, very like that on Big Island, and it here contains many fragments of the green rocks, forming a brecciated contact. A wide dyke of graphitic granite cuts through the beds on the point, but whether it connects with the granite of the mainland or cuts it as well, was not ascertained.

English River below the lake.

On English River, the beds at the outlet are very much wrinkled, and at the first rapid, bands of dark mica-schist and dark-gray gneiss, interleaved with coarse whitish granite, are seen. Below the second rapid, on the point opposite the portage, the beds are very much broken and twisted, so that pieces of the darker bands are broken off and carried forward in the mass. A coarse gray granite showing some foliation, occurs at Mattawa, and is followed two or three miles up the Mattawa River by dark hornblende-schists with a general east-and-west strike. At the elbow, about half way to Shallow Lake, red granite dykes are seen cutting the schists. The south-western arm of Shallow Lake is principally surrounded by hills of gneiss and granite of the Lac Seul type, ending at a point three miles and a half north of the outlet, where the gray gneiss is found to contain rounded masses of

Mattawa to Shallow Lake.

darker inclusions. Across the lake, half a mile north, dark fine grained mica-schists, very much crumpled, are cut by salmon-coloured granite. These may possibly be altered beds belonging to the same series as the rocks of the north-western part of the lake, and this point would then be about the northern limit of the Lac Seul Laurentian band.

Below Mattawa, the river widens to a small lake that discharges in a series of rapids, along the banks of which light granite-gneiss, running west-south-west is found, and occupies the sides of the stream to the next fall, the river running in a trough parallel to the strike. Bands of mica-schist become frequent, and on breaking through these to the south the river falls into Barnston Lake. Gneisses which call for no special remark are seen on the banks of the lakes, forming expansions on this part of English River.

The stream from Long-legged Lake which falls into Wilcox Lake was explored and mapped. The rocks are mostly a repetition of those on the English River and maintain a nearly uniform strike to the westward, varying locally, the altitude being generally vertical, but occasionally a dip of 45° south was found as the extreme variation. Fewer exposures are seen on these small rivers, owing to the current not being able to wear away the surface covering.

The northward continuation of the Laurentian of Lac Seul on the Wenassaga River, is found to show some changes in character. On Lac Seul, a series of granites is found interbedded with mica-schists. On the upper part of Wenastegao Lake, and on the river above to near Bluffy Lake, little change except that of the strike was noticed; but at the long portage, as noted before, the beds are very much crumpled and folded, over a short distance, and on Bluffy Lake return to a uniform south-west and north-east strike. Following these beds north-eastward, they are found to curve slightly more to the east, and at the east end of the lake are running about west-south-west and east-north-east. The gneisses are generally reddish to gray, and specimens taken from a small island near the eastern end, show layers composed of nearly pure quartz. On a smooth surface, this rock is seen to be made up of a series of lenticular grains which are the result of subsequent squeezing and perhaps shearing, while in a plastic condition. The gneisses seem to have the same structure.

At the entrance to the river above this lake, is an exposure of dark gray felspar-mica gneiss. The grains of felspar are very even in size, of a light colour and surrounded by flakes of black mica. Streaks of granular quartz run parallel to the foliation. The next exposures are near the outlet of Sand-bar Lake, where a ridge of dark gray gneissic



schist crosses the valley. Along the north shore the rocks are mostly a dark mica-schist, cut through by dykes of a light, very coarsely crystalline granite. On the river above, the schists form another dam and fall, where light gray gneiss is followed by a wide band of fine-grained schistose gneiss. The rocks exposed on the river above are probably of Huronian age, but the contact between the two series must be concealed by the surface covering, as the river for a short distance runs through a low swampy flat where no rock is seen.

Rocks of Lac  
Seul and  
Long-legged  
Lakes com-  
pared.

*Rocks of Long-legged Lake.*—Just at the entrance to the lowest lake of the series, a band of dark fine-grained hornblende-schist is found at the rapid. The strike of the gneisses about a mile below this is almost directly west, but half way between, a dark fine-grained gneiss strikes to the west-south-west, and at the upper rapid, where the fine-grained hornblende-schists are seen, the strike has turned to the south-west, which direction of strike is maintained to the west end of these lakes. It is thus shown by the line of weakness traced to the eastward, by crumpling and a change of strike, that a distinction is here to be drawn between the Lac Seul type of Laurentian, as found in the river, and the gneisses of the Long-legged lakes, which all trend to the south-west, or nearly at an angle of  $45^\circ$  to the former rocks.

Details on  
Long-legged  
Lakes.

On the lower lake are chiefly granites and gneisses. On the south-east shore are gneisses with a light porphyritic granite, and at the south end of the bay, the granite is found to hold dark oval patches or inclusions, while on the point south of the opening to the second lake, are masses of dark hornblende-schist which look like outlying fragments of Huronian, included in the foliated granite. These rocks are immediately followed to the west by dark gneiss. Passing through a narrows, the second lake is entered, and here the rocks are generally gray and red granite-gneiss; the exception being a small island of light-green fine-grained rock resembling that of the Huronian, but its relation to the surrounding gneiss could not be seen. On the west shore, a band of dark schist touches the shore and occupies a large island, but is followed by light-coloured gneiss, and this again by reddish gneiss and granite. On the narrows just at the entrance to the last lake, a band of dark-green coarsely crystalline rock was found, similar to some of those seen on the Red Lake River, and there supposed to be an eruptive associated with the Huronian series. Near the west end of this bay, another band of dark rocks was seen, the intervening beds being generally light-coloured gneisses.

Dark bands.

This recurrence of the dark bands at intervals of two or three miles suggests the possibility of their being the lower edges of a series of

folds of the Huronian. They seem to be accompanied in nearly every case by a few broken patches of dark inclusions in the adjacent beds, and in the case of the first one, on the west side of the lower lake, the continuation of the band on the south shore was indicated merely by such fragments in the gneissic rock.

On the hills to the south-west the beds are horizontal, but soon take Dips. a dip to the south-east; a mile east the dip is south-east  $< 20^\circ$ , at the second lake it is south-east  $< 30^\circ$  to  $45^\circ$ , and at the outlet the beds are almost vertical.

The absence of anything in the nature of mica-schist is a character of the gneisses of Long-legged Lake and also of those to the north-east on Bug Lake and Gull Lake, and the grouping of these rocks together, as being of common origin, is suggested from their being nearly on the same line of strike and separated by a very short interval in distance.

To the north-east of this group of lakes, on Gull Lake and the small lake lying to the east, is found an area in which light, slightly foliated granite is the prevailing rock. This, at its contact with the Huronian of the west shore, has sent long, finger-like masses between the beds, separating them. Fragments are found in the granite at some distance from the contact, and a band lying to the south of the Huronian, seems to be made up entirely of these fragments cemented together by the granite. At a greater distance to the south, these fragmentary rocks gradually assume the aspect of altered beds cut into by the granite in veins and dykes. Contact with Huronian.

On the Upper Medicine Stone Lake, a mass of granite forming a triangle between the two lakes, deflects these altered beds to the south-west, and it is possible that the gneisses of the lakes to the south of this may be a continuation of highly altered beds similar to those above, but in which the gneisses and foliated granites are also cut by a red granite. The larger dykes of granite cutting these gneisses at the western end of Long-legged Lake are of a light red, and suggest a possible connection with the large granite mass of the west shore of Medicine Stone Lake, while the granites and foliated granites found cutting, and interbedded with, the gneisses and dark-green schists of the middle and eastern lakes, are probably connected with the granite area east of Gull Lake. Upper Medicine Stone Lake.

*Rocks of Trout Lake.*—The Trout Lake area is probably all Laurentian, but the existence of Huronian in the immediate vicinity is to be conjectured from dark metamorphosed rocks in fragments and small masses held in the gneisses at several localities. Laurentian of Trout Lake.

At the outlet of Little Trout Lake, a small band of dark rocks very much seamed by red granite veins, is accompanied by granites and gneisses. This, by reference to the map, will be found to be a probable continuation of the south-west extreme of the Woman Lake beds. The south shore, on the continuation of this strike was not visited, but it is quite probable that traces of this band might be found connecting this area with the Red Lake series.

Another locality presenting somewhat similar features, is at the western extreme of Trout Lake, where the gneiss contains spotted bands looking like conglomerate pebbles of dark rock with a matrix of lighter colour.

Strike of  
gneisses on  
Trout Lake.

On the narrow water connecting Little Trout Lake with the larger one, are beds of a gray gneiss, the foliation running about south-west. The same strike was found to be common to the gneisses of the south-eastern part of the lake. Few exposures are seen on the south-west side and they are of an unfoliated granite, but on the extreme western end they become more gneissic, running about west.

On one of the points at the entrance to the western bay occurs the spotted band mentioned above. The whole point is foliated in a direction about north-west and south-east, the plane of foliation dipping south-west  $< 60^\circ$ . Half a mile north-west the point is a mass of reddish gneiss, the foliation is distinct but the mass is lighter coloured than the last and is nearer to a granite. Across the bay to the north, on the extreme north-western shore, the rock is a dark gray gneiss with foliation running to the north-east, cut by many seams of red granite. Eastward on the north shore, the gneisses are light gray and red, and of much the same character, preserving a general north-east and south-west strike.

Laurentian of  
Whitefish  
Spawning  
River

North of Red Lake, the Laurentian rocks are found to touch the northern shore of Pipestone Bay, and the hills north of a long arm on the north side look like granite, while on the lake, veins of granite cut the schists. The contact is evidently near at hand, and a short distance up the Whitefish Spawning River is an exposure of somewhat greenish granite, which seems to include small masses and crystals of a dark green hornblende or pyroxene giving it a darkened colouring.

Farther north, the granites are lighter in colour and show slight foliation. On the small lake above Little Vermilion Lake, the rock is a light-red fine-grained granite, and little variation, except in respect to traces of foliation, is observed on the upper waters of this stream. Red granite is observed on the height-of-land portage, and on the lakes forming the head-waters of the streams flowing north and south.

The granite at the head of Pipestone Bay, near the contact, shows some traces of green coloration from the Huronian rocks, more especially along cleavage planes. The foliation is slight and the colour is reddish, mottled with gray, fine, granular material which increases near the contact. The broken inclusions of Huronian schists, so common at other contacts, were not noticed along the north side.

*Rocks of Berens River.*—The geological character of the country Laurentian of Berens River. lying north of the height-of-land to Berens River, is given altogether by exposures of gneisses and granites, with intrusive dykes, and the small areas of reddish granite mentioned as being near the height-of-land and in the vicinity of the Mic-kai-ame Fall. A strongly banded gneiss is found on the lower part of White River and eastward beyond Sturgeon Lake, when granite of a light reddish colour, possibly intrusive, is followed by gneisses cut by many dykes of granite. The head of the eastern branch explored above Goose Lake, is in a small lake of which the shores are mostly composed of red granite. This extends southward to near Sha-boom-ene Lake, where gneiss is again found in contact with Huronian schists, the contact being of a broken nature, generally following the strike of the schists to the south-west. Angular patches of dark rocks are found, included in the gneisses as at other localities previously described.

### *Granite Areas of the South Shore of Red Lake.*

The following notes refer to the granites of the south shore of Red Lake :—

The first of these, near the outlet of Red Lake, is altogether surrounded by the Huronian of the Red Lake area. The contact as far as it could be traced among the islands, is evidently that of an intrusive mass breaking up through a bedded series. Fragments of the beds are included in the granite and alteration of both fragments and adjoining beds is also a feature. Granites surrounded by Huronian rocks.

The south shore of the western half of the lake, is also found to be of red granite of about the same general aspect, being light in colour and rather fine grained. This appears to penetrate into fissures and cracks in its contact with the Huronian. The line of contact which crosses the arm of the lake, touching the north shore and cutting off points, is found to take a somewhat sinuous course. The break does not always follow the bedding of the schists, but in many places is seen to cut across them at various low angles.

This mass is probably surrounded by the schists and greenstones of the Huronian, making a long oval area lying east-and-west, as at the

western end the schists are striking to the south of the granite area, and again on the south side, green fine-grained beds readily correlated with the clastic rocks of Red Lake, are met just north of Medicine Stone Lake. This probably forms a narrow belt, which, passing north of Bug Lake, joins the main mass on the west side of Keg Lake.

Granite probably eruptive.

This mass, with a skirting of Huronian, resembles in shape those areas already mapped in detail near Rainy Lake, but the broken nature of the contact on the north side, would suggest a rather violent separation of the narrow band from the main series and the interposition of an eruptive mass of granite.

Highly altered schists.

Outlying bands of gneiss south of the narrow band of Huronian mentioned above, are possibly highly altered schists. These are seen on the north shore of Medicine Stone Lake, the south shore of Upper Medicine Stone Lake, and on the stream south-east of a small lake lying to the west. Other masses of the red granite are found between the two Medicine Stone lakes and on the small lake to the west. The relation of these isolated areas of granite to the Laurentian gneisses of the region to the south-east has not been clearly determined.

### *Huronian.*

Comparison with Lake of the Woods and Rainy Lake.

The series of schists, limestones and bedded materials originally of volcanic origin, here mapped as Huronian, in many respects lithologically resemble the larger areas to the south which have been designated by the local name Keewatin; but the presence of dark blue limestone and of conglomerates with jasper pebbles, both very similar to those of the typical Huronian area north of Lake Huron, renders the propriety of extending the name Keewatin to these rocks doubtful. The Couchiching, supposed by Dr. Lawson to underlie the Keewatin in the Rainy Lake country, is possibly represented here by the small area west of Shallow Lake, but strata which most resemble the typical rocks of this series are found on Gull Rock Lake, and are seen to be only highly altered beds in contact with the Laurentian, which when followed along the strike, away from the contact, change very materially and resume the general aspect of the rest of the Huronian.

The contact with the gneissic rocks and granites of the region was found to be generally of a brecciated character, the gneisses and granites while in a plastic condition surrounding and inclosing the Huronian schists.\*

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\* With further reference to the nature of the contacts or lines of junction here described, and the inclusion of Huronian fragments in the gneissic rocks, see Lawson's reports on the Lake of the Woods and Rainy Lake. Annual Reports, Geol. Surv. Can. (N.S.), vol. I., p. 62cc and vol. II., p. 23f.

*Rocks of the Shallow Lake Area.*—As before noted in the Summary Report for 1883, a small patch of Huronian rocks was seen on this lake by Dr. Bell. The junction of the Laurentian gneisses with these rocks occurs on the west shore, at about three miles and a half north from the outlet. Gray gneiss, striking westward, occupies the shore to the first large bay. On one of the islands in this bay on which the Indians have small gardens, is a series of black gneisses very much twisted. On the mainland opposite, the gray gneiss gives place to dark gneiss very much seamed with granite veins, and in the gneiss are included fragments which apparently are broken from the darker series. The exact point of contact was not seen, but the attitude of the beds on each side, is that of a dark series very much twisted up by heat and pressure, becoming broken and fissured and finally disappearing in a much altered condition as fragments held in the mass of adjacent gray gneissic rock of which the strike is directly across the general trend of the dark beds.

Shattered contact with gneissic rocks.

Following the shore northward, the beds very soon lose their folded character and are found with a uniform strike to the north, afterward turning to the north-east with an easy curve. The general trend of the series is nearly parallel to the shore-line, so that the bed which is found at the mouth of Red Lake River would cross the points at the north-west corner, touching the shore at the bottom of the bays, thence turning south, would pass just clear of the west side and finally would be crumpled up near the contact, thus on the lake shore a very narrow section of the series is found. In going westward, this section consists of, first, dark semi-crystalline schists or gneisses, a band of dark-green hornblende-rock, in places rendered schistose and in others mainly a trap, and lastly the beds at the mouth of the river, which are a dark-green, fine-grained rock, well stratified and apparently clastic, resembling beds within the larger Huronian areas. On the river, few exposures are to be seen. At the foot of the first rapid, dark hornblende-schists are exposed, followed in a short distance, at the second fall, by coarsely-crystalline hornblende eruptive rock, which is similar to that on Shallow Lake. The thickness of the section can scarcely be estimated, as the western boundary was not seen, but the presence of angular granite boulders, which had evidently not been carried far, containing inclusions of dark rocks, would place this line just above the second rapid, or at a distance of two miles from the mouth of the river. A small eastward extension of the series is found on the narrow point separating the two Shallow lakes. These beds have an average south-west strike and appear to have formed a nearly separate area from the rocks of the west shore, while a series of granites with a varying

Huronian of Shallow Lake.



amount of foliation has occupied the gap between, which is probably one main break with several lesser ones in the form of dykes, generally cutting into the mass along the bedding planes. The islands in the centre of the lake and near the east shore are all of gneissoid granite. The main shore at the outlet of Little Shallow Lake, is a light granite with greenish tinge and numerous small crystals of light-green hornblende. This rock probably occupies the trough or valley of the connecting stream, as it is found again at the mouth, on Shallow Lake.

Rocks of Little  
Shallow Lake.

The Huronian rocks extend to the eastward on Little Shallow Lake, nearly to the mouth of Trout Lake River and occupy the west shore to near the south-west corner. The division line passes not far from the west shore making a light curve. The long point from the east shore appears to be mainly reddish granite and the small island opposite, near the shore is composed mainly of gneissoid granite. At the contact, near the south-west corner of the lake, the beds are found to show a great amount of metamorphism which decreases as the line of contact is left. A coarse-grained, whitish, gneissic granite containing silvery scales of mica and whitish felspar, is found in contact with a dark gray gneissic schist, which is succeeded by dark-green rusty-weathering coarse-grained schist and a dull fine-grained gneiss. The shore northward for a couple of miles, is occupied by a fine-grained, dark gneiss which resembles that of the west shore of the larger lake. From opposite the long point to the outlet, several beds are found of a dark, fine-grained stratified rock containing a great amount of magnetite and specular iron. These beds may prove to be of future use as ore-deposits.

Rocks of Trout  
Lake River  
above Little  
Shallow Lake.

The north-eastward extension of the series, follows the high ridge west of Trout Lake River, crossing this stream somewhere below the big fall. The first exposure is of a light grayish-green, quartzose mica-schist, which is probably a squeezed gneiss. This is associated with beds of a dark green to gray fine-grained material which is probably an altered sedimentary rock.

The granite dyke which breaks into the mass at the fall, is followed above, on the river, by dark-green hornblende-schists, and by a coarser crystalline hornblende-rock resembling the bands of eruptive rock on the north side of Shallow Lake. The northward extension above, is hidden, and we next see the granites which extend to Trout Lake. It is quite possible that the beds, which here are striking north-east and south-west, may continue to the north-eastward and join the area of Huronian exposed around Woman Lake, but of this there is no certainty.



*Rocks of the Woman Lake Area.*—Our explorations in this district were along two routes near together and probably at the extreme western edge of the Huronian area, as the beds very likely run much farther to the eastward than we had the opportunity of seeing.

Our routes were from Shaboomene Lake (in the Cat Lake basin) through Woman Lake and down the Trout Lake River, and again from Trout Lake eastward via a long narrow lake to Woman Lake, thence up stream to Clearwater Lake (lying east of Woman Lake), directly south up stream to Fly Lake and thence down by the Wenassaga River to Lac Seul. On the former route, we met with the western boundary of this series on the Shaboomene Lake, where a series of foliated granites are found in contact with dark-gray schists and garnetiferous gneisses, which appear near the western border of the series. The gneiss is cut by dykes of light coloured greenish-gray trap which is not seen in the foliated granites to the north. The beds following this are of green schist. The western boundary of the Huronian, includes a narrow strip along the west shore and cuts across a bay to the south side of the lake, leaving the northern part and a small patch on the south-western side, in the Laurentian; while part of the west shore, the south and the southern half of the east shore are composed of Huronian rocks. The bay at the south end, from which the portage is made, is surrounded by rather steep shores of light-green altered volcanic rocks, fine-grained and compact, with many small shrinkage cracks filled with calcite.

Contact of  
Laurentian  
and Huronian  
on Shaboomene Lake.

The portage to a small lake above Woman Lake is over a high ridge of dark green, squeezed and altered quartz-porphry. The same bed is found again on the north end of Woman Lake on a continuation of the strike to the south-west. Down the west shore, the succeeding beds are evidently of volcanic origin—light-green diorites and ashy-weathering agglomerates. Near the south end, at the narrowest part, a dark series of cherty rocks follows the west shore and passes away to the south-west, followed again at the bend by beds of dark fine-grained thin-bedded rocks, of which some are thoroughly filled with iron-pyrites and magnetite. Medicine Rock, just out of water in the centre of the channel, is apparently a mass of ore, while the weathered pyrites supplies the Indians with “medicine.”

Huronian of  
Woman Lake.

In the river at the outlet of the lake, the last rock-exposure is of a dark green-felsite, and on the first lake below—Little Bear Lake—the rock is a gray gneissoid granite with included fragments of a dark colour which were supposed to be highly metamorphosed pieces from the Huronian.

Rocks of route  
from Woman  
Lake to Trout  
Lake.

The route from Trout Lake through this area, is up a very small stream to the eastward for about five miles to a small lake. Here dark, green eruptives are seen, but the portage of two miles to the south takes us back again into gneiss, and the long lake there reached runs along the strike of these rocks. The contact with the Huronian occurs on a narrow strait leading northward to another arm of this lake, and its occurrence was indicated in advance by the presence, in the gneiss, of an increasing number of dark patches, apparently inclusions.

The attitude of the beds is somewhat similar, the schists first found dipping north  $< 45^\circ$ , while the gneisses near the contact are very nearly in the same position.

Along the eastern extension of this lake the rocks are principally green, and massive but, in places rendered schistose by pressure and then frequently splitting into thin plates. Near the eastern end, seams of white calcite are found generally interlaminated with the beds, but sometimes breaking through them and holding fragments from the sides. The massive green rocks often show small blots and lenticular patches of easily weathered material, which leaves cavities on the surface. On the portage to Woman Lake, the rock has the appearance of having been very much shattered and subsequently squeezed into schists along the lines of fracture.

Huronian of  
Lower Clear-  
water Lake.

On the first Clearwater Lake, the rocks near the north end are massive green diorites, but toward the south they become more schistose and the bedding or cleavage runs south-west parallel to the general direction of that on Woman Lake. Very fine grained, gray-green, massive looking porcellanous rock, breaking with conchoidal fracture, is found on the last portage leading to the second Clearwater Lake. This was not seen in contact with the rest of the series, but is probably one of the eruptives found in the Huronian. At the south end of the lake, a light yellowish-green, squeezed quartz-porphyry occurs, which is very similar to the beds at the north end of Woman Lake.

The course of the river, through the string of lakes, has been somewhat parallel to the strike or bedding, but from Clearwater Lake eastward, for two miles, it cuts across this direction, and another series of long narrow lakes is drained. The first of these lies in a north-east, and south-west direction, with a narrow bay extending two miles to the south and connecting by a small stream with another long narrow lake lying further south. The rocks here are rather fine-grained greenstones, with a fine porcellanous surface of fracture.

Rocks of Fly  
Lake.

At the portage to Fly Lake, a light-green rock, evenly spotted with ash-coloured irregular markings on the weathered surface, is found. It

is uniformly dark-green on fresh fracture, a coarsely crystalline hornblende-rock in which the bedding could not be made out.

Fly Lake lies in the same trough as the lake north of it, and runs nearly north-and-south, the strike of the rocks following nearly the direction of the shores. At the north end, a dark-green massive rock prevails. Toward the south end, fine-grained bedded rocks which have the appearance of being altered sedimentary materials are first met with.

The strike of the beds is to the south, but near the south end of Fly Lake this turns south-south-west, and on the Wenassaga River to the east, varies from south-south-west to south-west.

On the portage eastward from Fly Lake, light-green quartzose beds are followed by coarsely crystalline hornblende-rock. Down the stream, dark hornblende-schists are seen on the side of the valley, and on the long portage to Wapagase Lake, several ridges of the same dark-green coarse hornblende-rock are crossed, while at the eastern end, near the lake, schists are found which are apparently of the same composition, but show a secondary crystallization of the hornblende, a common contact phenomenon.

Rocks of west branch of Wenassaga River.

A few exposures of a thin bedded quartzite or quartzose schist are to be found at the small rapids below, all striking south-west to west-south-west, and at the little lake near the mouth of Sand-bar Lake, gray gneisses, which possibly belong to the Laurentian, occur. The junction between the two formations was not seen, and the exact southern boundary of the Huronian was therefore not established.

Laurentian of Wenassaga River.

The western outline of the area of Huronian rocks above described is probably very sinuous, beginning to the west of Shaboomene Lake, making a long point toward Trout Lake and taking in part of a long narrow lake, then forming a long tapering arm including Woman Lake and touching the eastern end of Little Trout Lake, with a very uncertain southern edge, reaching to near the Sand-bar River branch of Wenassaga River.

*Rocks of the Red Lake area.*—The Huronian area of Red Lake and vicinity is, on account of the greater variety of rocks included by it, of more interest than those previously described. The exact boundaries of its rocks are determined only by those exposures of contacts which are to be seen on the lake shore and on the streams explored, so that the connecting lines between such exposures are necessarily somewhat uncertain. The northern side of the lake touches the Laurentian only on Pipestone Bay, and on Whitefish Spawning River the contact is a short distance from the lake. The boundary is thus conjectural between these points. To the south, the boundary is seen at several

Boundaries of the Huronian.

places on the lake, as appears by the map appended. There two large oval areas of granite come up through the Huronian rocks, and these granites, by the nature of the contact, are evidently intrusions. The complete section was not worked out, owing to lack of time.

Section on  
Pipestone  
Bay.

The western bay of the lake, Pipestone Bay, affords the best opportunity of studying an almost continuous exposure of the beds across the strike. It was found to present, with Trout Bay to the south, a series of highly inclined beds representing possibly many folds which have assumed the general form of an anticline, the axis running east-and-west occupying the area of Pipestone Bay. The beds on the north, in contact with the gneiss, dip northward at angles varying from  $60^{\circ}$  to  $80^{\circ}$ . At the centre and near the south side they are nearly vertical. Southward through the narrows, the inclination is south varying from  $50^{\circ}$  to  $80^{\circ}$  from the horizontal. A synclinal fold with its axis running north-west, brings the beds up again on the south shore of Trout Bay, where they strike along the general direction of the south shore of this arm. The continuation of this to the south-east probably forms a narrow belt, passing near Medicine Stone Lake and joining the same rocks at Gull Rock Lake.

Rocks represented.

The composition of the series in these folds appears to be as follows, in ascending order :—

1. Dark green schists, probably squeezed volcanic material, together with a more crystalline hornblende-rock which appears to be eruptive.

2. Yellowish-white, rusty-weathering, dolomitic limestone holding irregular nodules of a cherty nature. These beds in some places are more or less quartzose owing to the greater or less prevalence of the cherty masses. Alternating with them are greenstones which are occasionally altered to a soft chlorite or pot-stone, the pipe-stone of the Indians. In this form, an example is found in the narrows leading to Pipestone Bay, where a bed of one foot in thickness lies between beds of rusty dolomite.

3. Beds of slate and schist, mostly black and dark-green, are found to intervene between the first rusty beds and a second series above.

4. The second series of rusty-weathering dolomites is preceded by a bed of squeezed and altered quartz-porphyry of ten feet in thickness. The dolomite is in a thicker bed, and, like the first, very much spotted with dark-weathering irregular masses of cherty or quartzose material.

Above this is another band of altered quartz-porphyry, which is in the form of a gray hornstone with numerous blebs of quartz.

In other parts of the section, these beds can be with difficulty followed, but may become altered to varieties of slates, schists and quartzites, while layers of greenstone, perhaps of volcanic origin, are found interstratified or forming lenticular masses between the beds, often seemingly occupying the place of other members of the section. Further extension of these bands.

The beds crossing the central portion of Pipestone Bay, possibly representing the lower members of the series, are nearly altogether of alternate layers of greenstone and green schists, often becoming a chlorite schist. Succeeding them to the north, a series of highly quartzose felsites, occupying probably a similar position to the lower dolomites of the south side, weather to light colours and assume the appearance of quartzites.

In the northward extension, which should represent the upper part of the section, the first band of altered quartz-porphyrries and cherty dolomites only, are found in contact with a band of dark diorites and hornblende-rocks, which extends to the contact with the Laurentian.

In a bay just north of the Wolf Narrows, a band having the appearance of a conglomerate is found, with occasional pebbles of red banded jasper and others of a light-yellowish quartzite, but the majority of the pebbles are of a dark purplish-gray to green with a matrix of the same colour. The thickness of the band is about ten feet, and the associated rock is of a greenish to gray colour in rather thin beds. The position of this bed is probably represented by a band of conglomerate, which follows north of the slates exposed on the north side of Sate Bay. These slates, a fine-grained argillite in composition, are generally black and thin bedded, with many jointage planes dividing them into small pieces less than a foot in length. Conglomeratic rock. Argillite.

At the eastern end of the lake, dark blue limestones are found associated with these beds, but as the strata there are apparently much folded, the relations of the two classes of rock could not be ascertained.

The rocks on the south shore of Granite Bay, as well as the points on the north, are all of a light reddish granite in which the foliation is very slight. Wherever noted, this is nearly parallel to the general line of the northern border, dipping towards it at a low angle. Limestones.

The line of contact of the Huronian schists is seen in many places, beginning on the west at the narrows from Trout Bay, where it cuts off two small islands lying in front of the opening. Thence it crosses Marble Bay, and the beds on the point to the east are cut at an angle of 45° by the granite, which occupies the point and also the western face of a small round island where the schists abut directly on it. Huronian contact with granites.

The large island to the south, is mainly granite, with only the slender point at the east end, of Huronian. At the Wolf Narrows, both shores are granite, the line of contact following nearly the line of bedding of the schists, and cuts off the northern point. In the bay to the east, the granite has been eroded to the contact-line, and along the shore small patches of it are found clinging to the face of a high cliff, while seams of the same material occur, running north into the mass of the darker rocks. This shore is thus chiefly composed of Huronian rocks, but generally represented by a dark crystalline rock which looks somewhat like a diorite squeezed in some places to a crystalline schist.

The granite of the south shore is replaced at the Middle Narrows by black schists and dark-green rocks which strike south-by-east, apparently the same beds which border the north shore of the bay to the east. The contact line bends around from the north shore, touching the islands, and strikes the south shore just south of the narrows. There the contact is a sharp line running with the strike, but having a few parallel dykes of granite, apparently filling breaks made along the bedding near the contact. A few scattered dark angular fragments are seen in the granite.

#### Marble

The rocks of Marble Bay, on the north, are continuations of the altered quartz-porphry and rusty cherty bed which is seen directly to the west. These are followed to the north-east by fine-grained light-green altered rocks and by a small area of white calcite with many dark irregular markings which are very similar to those in the yellow beds before mentioned. This area of white marble-like rock, does not seem to form a well defined bed, but looks rather like an irregular mass. At the end of the bay, dark crystalline rock is seen, altered to a serpentine or something of that nature.

#### Slates and agglomerates.

The eastern part of the lake is divided into two parts by a string of islands, with a large one, Mackenzie Island, at the north end. The northern part forms a long narrow arm running to the north-east and is named Slate Bay, from the many exposures of this rock running parallel to the north shore, and also exposed on the north shore of Mackenzie Island. The slate band of the north shore is found to be flanked on both sides by agglomerate. That on the south side is a dark-green mass, in which large lumps of slightly harder rock are cemented together by material similar in colour, but weathering somewhat more readily. Fractures along the bedding show a very lumpy surface. This bed may prove to be of volcanic origin, and it was recognized in two places, on a point at the west end of the bay and on another opposite Mackenzie Island.



On the northern edge of the slate band, a narrow strip of lighter coloured slate, holding lumps or grains of quartz, was found. The possibility that this is a much squeezed and altered quartz-porphyry, is suggested not only by its appearance, but from the position it seems to occupy in the section, where it is apparently a continuation of the bed seen on Marble Bay. This is followed northward by a bed of argillaceous slate, making a total breadth for the slate bands of nearly a quarter of a mile.

A band of cherty rocks, holding pebbles of much the same nature, occurs at the north side of a bay near the west end, and again appears north of the slates, in a deep bay northward from the centre of Mackenzie Island. Still farther north, after passing some dykes of fine-grained diorite, similar pebbly rocks are cut by granite dykes, which are apparently offshoots from a mass that seems to compose the hills at a short distance north of this arm.

On the north end of Mackenzie Island and on the mainland to the east, dark blue limestones are found associated with dark schists. These rocks strike to the south of east on Mackenzie Island, but north-west this changes gradually, till in the narrows leading to Whitefish Bay, they are running north-east and parallel to those on the north side. They seem to form a broad curved band coming from East Bay and abutting on the schists and slates of Slate Bay. In the narrows above, the rocks are fine-grained, black schists, and in East Bay the principal rock seems to be a dark-green schist, which maintains a nearly uniform strike of south-east by south. On the west shore are dark greenish-blue limestones, followed by yellow rusty-weathering cherty dolomites or limestones, which are probable continuations of some of the limestone beds of Mackenzie Island. The attitude of these is generally vertical, but occasionally they dip to the west. On the eastern shore of East Bay several large dyke-like masses of granite, generally light-gray, cut the beds, and probably indicate the proximity of the granite which occupies the shores of Trout Lake to the east.

The northern point of Mackenzie Island shows beds evidently very much disturbed. Their strikes converge on a point just west of the island, dipping on the north point at a high angle to the north, to the south of this point, towards the south, and lastly, along the western shore, they dip to the west, apparently passing under the slates exposed on the west side of the island. The position of the dark-blue limestones would appear to be lower in the series than the slates though as there is possibly a great dislocation as well as folding, this is uncertain.



Intrusive  
granite mass.

The bay to the south, or near the outlet of the lakes, is found to have been eroded through the centre of an oval area of intrusive granite, which occupies a part of the south shore, several small islands in the middle, parts of islands near the outlet and the southern part of Mackenzie Island. The contact with the Huronian on all sides shows the intrusive nature of this granite mass.

The schists on the south, strike approximately parallel to the contact, following around the granite, while on the east and north, the beds are more broken up and have been replaced by the granite. Part of the beds which pass to the south do not reappear on the west, and are evidently broken off. The main mass of the rocks of the south shore, west of the granite, are black hornblende-schists and eruptives, and these beds are seen again at the outlet and thence to Keg Lake, but a series of fine-grained greenish-gray, thinly laminated, chloritic schists, with lenticular patches and thin partings of calcite, lie to the north. These end at the granite, appearing only on its eastern side.

Huronian of  
Keg and Gull  
Rock Lakes.

*Rocks of Keg Lake and Gull Rock Lake.*—On Keg Lake, beside the dark schists, a very quartzose, fine-grained, black rock holding crystals of quartz, is found at the outlet, followed by spotted green rocks, which may prove to be volcanic agglomerates. Near Gull Rock Lake, after passing fine-grained green eruptives, we find dark green schists at the west side of the lake in a vertical attitude, striking about west-south-west. These beds occupy the eastern part of the narrow neck separating the two lakes, and probably cross in that direction to the west. A mass of granite is found on the extreme south-eastern end of this point. Farther north, beds which are continuations of those on Keg Lake and the river above, are seen crossing the lake, but possibly do not extend much farther. On the small lake to the northward of Gull Rock Lake, a small portion only of the shore is of Huronian rock, as the main part to the north-east is of granite and gneiss.

The schists on the west shore near the outlet, seem to be vertical, running north-and-south, while a short distance northward, they run east-south-east and west-north-west, showing a good deal of disturbance near their eastern contact with the granites.

On the islands in the southern part of Gull Rock Lake, masses of dark schists are found everywhere in contact with the granite, and often completely surrounded, so that the contact line is nowhere definite. The exposures are small, but the larger pieces of bedded rock appear to preserve their strike, so that many are possibly beds separated by finger-

like intrusions of the granite ; but on nearly all the islands many fragments are found completely inclosed in the granite.

To the south-west, somewhat the same appearance is noticed, especially on the river coming from Bug Lake. Fragments are there found in the granite, forming a belt of broken gneissic and granitic rocks, which borders the Huronian along nearly its whole southern and eastern limit.

### *Superficial Geology.*

The surfaces of the Archæan rocks in this area are all more or less rounded and sometimes polished by glacial action.

Striæ are not well preserved on the surface of granite and gneiss, but in sheltered spots, as under boulders, they can be made out. On the finer-grained rocks of the Huronian, the surface is generally highly polished and the striæ are more distinct. The general direction is  $22^{\circ}$  to  $40^{\circ}$  west of south. The variations are caused by deflections in the direction of valleys or depressions through which the ice flowed. On the higher ground, the direction is more uniform and averages S.  $30^{\circ}$  W.

The material left by the glacier is of two types, an unmodified till or boulder-clay, and a stratified or re-assorted deposit in the form of fine clay, silt, and stratified sands. The till is found rather sparingly spread over nearly the whole area, immediately on the surface of the harder rocks, and has been in turn covered, in some localities, by the stratified sands and silts. A high ridge of sand, boulders and well rounded gravel, is approximately the northern and eastern boundary of these silts.

This ridge, or series of ridges, as found bordering the south side of Trout Lake, is seen again south of Little Trout Lake, and crosses the valley of Trout Lake River above the first rapid. Hills which are supposed to be similar in character, are seen south of Sand-bar Lake on the Wenassaga River, and it is believed that the ridge may extend eastward to the head of Lac Seul. Northward, its extension is uncertain, but the Indians report a continuation from west of Trout Lake to Berens River at Mick-kai-ame Fall or just east of Sturgeon Lake, where there is a ridge of sand and gravel with boulders crossing the valley.

The top of the ridge, south of Trout Lake, is a series of closely placed narrow hills or parallel ridges, steep on the northern face and more gradually sloping to the south, averaging about 270 feet above Trout Lake or 1575 feet above the sea. The material seen on the northern

slope is sand and gravel with rounded boulders. Several steps or terraces, are also noted, but they continue but short distances, and from the lake no such continuous line can be traced. On the surface of the ridge, large boulders are found, the crest being well covered with them, but they occupy a narrow belt only, as the slope to the south, though less abrupt than to the north, commences immediately. The general appearance of the ridge is not that of an ordinary land moraine, but suggests a moraine or accumulation along the front of an ice-sheet terminating in water of considerable depth, in which the débris has been somewhat evenly distributed.

Deposits  
north of the  
ridge.

To the north of this ridge, in the Trout Lake country, there is a light coating of sand and gravel, but a much greater number of boulders is seen on the surface than to the south. The same in a less degree is true of the region to the east. On Trout Lake, the large island named Cat Island, is capped by, and appears to be mostly composed of sand and gravel similar to that of the big ridge, and is of about the same elevation. Other hills immediately north of the ridge may possibly be of the same nature.

Deposits south  
of the ridge.

South of the ridge, the boulder-clay is found in a great many places to be covered by stratified deposits, and a number of occurrences may be cited.

On Lac Seul, at the Hudson's Bay Company's post, terraces of sand show sections on the lake shore of twenty to thirty feet of clearly stratified beds with clay partings. In one instance, several feet in length of a thin bed is contorted, evidently from the pressure of a large mass of floating ice. The beds beneath and above are not so disturbed.

On the south shore, cliffs of sand, which reach a height of about eighty or one hundred feet, are apparently continuations of the terraces at the post, and are no doubt stratified likewise.

On Wenastegao Lake, just north of the western end of Lac Seul, stratified beds of sand, fifteen to twenty feet thick, are seen on the eastern shore. The valley of the Mattawa is characterized by stratified material containing more clay or silt, but capped by sands at about the level of Lac Seul. Again, on the streams coming from the north, the country cut through is found to have a considerable depth of stratified deposits in the valleys, which, although partly river deposit, is nevertheless often spread over a wide plain, as at the east of Little Shoal Lake, and then seems to be earlier than the present river-valley.

On Gull Rock Lake, beds of sand averaging twenty feet are shown in cliffs on the south-west side, and similar deposits are also found in some

parts of Red Lake. To the south, on Long-legged Lake, there is not apparently so much of this stratified material, but local examples of sand-banks are found on the English River below Mattawa.

It might seem probable that the high ridge to the north indicates the eastern limit of the great glacial Lake Agassiz, because of its great elevation and the undoubted lake-deposit on its western and southern front. There appears to be, however, no definite information that these deposits continue beyond the basin occupied by Lac Seul, Shallow Lake, Gull Rock Lake and Red Lake, and they may thus indicate a lake of much smaller dimensions. At present, there seems no reason to suppose that the outlet of this basin through the valley of the English River, had ever been dammed up to a greater extent than eighty feet by morainic deposits, but a possible barrier might have been formed by the presence of two small confluent glaciers on the higher ground on either side. Origin of the southern deposits.

Between the hills bordering the west shore of Shallow Lake and the ridge running north-east from the northern end of the lake, there is a wide, low flat, through which the Red Lake River runs, but two rather prominent hills seem partially to bar the exit of this stream, and it finally reaches Shallow Lake by making a detour to the east around them. They are seen to be narrow ridges lying about west-south-west and east-north-east, and from exposures on their slopes, are known to consist almost wholly of boulders and gravel, well polished and rounded. Their height above the surrounding low country was found to be about 170 feet. The crest of each, is a narrow ridge sloping abruptly on each side. Large angular boulders of gneiss and granite are found on the southern slope. The northern is in the form of three or four narrow terrace-like steps, showing only the well-rounded gravel and boulders on faces of the steeper slopes. The origin of these hills is probably the same as that of the Trout Lake ridge, except that the position and direction would appear and indicate that they are lateral moraines. Smaller ridges of morainic material are crossed or cut through by the same stream a short distance to the north-west. Ridges near Shallow Lake.

In the valley of the upper waters of Berens River, the mantle of drift is of a variable thickness. On the height-of-land on the south and east, there seems to be very little but loose boulders, with some sand and clay. Lower in the basin, there is more sand with the same abundance of boulders. In one place on the lower part of White River, dark clay was found lying immediately above the rock, with sand on the surface. Berens River basin.

Glacial markings and polishing are here again everywhere noticeable, but on weathered surfaces not very distinct. The general direction of glaciation appears to have been from the north-west. At the south end of Pekangikum Lake the striæ run S. 36° W., but further to the east on Fairy Lake, they run west, thus showing considerable local deflection.

At the first fall above Sturgeon Lake, a ridge of sand and gravel seems to be cut by the river. High banks of sand and gravel are shown at the portage and a ridge is said to extend to the south a long distance. On the White River, about south-west from the above place, the stream cuts through a deposit of sand and boulders. No section was seen, but the bed of the stream contains an increased number of boulders.

Lands suitable for agriculture restricted.

The agricultural possibilities of this valley seem to be limited, and the areas suitable for cultivation are only to be found in isolated patches. These are principally in the neighbourhood of the larger lakes. The Indian reserves have been located with this end in view as they seem to cover about the best land seen. The soil is a light gray clay with a little vegetable mould, and the gardens made by the Indians produce potatoes of fair quality, the only vegetable grown.

In the southern part of the district, better land is found and in greater extent than in the Berens River valley. On Lac Seul, at the mission and trading post, there are several very good gardens in a flourishing condition, with all the ordinary vegetables growing very satisfactorily. The Indians appear to care little for any gardening except a very primitive attempt at raising potatoes.

Land suitable for gardening was seen at Mattawa, and indeed the best and largest extent for this purpose is to be found between Lac Seul and Shallow Lake. The country is well covered by timber but of small average growth. The sandy-tracts are generally wooded by Banksian pine, but in the river-valleys and on the heavier land, poplar, birch and spruce are abundant. White and red pine are found in small groves south of Lac Seul and are of good average size for timber. On the lake are scattered trees of both varieties. The northern limit of Red pine extends to Red Lake, where a few trees were observed. Cedar of inferior growth occurs in isolated localities and extends north-west to the height-of-land, but none was seen within the Berens River basin.





