Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

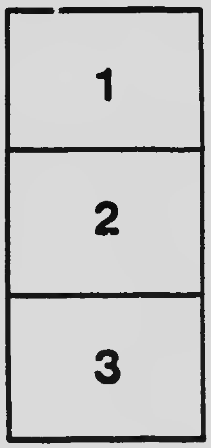
- [x] Coloured covers / Couverture de couleur
- [ ] Covers damaged / Couverture endommagée
- [ ] Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- [ ] Cover title missing / Le titre de couverture manque
- [x] Coloured maps / Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- [ ] Bound with other material / Relié avec d'autres documents
- [ ] Only edition available / Seule édition disponible
- [ ] Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- [ ] Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- [x] Additional comments / Commentaires supplémentaires: Various pagings.

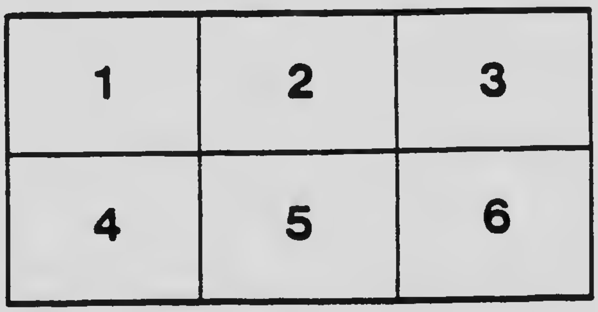
- [ ] Coloured pages / Pages de couleur
- [ ] Pages damaged / Pages endommagées
- [ ] Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed / Pages décolorées, tachetées ou piquées
- [x] Pages detached / Pages détachées
- [x] Showthrough / Transparence
- [ ] Quality of print varies / Qualité inégale de l'impression
- [ ] Includes supplementary material / Comprend du matériel supplémentaire
- [ ] Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- [ ] Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below / Ce document est filmé au taux de réduction indiqué ci-dessous.

10x	12x	14x	16x	18x	20x	22x	24x	26x	28x	30x	32x
							✓				

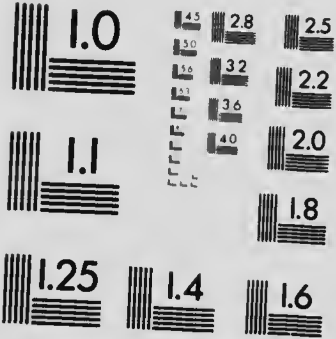

1
2
3


1
2
3


1
2
3
4
5
6

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc
1653 East Main Street
Rochester, New York 14609 USA
(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

CANADA

DEPARTMENT OF MINES

GEOLOGICAL SURVEY BRANCH

HON. W. TEMPLEMAN, MINISTER; A. P. LOW, DEPUTY MINISTER; R. W. BROCK, ACTING DIRECTOR.

REPORT

On a portion of Northwestern Ontario Traversed by the

NATIONAL TRANSCONTINENTAL RAILWAY

BETWEEN

LAKE NIPIGON AND STURGEON LAKE

BY

W. H. COLLINS.

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1908

No. 992.

CANADA

DEPARTMENT OF MINES

GEOLOGICAL SURVEY BRANCH

HON. W. TEMPLEMAN, MINISTER; A. P. LOW, DEPUTY MINISTER; R. W. BROCK, ACTING DIRECTOR.

REPORT

On a portion of Northwestern Ontario Traversed by the

NATIONAL TRANSCONTINENTAL RAILWAY

BETWEEN

LAKE NIPIGON AND STURGEON LAKE

BY

W. H. COLLINS.

OTTAWA

PRINTED BY S. E. DAWSON, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY

1908

No. 992.

A. P. LOW, Esq.,

Director, Geological Survey of Canada.

SIR,

Herewith I beg to submit my report on the region between Lake Nipigon and Sturgeon lake, bordering the National Transcontinental Railway line, together with a map of the same.

I have the honour to be,

Sir,

Your obedient servant,

W. H. COLLINS.

OTTAWA, April 24th, 1907.

CONTENTS

THE

Transcontinental Railway Location

BETWEEN

Lake Nipigon and Sturgeon Lake

W. H. COLLINS

The summer of 1906 was occupied in the exploration of a belt of country flanking the proposed route of the National Transcontinental railway westward from Lake Nipigon. The season's travel was accomplished in two canoes and with the help of an assistant and three canoemen. With this party the ascent of the Nipigon river from Nipigon station was commenced on May 29th. Nipigon House was reached on June 4th, from whence the Wabinosh canoe route was followed as far as Cache 15 of the N. T. C. R'y. supplies. Work began at this point on June 8th and continued without interruption until October 1st.

The accompanying map represents the area explored, together with what work had been done previously. The existing geographical information was supplemented by surveys, made with a micrometer telescope and prismatic compass, by Mr. H. C. Cooke, who acted as my assistant. For short distances, where comparatively well determined end points were available, track surveys were made. A total of 394 miles of instrumental and about 100 miles of track surveys was completed. The geological work and general observations upon matters of economic interest were conducted at the same time. On the termination of work at Sturgeon lake the party canoed to Osaquan siding on the C. P. R'y., leaving for home on October 4th.

PROGRESS OF EXPLORATION.

A map of the Dominion of Canada, published by the Geological Survey of Canada in 1866, indicates at that time no accurate knowledge of the territory here in question, or its immediate vicinity. Lakes Nipigon, St. Joseph, Seul, Sturgeon and Savant are the only waters represented and these very inaccurately, both in position and outline. Between 1866 and 1879 an impetus was given to surveying in Western Ontario by the decision to construct the C. P. R'y, and although attention was chiefly directed to the southern part, yet exploratory lines were cut around Lake Nipigon and from Nipigon westward to Sturgeon lake and Minnitaki. Dr. R. Bell of the Geological Survey made in 1869 and 1871 a triangulation and micrometer survey of Lake Nipigon, portions of the Wabinosh river and the Pikitigushi river as far as Round lake. (1). Mr. Lindsay Russell in 1874, acting under instructions from the Department of Public Works, made an exploration of a canoe route leading from Wabinosh bay to the southern portion of Sturgeon lake. On the north, in 1885, D. T. S. Fawcett conducted a micrometer survey extending from Kenora to Lake St. Joseph, along the English and Albany rivers, terminating his line with a post known as Fawcett post. The Ontario Department of Crown Lands in 1890 employed Alexander Niven (O.L.S.) to survey the boundary between Thunder Bay and Rainy River districts northward to a point some miles above Sturgeon lake. This was followed in 1897 by his fourth base line and fifth and sixth meridians; a report upon the geology of these lines was made by W. A. Parks of the University of Toronto; (2). Again, in 1900, of the ten parties sent out by the Bureau of Mines, two, Nos. 7 and 9, traversed this region. (3). Party Number 7, in charge of H. P. Proudfoot, (O.L.S.) made micrometer surveys and a geological reconnaissance of the Wabinosh river and canoe route through Smooth Rock Island lake to Fawcett post, the Ogoki river from Lake Wabakimmung to Whiteclay lake and from the latter southward to connect with Dr. Bell's survey of Round lake. The most valuable result of party Number 9 was a good micrometer survey of Sturgeon lake. In 1901 W. McInnes of the Geological Survey explored geologically and made track surveys of Sturgeon river and lake, Savant lake and the route connecting it with Sturgeon lake. (4). The following season he surveyed, by micrometer, the principal branches of the Wabinosh river, Onamakawash and Trout lakes, and traversed the Whitesand river and neighbouring waters, working out the geology of the country. (5). At this time the Grand Trunk Pacific Railway surveys commenced and continued up to June, 1905, after which the work of obtaining a transcontinental route was turned over to the National Transcontinental Railway Department under control of the Federal Government. Much detailed information has been obtained from these surveys, their lines affording checks upon other topographical surveys. At present the first railway location is being revised in detail; just to the west of the accompanying map-sheet construction is under way.

The principal topographical data added to the above by the writer and his party last year were micrometer surveys of Caribou lake, Allan Water, its branches and large lakes, Flint river and various lakes and creeks lying near the railway lines. Dog river and three canoe routes between Island lake and Sturgeon river were traversed.

TOPOGRAPHY.

The area mapped is part of the Archæan peneplain, whose uniform character has been so often described that only a brief reference is now required. Here it possesses a rolling hummocky surface varying from 900 to 1400 feet in elevation above sea level. Fig. 1, representing a profile nineteen miles in length and compressed 52.8 times, shows in exaggeration the irregularity of the surface. Hills, though the conspicuous feature, seldom exceed 200 feet in height. Crystalline rocks are nearly always exposed upon them; the intervening depressions, however, contain soils.

(1). Report of Progress, G.S.C. 1866-69 ibid 1871-72
(2). Report of Bureau of Mines, Ontario, 1897.
(3). Rep. Explor. North. Ont., 1900.
(4). Summary Rep. G.S.C., 1901.
(5). Summary Rep. G.S.C., 1902.

Fig. 1—Profile of N. T. C. Railway location eastward from Pelican Lake.
Hor. Scale : 5 miles = 1 inch
Vert. Scale : 500 feet = 1 inch

Considered broadly this broken surface is plain-like. A profile of the railway route from Lake Nipigon to Dog lake, when reduced to three feet in length, appears almost a straight horizontal line. The grades are under one half per cent, the minimum elevation at Mud river being 900 feet and the maximum at Lake Chivelston 1,415 feet above sea level, approximately.

The general superficial character varies, in detail, in different portions, according to the texture of the constituent rocks. The vicinity of Lake Nipigon, where a trap sheet spreads over the Laurentian, shows a maximum irregularity and has been somewhat of a problem to railway engineers. The sheet, presumably once continuous, has become dissected to its underlying, more resistant floor of gneiss. Near the lake, where it is thickest, it is traversed irregularly by deep fissure-like valleys, forming the drainage channels. Inland, toward the thinner periphery, these fissures have been enlarged until only scattered patches of trap remain upon the again exposed floor; these patches become smaller and less frequent, finally disappearing in the vicinity of Allan Water. The margins of these isolated patches and ravine-like valleys erode precipitously, forming extremely rugged cliffs.

The Laurentian series is peculiarly resistant and free from lines of structural weakness. Glacial and pre-glacial erosive forces acted upon a uniform surface; hence the smooth, easy contours of the present. The Keewatin schists, on the contrary, possess a high degree of schistosty, along which ice action found a minimum of resistance. The result is a furrowed surface of alternating ridges and hollows paralleling the rock strike, rugged, though not on a large scale.

The smooth, well scarped rock surface left by the retreating glacial ice has changed only slightly under the influence of subsequent erosion. It is now much the same as when the ice disappeared. Its materials are chemically and mechanically resistant and have been additionally protected by the superficial planing which left few inequalities exposed to denuding agents. In low ground and along lake shores, where the presence of water has been a protection, the original ice engravings remain; in gneisses and the coarser acid rocks the zone of weathering extends only a fraction of an inch beneath the scratched surface. Green schists and trap have decayed more easily. Internal chemical change is a more uncertain problem, there being no such date marks from which to calculate.

Mechanical action is a more important factor. Forest fires have repeatedly swept the country, destroying accumulations of vegetable mould and leaving the exposed rock surface littered with fragments loosened by unequal expansion. These fragments are sometimes a foot in thickness and scale-like in form. All steep rock faces show a talus of fragments, especially in the Keewatin, where the fissile schists separate in great flakes. River action is extremely feeble.

Since glacial times, apparently, the formation of soils in situ from the solid rocks has been trifling. However, a certain amount of glacial debris—clays, sands and gravels—was left by the ice, and to these have been added mould from the decay of forest growth. Counteracting these accumulative tendencies, forest fires have at intervals consumed the organic soil constituents and left unprotected a layer of ashes and inorganic residue to be removed by wind and rain. The general effect has been uneven distribution, the hill tops and slopes being left bare, and the depressions acting as soil reservoirs. The supply of material having never been generous, even these hollows are not very deeply filled, and are, besides, frequently wet and swampy. Consequently, the soil sheet is very incomplete, and in small irregular areas.

WATERWAYS.

The accompanying map indicates how abundantly the region is supplied with lakes and water courses. The remarkable amount of dormant water is to be explained by geological peculiarities. Soil, which, in alluvial districts, acts as a sponge, is not here thick or continuous enough to be effective in removing rainfall by capillarity or by serving as a soft, bedding stratum in which water courses of regular grade and river-like character might be evolved. Instead, the surface is of solid rock, impervious and very refractory to the carving action of water. The general slope of the region is quite sufficient for rapid drainage, but is obscured by the uneven, pitted character of the rock surface, which forms a multitude of water-tight basins. The formation of these basins into continuous series or channels has made slight progress. With the exception of the larger streams, which occupy old valleys, the present post-glacial drainage system consists of a large number of rock pools overflowing into others of lower level—a very juvenile arrangement.

Lakes are the most noticeable hydrographic feature, and are excellent physiographic expressions of the geological structure. Their outlines are ideal contours, illustrating faithfully the character of the denuded surface in which they rest, which, as already remarked, is dependent upon rock structure. Among the Keewatin schists they are typically linear in form, extending in the direction of the strike and, within one area, exhibiting notably parallel orientation. Their islands display the same peculiarities of form and distribution, being really the crests of submerged ridges. The northeastern portion of Sturgeon lake, lying wholly within this formation, is representative; its description would express the salient features of all lakes in the Keewatin schists. Steep, rocky shores are the rule. Couture and Beckington lakes represent the simplest form, in which only one narrow trough is water-filled.

Schistosity is not a notable feature in the Laurentian; consequently the tendency to linear sculpturing is less marked than in the schists. The large lakes of this system are distinguished by labyrinthine coast-line and the presence of great numbers of equally shapeless islands. Caribou lake forms a good illustration of these peculiarities and, at the same time, shows how closely lacustrine character is dependent upon geological structure. It lies in three formations. The long eastern bay is in the Keewatin and possesses the usual narrow trough form. The large central portion lies in granites and gneisses, to which it owes its extremely irregular coast, numerous islands and low shores; it is probably shallow. The southern lobe is enclosed by diabases and, like others to the south, contains few islands; the shores are regular and cliff-like. Sassaganaga lake, in its eastern part, is of true Laurentian irregularity, but on the north and west, where it occupies a basin of well foliated hornblende and biotite gneisses, the bays and islands resemble those of Sturgeon lake. Heathcote and Onamakawash lakes also conform in direction with the strike of the gneisses.

The small lakes eventually fill up with materials accum ated from higher ground, and become muskegs. All stages in this transformation are at present observable, from the rock basin with clear shores to the muskeg enclosing a shallow muddy pond choked with aquatic vegetation. The larger lakes exhibit only traces of this process where cre ks enter them. Elsewhere, their shores are characteristically bare of soil vegetation, and their waters are clear.

The lakes occasion a great many creeks. Though usualty of insignificant volume they are useful as canoe routes, affording tranquil meandering reaches in low ground besides serving as guides from lake to lake. The principal streams are in old, well defined rocky valleys, but have not enough alluvial materials with which to cover up irregu'arities and develop evenly graded beds. The Whitesand and Mud rivers are the only exceptions. The former, according to Mr. McInnes, is now cutting through thick sand beds. It is uniformly swift, tortuous and without lake expansions. Allan Water and Sturgeon iver are the largest and best examples of the Archæan type. For long distances they are not river-like in the usual sense, but strings of highly irregular expansions, in which no current is perceptible. These connect by short river-like constrictions in which a apid or fall invariably occurs. Below Granite lake Allan Water is more truly fluvial. Such lake expansions are perfect traps for collecting detrital materials, yet they show only the slightest evidence of such accumulations; as an exception, portions of the Dog River valley are clay-filled. Whatever load is being carried by the river is evidently in a soluble or finely comminuted state. There being no materials with which to cover up the obstructions in their courses the rivers have recourse to eroding action. This, however, is even less effective; the rock materials are very insoluble and the streams unsupplied with abrasive sands and gravels. River development is exceedingly slow.

For travelling purposes the waterways are excellent. Nearly all the changes of level take place in rapids and falls which are passed by short portages, the water, otherwise, being sluggish. The Wabinosh having a greater descent than any of the other stre us necessitates many portages and is the most difficult to navigate. In small canoes practically all the water mapped can be traversed. Portaging has been greatly facilitated by the work of the railway surveyors.

GEOLOGY.

All the rocks of the territory explored are Pre-Cambrian, and almost wholly crystallin They may be classified as:—

1.—Laurentian.
2.—Keewatin.
3.—Huronian.
4.—Keweenawan.

This order represents the time succession, but as the rocks are mostly igneous, and separated by great gaps, the time element is very indeterminate. The division is of real value, nevertheless, in that the three groups are lithologically distinct

The oldest rocks are a series of metamorphic biotite and hornblende-gneisses and schists and their associates, lying at the base of the Keewatin. These occur at the margins of green schist areas and in scattered ribbons and patches in the Laurentian. Lithologically they are identical with the Couchiching group in the Lake of the Woods area and resemble some members of the Grenville formation in eastern Ontario. Overlying these gneissic rocks is the Keewatin proper, (1) a complex series of altered effusives which have taken on a secondary schistose structure. Included with these are certain modified sediments. Physical conditions governing the formation of these rocks are obscure, but, following them, came a period of Plutonic intrusion of the Laurentian, accompanied by folding and magmatic absorption. Whatever the resultant character of the surface, it was greatly worn down by erosion before receiving the Keweenawan. The time required is very great. At the irruption of Keweenawan time at least the eastern portion was submarine, and the denuded crystalline floor received a deposit of sandstones and dolomites. This process was interrupted by volcanic activity with intrusion of great diabase-sheets. Evidence from other points indicates sedimentation and vulcanism to have alternated more than once, but, in this district, such information is incomplete. The Keweenawan rocks lie horizontally and undisturbed as if no considerable earth movement had since taken place, but the subsequent geological record has been obliterated up to glacial times, the post-glacial debris lying directly upon the worn diabases.

ANCIENT GNEISSES.

The group of rocks referred to as the oldest of the region forms poorly defined areas in the immediate vicinity of green schists. Two such have been mapped, one on Caribou lake, the other between Sassaganaga and Sturgeon lakes. Smaller masses of the same nature were observed at other points, but were too insignificant and vaguely limited to be laid down on the map.

Caribou Lake Area.

From about half-way along the narrow eastern bay to where it opens into the main lake a sheet of gabbro covers the underlying formation. At its east edge are Keewatin green schists; on the west a complex metamorphic series of crystalline-gneisses. Evidently, then, the contact of the two groups lies hidden beneath the gabbro. It may be laid bare in the islanded northern bay, which, however, was not penetrated far.

The shores of the northern part of the main lake are composed of these metamorphics. A glistening black hornblende-schist is the most noticeable member. It forms bands, fairly continuous and inclined at angles from 90° to horizontality. In company with these are similarly disposed bands of a grey biotite-schist or gneiss, more abundant than the hornblende-schist and less homogeneous ; it varies from a schistose, friable type to one quite gneissic and compact. A coarse acid rock containing large quartz grains in a crushed feldspathic ground-mass has probably been developed from crushed quartz-porphyry; at first sight it suggests a coarse grit. Along the southeastern shore, half way down the lake, large rounded masses, six to fifteen inches in diameter, are enclosed in a gneissic

(1). While this is the apparent relationship between these two formations, it cannot be taken as having been absolutely established.—R. W. B.

Forest on Sturgeon Lake

material. These granite inclusions give an "augen" or conglomerate-like appearance to the rock, the nature of which is not very evident.

These are the chief rock types. At the north end of the lake they form a compact area, but, towards the middle become intermingled with the acid rocks of the Laurentian. A distinct line of separation cannot be drawn. Miles to the south, in the Laurentian, little bands of hornblende and biotite-gneisses persistently occur, which appear quite identical with the types here mentioned

Sassaganaga Lake Area.

The relationship between this series and the Laurentian is better seen on Sassaganaga lake than in the preceding although there, too, the contact with the green schists was not observed, owing to a light drift covering. Glistening hornblende schists and biotite-gneiss again characterize the area, lying at high angles and striking at about 200° to 220°, the direction of strike in the green schist to the west. On the western end of the portage leading from Sassaganaga towards Sturgeon lake are sericite-schists of the ordinary Keewatin type. The eastern half of the portage and the narrow bay and creek are soil covered, and the rocks concealed. The western portion of Sassaganaga occupies a basin in well laminated hornblende and biotite-schist and gneisses which contain a number of quartz veins bearing pyrite. The rocks dip steeply westward and extend uniformly southwestward. The central part of the lake shows the same types but also a proportion of acid igneous gneisses and granite dikes. These, in the eastern third—Sassaganaga being naturally divided into three parallel sheets—are more prominent and the laminated gneisses less in quantity. The Laurentian gneisses seem to alternate with these as if band or tongue-like in outline. At several points the Laurentian was found to contain block-like inclusions of biotite-gneiss of angular form, and sometimes several yards in diameter. Often, these had been shattered, and the fragments re-cemented by granitic material forming a network of pale coloured anastomosing dikes over the darker surface of the block. These dikes were quite as coarse-grained, even somewhat coarser, than the enclosing Laurentian, though evidently continuous with it and of the same composition. On McEwen lake, twelve miles farther east, inclusions of hornblende-schist were observed, but had lost their angular outlines and were always small,—the largest perhaps fifteen inches across. Their peripheries crumbled easily, leaving cavities in the acid gneiss in which the schist kernels lay.

The angular and rounded inclusions are certainly older than the acid granite-gneisses which enclose them. It is equally certain that the enclosing materials are igneous in origin and were once plastic or molten. The presence in such rocks of older rock inclusions may, therefore, be explained as dating back to a time when they were torn from the formation to which they originally belonged and floated out into a magma which subsequently hardened. The small rounded fragments lying farthest away suggest themselves as vestiges of a process of absorption whereby a part of the old hornblende and biotite rocks were destroyed and assimilated by the intruded fluid. This intruded material solidified under Plutonic conditions or conditions of like effect, for the Laurentian granites and gneisses are coarse textured and holocrystalline. It is necessary then, to consider them, at the period of cooling, as deep-seated, and their present exposed surface originally thickly covered. This would imply a continuous roof extending between Caribou and Sassaganaga lakes, now eroded. Such an assumption would furnish an explanation of certain Laurentian peculiarities. Between the lakes mentioned there occur ' ads and ribbons of the above mentioned hornblende and biotite-gneisses, or, at least, what are lithologically indistinguishable from them. Taken as such, it is difficult to conceive of them having been floated laterally through miles of not very fluid matter without mechanical disintegration and absorption. They may more readily be considered as vestiges of a former overlying solid crust, of the same character as that which still exists at the two points described. The basal surface of this crust became incorporated with the plastic Laurentian substance and remained imprisoned in it, and protected from the enormous denudation which destroyed and removed everything above.

Petrographical Notes.

The biotite-gneiss varies from a quartzose mica-schist to a true gneiss, always moderately fine-grained, but varying considerably in the degree of foliation. All the constituents are in irregular grains of about equal size, forming a mosaic structure. The mica scales are in parallel orientation and responsible for the fissile character of the specimens. Considering their friable nature, the constituent minerals are remarkably fresh. Quartz, microline and orthoclase are the colourless minerals, plagioclase being uncommon. Biotite, the chief ferromagnesian constituent, is abundant in irregular scales, characterized by the presence of minute inclusions surrounded by pleochroic halos; it is often bleached nearly colourless. Sphene, pyrite and hornblende and less frequently corroded fragments of a colourless garnet are accessory. Thin sections of similar rocks collected east of Lake Nipigon show cordierite and graphite. The absence of soda rich minerals is notable; there is much to suggest for these rocks an original sedimentary condition.

The hornblendic schists are somewhat finer in texture and more evenly laminated. Their glistening black fresh surfaces are characteristic. The mosaic structure is like that of the biotite gneisses, schistosity being due, however, to hornblende instead of mica. Quartz, microline and orthoclase again form the colourless portion of thin sections, quartz predominating. Hornblende is always in large amount, either well crystallized, with brown and light green pleochroic tints, or feathery and exhibiting the usual blue green pleochroism of the secondary mineral. Other minerals, pyrite, plagioclase and biotite, are unusual.

KEEWATIN.

The Keewatin green schists are a very distinctive field group, their dark colour and eminent slaty cleavage being unique in the region. They form elongated tongue-like areas, tapering to points or to a number of finger-like terminations in whose interstices the underlying gneisses appear. In each area the schists are inclined almost vertically and strike parallel to its long direction. They consist of alterations of both acid and basic effusive rocks in which the abundant development of the micaceous minerals, chlorite and sericite, has proceeded to various degrees. Some of the gabbros and orthoclase porphyries retain their crystallized minerals nearly intact, and fracture irregularly, but, in the majority, the erupt ve characters have been obscured by secondary schistose development. Porphyr ic rocks have been altered to dark schists in which the crushed phenocrysts show as small eyes. Often secondary mineral formation has been so complete that no original structure is left. In general the acid eruptives have developed into seric - schists composed of irregular quartz grains and sericite in parallel shreds, the b types to a darker chlorite schist made up of chlorite or actinolite quartz and tur . calcite. Pyrite is a widespread constituent of these schists.

HURONIAN.

Accompanying these modified igneous ro ks are a few sediments, the mo notable being a conglomerate of granite and schist pebbles in a schist matrix Quartzites have been recorded by other observers; well defined jaspilite bands were seen by the writer. The presence of conglomerates derived from Keewatin materials points to an unconformity separating two periods; however, insufficient details have been accumulated to make a separation advisable he e ut the sedimentaries are probably to be referred to the Huronian.

Caribou Lake Area.

A band of green schists crosses the eastern bay of Caribou la ng i a nearly east and west direction. It does not extend far westw bly no schists have been observed on Smooth Rock Island lake. It is rtain continuous with the belt that McInnes and Bell found at Round la

On Caribou lake the southern margin is hidden by a trap sch ca of far from the mouth of the bay. At the other end, on the narrow -like sion, banded hornblende-gneiss indicates the recurrence of Laure n rock band is thus about four miles across. Well laminated pyritifer ous chlo sericite-schists compose the area, together with some harder fine rained

Sturgeon Lake Area.

A large Keewatin area occupies the northeastern part of Sturgeon extends for some distance inland towards the north and ea App Sassaganaga lake it is first met on the fifty-six chain portage ling fr as a sericite schist containing lenses of dark quartz. The n ow lake end of the portage lies in vertical hornblende-schists which contin striking like the sericite band at 20° east of north. The south shore lake was not examined, but is likely of Laurentian, for on the west side travelled it, McInnes found biotite gneiss.

A small island at the north end of Coveney lake exposes a coarse mi enite. In thin section it is seen to be principally microperthite with a comp atively small amount of biotite. Quartz, magnetite and large zircon crystals are accessory. No ferromagnesian minerals except biotite are present, hence it is a true mica syenite; the predominance of microperthite gives it a similarity to nordmarkite. Small dikes of this material cut the schists so that it is evidently post-Keewatin in age.

Between Coveney and Sturgeon lakes are two bands of crushed quartz porphyry, alternating with hornblende and other basic schists. The northwest rn bay of Sturgeon lake contains a complex of sheared diabases, quartz porphyry, felsite and other intrusives in well marked stages of shearing, and evidently the products of recurrent intrusions. The southward projecting peninsula contains the western edge of the formation, the schist being interrupted sharply by a younger body of porphyritic granite. The schists are hardened at the edges and the granite contains a good deal of unassimilated materials taken from these older rocks.

North of the lake the schists bend towards the northwest and are almost in continuity with those of Savant lake. Except for the extension reaching to Chivelston lake they lie south of the railway location. At the contact with the Laurentian, at the north end of Beckington lake, are black actinolite schists and hornblende schists which, towards the south end, give place to felsites and a sheared acid porphyry of quartzitic appearance. Richan lake shows on its shore a basic diorite of moderately fine grain. It consists very largely of hornblende with accessory patches of turbid feldspar and considerable ilmenite. It is much fr her than the usual Keewatin rocks.

Savant Lake Area.

This third area begins only a few miles north of Sturgeon lake and extends northeasterly. Its eastern edge corresponds pretty closely with the eastern lake shore. At the north the lake crosses into Laurentian rocks, the schists continuing northeastward, but, how far, it has not yet been determined. On the west a long arm turns southwestward along the Dog river for nearly its entire length. The area is thus irregularly triradiate in outline.

From the railway cache on Sturgeon lake up to Chivelston lake the rocks are Laurentian of the ordinary type, but on the portage at the north end of the latter a band of green schists, presumably an extension from Sturgeon lake, is crossed and the Laurentian re-entered. The granites were found along the north shore of Island lake and again at the fall below it. The southern edge at Houghton lake is a crushed, much altered quartz porphyry with highly fissile chlorite schists intervening between there and Island lake. Very similar forms extend northward from Lewis lake. The intrusion of granites near Pickerel lake has produced a more compact green schist which, near the exit of Grebe lake, is beginning to resume its characteristic schistosity. The south shore of Island lake is of chlorite-schist, becoming mingled with siliceous bands containing magnetite farther to the northeast, on Kashaweogama. The jaspilite or siliceous bands stand nearly vertically like the other rocks and alternate with a chlorite-schist. The north shore of Kashawaeogama shows a narrow band of conglomerate, and sericite-schist. The conglomerate is formed of granite pebbles chiefly in a matrix of the same character as the neighbouring schists and not distinctly separated from them.

A few islands and the north shore of Island lake exhibit a contact zone between the schists and the younger Laurentian granite. The schists appear to have been frayed peripherally and much of their substance incorporated into the intruded material. Elongated schist bodies lie enclosed by granite of a dull colour and indistinct crystallization; the granite towards the north becomes clear in colour and free from inclusions. While it appears to have been wholly modified, the schists are not greatly changed, and show no tendency to a coarser crystallinity.

LAURENTIAN.

A large proportion of the whole area is composed of acid Plutonic rocks, more or less foliated. Two areas may be distinguished: one extending from Sturgeon and Savant lakes eastward and passing under the Keweenawan formation at Lake Nipigon, its north and south confines being beyond the limit of exploration, the second beginning west of the same two lakes and extending toward Lac Seul.

The dominant member of the eastern area is a biotite granite sometimes quite massive but usually insensibly assuming a more or less prominent gneissic structure. A number of nuclear granite masses are preserved, around which the gneisses are arranged in enclosing fashion. While the nuclei themselves are homogeneous the outlying gneisses assume complex features. They contain inclusions, usually narrow bands and streaks but sometimes angular masses, of hornblende and biotite gneisses of fine texture, arranged in parallel orientation with the foliation of the coarser gneisses. These inclusions are indistinguishable from the gneisses already regarded as comparable with the Grenville and Couchiching series; their presence in the Laurentian in fragmental shapes is taken to establish their greater age.

The green complex is frequently cut by sharply defined dikes or, less frequently, boss-like areas of a coarse granite composed of quartz, feldspar, magnetite and either biotite or muscovite. They differ from the ordinary dike in their coarse texture which persists from edge to edge, indicating the existence of deepseated conditions of formation, like the gneisses which contain them. The angular shattered blocks of biotite-gneiss on Sassaganaga lake are traversed by anastomosing dikes of similar coarse acid nature. As these formed toward the close of Laurentian activity, when the granite magma had lost power to assimilate included fragments, the idea suggests itself that the coarse dikes and bosses, which resemble them so much, represent the final stages of Laurentian intrusion. The granite-gneisses, certainly, were solid at the time of these intrusions and the latter appear never to be cut by any other Laurentian member.

In addition, there are apparently numerous and diversified igneous bodies in the Laurentian of distinct chemical and mineralogical compositions, but much more detailed work than has yet been done is required to delimit them. The paucity of sharply defined boundaries between the various Laurentian members renders its subdivision difficult and only to be done by traversing the complex thoroughly.

On the route from Rocky Island lake to Caribou lake the country is low and few rocks are exposed, but, wherever observed, they are biotite-gneisses containing streaks of finer hornblende and biotite-gneiss. On the shore of the southern lobe of Caribou lake a small area of coarse black dioritic rock has been indicated on the map. The middle portion of the lake shows a transition to the older gneisses which, northward, become more and more prominently represented. Up the Wabinosh river from Kanakskanias lake the same uniform biotite-gneiss mingled with black hornblende-gneiss bands holds throughout. Trout and Onamakawash lakes are in similar rocks. Lookout and Eagle brooks traverse biotite granite-gneisses of more obscure foliation and freer from gneiss inclusions. These extend northward along Redhead and Baldheaded lakes changing near Snake lake to a massive biotite granite. From the vicinity of Snake lake toward Smooth Rock Island lake coarse granitic structure dominates. A fine example of graphic granite was observed on the portage leading from Wabakimming to Smooth Rock Island lake. Northward, along the two last mentioned bodies, gneisses with the usual banded members are entered, as if the northern limit of the area were being approached closely. This northern gneiss body continues southwestward along Flint river and Allan Water to Sturgeon lake. Among these, on the second portage below Flint lake, occurs a coarse augen gneiss in which crushed feldspar crystals, an inch in diameter, present a conglomerate-like appearance. The older stratiform gneisses grow increasingly abundant southward, being an almost continuous formation on the south end of Sassaganaga lake. The long south bay of this lake lies in biotite granite-gneiss.

The Laurentian body extending along Sturgeon river is only one end of an area that encloses Lac Seul. Reference is here confined to the portion mapped. On the whole, its members are more basic and more foliated than those of the eastern area. Banded gneisses are abundant and massive granites uncommon. On the western side of the peninsula which extends southward into Sturgeon lake is a feldspathic granite, porphyritic along its contact with the Keewatin. This body extends nearly the length of the peninsula, but is not very wide, for on the western shore of the lake are the usual biotite-gneisses. A coarse hornblende-gneiss was met at the first portage below the lake on Sturgeon river. In the vicinity of White fall are syenite gneisses of dull red colour; these again give place to the usual biotite-gneiss which continues beyond Dog lake. Dog river and the other northern tributaries of Sturgeon river traverse the same rocks; especially in the vicinity of Canoe lake stratiform gneiss bands are abundant. Pale biotite granite occurs about Grebe lake.

KEWEENAWAN.

The Keweenawan represented upon the accompanying map sheet is only part of a formation that fills a shallow Laurentian basin of which Lake Nipigon approximately marks the centre. Denudation has exposed the Laurentian floor over a large proportion of the whole area and, at the present, only a remnant of the superincumbent formation exists. Along the shores of Lake Nipigon and in the river valleys of its vicinity, where vertical sections are presented, the Keweenawan is seen to consist basally of horizontal beds of conglomerate, sandstone, dolomite and magnesian limestones and shales. These lie unconformably upon the older eroded crystalline rocks. The submarine conditions of deposition are indicated by the occurrence of ripplemarks, gypsum inclusions and salt crystal casts in the beds. These sediments are capped by a sheet of basic trap, whose present upper surface is glaciated.

Within the map sheet the sedimentary portion of the series, where observed by Mr. McInnes, consists of a sandstone and an impure magnesian limestone, both flat lying and showing little evidence of metamorphism. The sandstone was found immediately upon the Laurentian, graduating from a feldspathic material not greatly different mineralogically from the gneiss itself into a pure siliceous sandstone. The limestone is magnesian and deep red in colour from the ferric oxide. Exposures are to be found only in the deeper river valleys and lake shores where they crop out beneath the igneous cap.

Both sedimentary and igneous members grow thin toward the margin of the formation and the outlying trap bodies lie directly upon the gneisses, indicating a more restricted area of occurrence for the sediments. The sediments are in places broken and locally crumpled by the ascension through them of dikes which are directly traceable into the overlying sheet. In the small area north of Redhead lake, where the Keweenawan trap sheet is only a few feet thick and the gneiss frequently shows through, the latter is intersected by fine-grained dikes continuous with the overlying sheet. These are presumably the vents, younger than either gneiss or Keweenawan sediments, through which the erupted material ascended.

The trap sheet itself is of variable thickness at present owing to the erosion of its upper surface, varying from a few feet to over 100 feet. Usually it is coarse textured and holocrystalline, being, in mineralogical composition, a gabbro. Feldspar, the chief constituent, is in elongated crystals penetrating the other minerals; its extinction angle lies between that of labradorite and bytownite. Augite, the other principal constituent, is in large irregular masses. Ilmenite showing lamellar structure is rather abundant as an accessory constituent.

ECONOMIC GEOLOGY.

The Keewatin is the most interesting series, economically considered; it is both gold and iron bearing. Within the confines of the map sheet gold is mined only on Sturgeon lake. The other schist areas, although as promising in appearance, have received practically no attention as yet, and their mineral values are unknown. Thin magnetite seams were observed in 1901 by McInnes on Savant lake; last year the writer found them continuing into a typical jaspilite formation on Kashaweogama lake. Thin magnetite seams were also found on Caribou lake, which, like those of Savant lake, though themselves valueless, may indicate the existence of larger accumulations to the east. Indeed, within the past year very promising iron deposits have been opened up in that direction, some miles northeast of Lake Nipigon.

GOLD.

The contact between green schists and granite which extends down the western side of the Sturgeon Lake peninsula is auriferous at a number of points. Chief among these is the St. Anthony Reef mine, lying directly upon the contact. On the one side are green schists, somewhat indurated and shattered, on the other a pale coloured porphyritic granite with which are associated dike-like bodies of phlogopite-bearing granite and a small area of coarsely crystalline quartz porphyry. The intrusion of the granite, which is the younger, and its solidification, was followed by a process of fissuring and vein formation. In the schists the veins tend to follow the rock cleavage, but in the granites they are very irregular, branching and re-uniting to form a network. The vein stuff is quartz with very small amounts of calcite; free gold, pyrite, chalcopyrite, galena and zinc blende are the mineralizing substances.

Mining operations began here in 1903. In the summer of 1906, under the direction of Mr. Arthur L. McEwen, a force of forty men were at work. Material was being removed from a forty foot open cut which was being pushed to the shore of Couture lake, and from a shaft connecting with the underground workings which were then at a depth of 100 feet. The ore is crushed in a ten stamp mill, the free gold separated by amalgamation, and the sulphide concentrates, which yield high assay returns, stored.

The contact on which the St. Anthony Reef is situated crosses to the main shore in a southwesterly direction from the south end of the peninsula and is visible on a small island where conditions like those above described exist. This property is held by Mr. Barnard who is engaged in stripping it. The quartz is dark in colour, but in other respects the two properties do not differ notably. The mineralization is the same; rich free gold specimens occur at the surface.

Midway between these properties an auriferous vein is mentioned by other investigators. It lies within granite, but only a short distance from the Keewatin contact.

Mining operations were begun a few years ago at the head of Belmont bay, but, after a 250 foot shaft had been sunk, were suspended. Work has recommenced under the Belmont Bay Gold Mining Co. management, and a three stamp mill was in process of construction last October. The Belmont Bay locations, belonging to the above company and Messrs. Fawcett, Cody and Douglas, seem to be, each, in the neighbourhood of igneous bodies, fresher in appearance than the schists. The Fawcett property crosses the edge of a mass of coarse gabbro. Mr. Cody's is near a weathered orthoclase porphyry on whose surface the outlines of phenocrysts one and a half inches in diameter are distinct. Stibnite is a common vein mineral.

A number of properties were not visited, so that an absolutely general statement cannot be offered, but it will be observed that all those here described are contact occurrences. The sequence of igneous intrusion, fissuring and vein filling is especially well seen at the two first mentioned places. While only of empirical value, it is nevertheless probably near the truth that the auriferous veins are to be found near intruded bodies in the Keewatin, and that such bodies have been instrumental in their formation. The Keewatin is everywhere supplied with quartz veins and lenses, but the most of them are worthless.

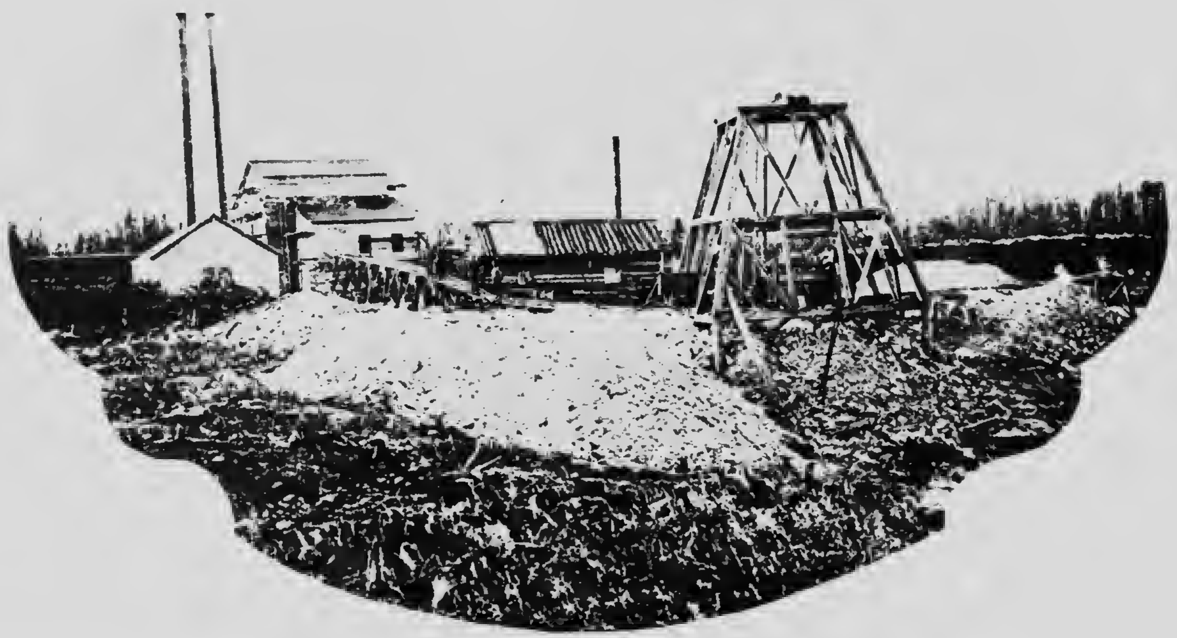
Gold has been reported to occur on Savant lake. The larger quartz veins of Island lake and vicinity have not yet been prospected.

Iron.

A detailed report upon the Island Lake iron range is deferred until it can be carefully examined. It was discovered at the close of the 1906 field season, when there remained time for only hasty reconnaissance. The ground is well forested, thus offering considerable difficulty to its geological study. The present information was obtained along the shores of Kashaweogama and neighbouring lakes where the rocks are exposed or only thinly covered.

About half-way along Kashaweogama lake, on the south shore, there appear in the ordinary green schists of the area black quartzite bands. At that point the shore rises steeply to a height of thirty to fifty feet, and is thinly moss covered. By stripping off the moss in patches up the hillside the formation was found to consist of alternating bands of sericitic schist and quartzite, the latter ranging from one to six or more inches across. The bands dip steeply and strike at about 50°. The quartzite varies from a lean banded jaspilite to a heavy black magnetic iron ore. The magnetite is contained as fine grains of fairly well defined crystal form in a quartzite of irregular grains, and varies in quantity from nothing to about one half the volume of the rock.

St. Anthony Reef Gold Mine Camp



St. Anthony Reef Gold Mine

For about two miles along the south shore this banded arrangement is visible, but farther east the ground is low and shore exposures uncommon. Iron bearing bands were next seen on Iron lake where it bends southward, the formation being similar to that first observed. On Savant lake the rock strike is more to the south and nothing but green schists were noted. However, these contain a few streaks of iron ore. Mr. McInnes reported in 1901 thin bands of this sort on the southeast of Savant lake.

The iron formation appears thus to lie between Iron and Island lakes, on the south of Kashaweogama. The north shore of the last named lake was not explored any distance back so that the existence of parallel bands of the iron range on the north remains to be investigated.

The Caribou Lake occurrence is, where noted, of no economical value. Halfway along the northwestern shore of the narrow eastern area is a high bluff rising from the water's edge. A few chains farther up the shore there is a band of impure magnetite about fifteen inches wide in the green schist. The band itself is of green schist impregnated with the ore, and, like the formation to which it belongs, dips almost perpendicularly, striking in an east and west direction. As in the case of the small streaks on Savant lake this may connect with a true iron formation. This may be looked for to the east rather than the west, as the schist area evidently terminates a few miles west of Caribou lake. but, no doubt, connects with the belt crossing Round lake.

Nothing of value has, as yet, been reported from either of the Laurentian areas. They are peculiarly unfitted for holding deposits of metalliferous substances owing both to their acid constitution and freedom from dynamic effects. Quartz, feldspars and mica form a very large percentage of the rock composition, and any process of mineral segregation within the series would act upon nonmetallic materials. Party seven, sent out in 1900 by the Ontario Bureau of Mines, reported mica on Smooth Rock Island lake, but not commercially useful. The biotite-gneisses occasionally contain bands of pyrite though not in very concentrated condition. Pyritiferous bands were observed on Sassaganaga lake, one on the eastern side of the southwestern area near its entrance, the other a short distance south of the west end of the portage which crosses the southerly extending peninsula. In both cases a band of gneiss a few feet wide is impregnated with scattered pyrite grains. Neither are valuable.

Since its formation the Laurentian appears to have been very little disturbed, even in Keweenawan time, and shows few veins or dikes on its surface. Consequently it has not been a good recipient for deposits leaching from former adjacent series. The Keweenawan trap is a homogeneous body and economically uninteresting. Its underlying sediments are so hidden that their examination is possible only at the wall-like exposures on river valleys and lake shores. Nothing has been reported from either.

GLACIAL GEOLOGY.

Following the general character of the Archæan, the country between Lake Nipigon and Sturgeon lake retains its old glaciated surface in excellent preservation. Ice movement, as evidenced by glacial striae and stossing, was S.S.W. Lake valleys lying in an east and west direction, *e.g.*, Kashaweogama, have harsh steep north shores, while on the south the rocks are well smoothed, sloping and lower. The average course of thirteen striae measurements collected by McInnes on Savant lake and Sturgeon lake is 200° magnetic. Away from low ground and bodies of water the glaciated surface is either hidden by forest or has been scaled off during forest fires.

Glacial debris is not abundant. Boulders are to be found at intervals over the whole area. The eastern and western parts are only veiled by till but a thick band extends across the middle in the neighbourhood of Allan Water, forming a belt of gravel hills about ten miles across from east to west. Along the N. T. C. Railway route it begins near Duck lake. On the south end of Redhead lake is a morainic ridge 150 to 200 feet high extending in a southerly direction. Its sides show a fine loamy till in which are embedded crystalline boulders of various dimensions. Ridges of the same character are observed down the Allan Water: at five miles below the G.T.P. crossing a ridge of this kind forms a line of islets or boulder heaps from which the finer materials have been washed by the river. Good exposures of glacial materials are to be seen on Wilcox and McEwen lakes where the waves have eaten into gravel hill sides.

ACCESSIBILITY.

At present ingress is from Nipigon and Ignace stations on the C. P. railway, from which points the N. T. C. survey lines are distant about ninety and seventy miles respectively. During the winter a sleigh road is open between Nipigon and South bay on Lake Nipigon, where a supply depot has been established. In summer the Nipigon river is ascended by canoe. In June, 1906, a right of way was being cleared for a railway line connecting with the lakes, so that in future communication will be easy. Two small steamers ply on Lake Nipigon between South bay, Nipigon House and the N. T. C. supply caches at Wabinosh bay and Mud river.

From Osaquan siding near Ignace the canoe route is provided with a line of three gasoline boats operated by the Osaquan Transportation Co. They run as far as the portage at the south end of Sturgeon lake, there connecting with a small steamer owned by the St. Anthony Mining Co., which plies up and down the lake.

With the completion of the N. T. C. railway the area mapped will be traversed and readily accessible. From Fort William a spur line connecting with the main line at Lake Superior junction, about twenty miles west of Dog lake, will allow of access from Lake Superior. In October of 1906 the main line between Dog lake and Lake Nipigon was being finally revised and construction was expected to begin the following spring. The spur line was already under construction.

For residential purposes the country traversed by the new railway is not materially different from that along the C. P. railway to the south. The climatic conditions are similar. Vegetables are successfully cultivated on Sturgeon lake, the only point where an attempt at agriculture has so far been made. Grain and small fruit will doubtless do as well. For farming purposes, however, the soil distribution is too uneven and scanty to admit of any but small irregular patches being cultivated.

In most places there is an abundance of small timber suitable for firewood and mining purposes. Recent fires in the vicinity of Redhead and Onamakawash lakes have left the country bare. Heavy timber is sparsely distrib[illegible]t. The best sections noted were near Houghton and Sassaganaga lakes. Spruce, tamarac, poplar, birch and cedar are the ordinary trees. Their rate of growth is very dependent upon situation, being rapid on light dry soil and exceedingly slow in muskegs. A few red and white pines were observed. Most of the better timber will be required for railway construction. Generally speaking the best timber and soil lie west of Allan Water.

Excellent water power is available on Allan Water and Sturgeon river at points indicated upon the map.

SELECTED LIST OF REPORTS

(SINCE 1885)

OF SPECIAL ECONOMIC INTEREST

PUBLISHED BY

THE MINES DEPARTMENT OF CANADA

(A.—*Published by the Geological Survey.*)

MINERAL RESOURCES BULLETINS

818. Platinum.
851. Coal.
854. Asbestos.
857. Infusorial Earth.
858. Manganese.
859. Salt.
860. Zinc.
869. Mica.
872. Molybdenum and Tungsten.
877. Graphite.
880. Peat.
881. Phosphates.
882. Copper.
913. Mineral Pigments.
953. Barytes.

---

745. Altitudes of Canada, by J. White. 1899. (40c.)

BRITISH COLUMBIA.

212. The Rocky Mountains (between latitudes 49° and 51° 30'), by G. M. Dawson. 1885. (25c.).
235. Vancouver Island, by G. M. Dawson. 1886. (25c.).
236. The Rocky Mountains, Geological Structure, by R. G. McConnell. 1886. (20c.).
263. Cariboo mining district, by A. Bowman. 1887. (25c.).
272. Mineral Wealth, by G. M. Dawson.
294. West Kootenay district, by G. M. Dawson. 1888-89. (35c.).
573. Kamloops district, by G. M. Dawson. 1894. (35c.)
574. Finlay and Omineca Rivers, by R. G. McConnell. 1894. (15c.)
743. Atlin Lake mining div., by J. C. Gwillim. 1899. (10c.)
939. Rossland district, B.C., by R. W. Brock. (10c.)
940. Graham Island, B.C., by R. W. Ells. 1905. (10c.)
949. Cascade Coal Field, by D. B. Dowling. (10c.)

YUKON AND MACKENZIE.

260. Yukon district, by G. M. Dawson. 1887. (30c.)
295. Yukon and Mackenzie Basins, by R. G. McConnell. 1889. (25c.)
687. Klondike gold fields (preliminary), by R. G. McConnell. 1900. (10c.)
884. Klondike gold fields, by R. G. McConnell. 1901. (25c.)
725. Great Bear Lake and region, by J. M. Bell. 1900. (10c.)
908. Windy Arm, Tagish Lake, by R. G. McConnell. 1906. (10c.)
942. Peel and Wind Rivers, by Chas. Camsell.
943. Upper Stewart River, by J. Keele. } Bound together. (10c.)
979. Klondike gravels, by R. G. McConnell. }

ALBERTA.

237. Central portion, by J. B. Tyrrell. 1886. (25c.)
324. Peace and Athabaska Rivers district, by R. G. McConnell. 1890-91. (25c.)
703. Yellowhead Pass route, by J. McEvoy. 1898. (15c.)

SASKATCHEWAN

213. Cypress Hills and Wood Mountain, by R. G. McConnell. 1885. (25c.)
601. Country between Athabaska Lake and Churchill River, by J. B. Tyrrell and D. B. Dowling. 1895. (15c.)
868. Souris River coal-field, by D. B. Dowling. 1902. (10c.)

MANITOBA.

264. Duck and Riding Mountains, by J. B. Tyrrell. 1887-8. (10c.)
296. Glacial Lake Agassiz, by W. Upham. 1889. (25c.)
325. Northwestern portion, by J. B. Tyrrell. 1890-91. (25c.)
704. Lake Winnipeg (west shore), by D. B. Dowling. 1898.
705. " (east shore), by J. B. Tyrrell. 1898. (25c.) } Bound together.

KEEWATIN AND FRANKLIN

217. Hudson Bay and strait, by R. Bell. 1885. (15c.)
238. Hudson Bay, south of, by A. P. Low. 1886. (10c.)
239. Attawapiskat and Albany Rivers, by R. Bell. 1886. (15c.)
244. Northern portion of the Dominion, by G. M. Dawson. 1886. (20c.)
578. Berens River Basin, by D. B. Dowling. 1894. (15c.)
618. Northern Keewatin, by J. B. Tyrrell. 1896. (30c.).
787. Grass River region, by J. B. Tyrrell and D. B. Dowling. 1900. (25c.)
815. Ekwan River and Sutton Lakes, by D. B. Dowling. 1901. (15c.)
905. The Cruise of the *Neptune*, by A. P. Low. 1905. ($2.00).

ONTARIO

215. Lake of the Woods region, by A. C. Lawson. 1885. (25c.)
265. Rainy Lake region, by A. C. Lawson. 1887. (25c.)
266. Lake Superior, mines and mining, by E. D. Ingall. 1888. (25c.)
326. Sudbury mining district, by R. Bell. 1890-91. (20c.)
327. Hunter island, by W. H. Smith. 1890-91. (20c.)
332. Natural Gas and Petroleum, by H. P. H. Brumell. 1890-91. (25c.)
357. Victoria, Peterborough and Hastings counties, by F. D. Adams. 1892-93. (10c.)
627. On the French River sheet, by R. Bell. 1896. (10c.)
678. Seine River and Lake Shebandowan map-sheets, by W. McInnes. 1897. (20c.)
672. Nipissing and Timiskaming map-sheets, by A. E. Barlow. 1896. (In Vol. X. No.
723. Iron deposits along Kingston and Pembroke Ry., by E. D. Ingall. 1900. (25c.)
739. Carleton, Russell and Prescott counties, by R. W. Ells. 1899. (25c.)(See No. 739 Quebec).
741. Ottawa and vicinity, by R. W. Ells. 1900. (15c.)
790. Perth sheet, by R. W. Ells. 1900. (10c.)
873. Sudbury Nickel and Copper deposits, by A. E. Barlow. (In Vol. XIV. 80c.)
977. Report on Pembroke sheet, Ont., by R. W. Ells. (10c.)
961. Reprint of No. 873
962. " " 672

QUEBEC

216. Mistassini expedition, by A. P. Low. 1884-5. (10c.)
240. Compton, Stanstead, Beauce, Richmond and Wolfe counties, by R. W. Ells. 1886. (25c.)
268. Mégantic, Beauce, Dorchester, Lévis, Bellechasse and Montmagny counties, by R. W. Ells. 1887-8. (25c.)
297. Mineral resources, by R. W. Ells. 1889. (25c.)
328. Portneuf, Quebec and Montmagny counties, by A. P. Low. 1890-91. (15c.)
579. Eastern townships, Montreal sheet, by R. W. Ells and F. D. Adams. 1894. (15c.)
670. Auriferous deposits, Southeastern portion, by R. Chalmers. 1895. (20c.)
591. Laurentian area north of the Island of Montreal, by F. D. Adams. 1895. (15c.)
672. Timiskaming map-sheet, by A. E. Barlow. 1896. (30c.) (In Vol. 10. 80c.)
707. Eastern townships, Three Rivers sheet, by R. W. Ells. 1898. (20c.)
739. Argenteuil, Wright, Labelle and Pontiac counties, by R. W. Ells. 1899. (25c.) (See No. 739, Ontario).
788. Nottaway basin, by R. Bell. 1900. (15c.)
863. Wells on Island of Montreal, by F. D. Adams. 1901. (30c.)
923. Chibougamou region, by A. P. Low. 1905. (10c.)

UNGAVA AND LABRADOR

217 Hudson Strait and Bay, by R. Bell. 1885. 15c.
267 James Bay and east of Hudson Bay, by A. P. Low. 1887-88. (25c.)
584 Labrador Peninsula, by A. P. Low. 1895. 30c.
657 Richmond Gulf to Ungava Bay, by A. P. Low. 1896. 10c.
680 Hudson Strait (south shore) and Ungava Bay, by A. P. Low. 1898. (15c.) } Bound together.
713 Hudson Strait (north shore), by R. Bell. 1898. (20c.) } Bound together.
778 Hudson Bay, east coast, by A. P. Low. 1901. (25c.)
819 Nastapoka Islands, Hudson Bay, by A. P. Low. 1901. 10c.

NEW BRUNSWICK AND NOVA SCOTIA

218 Western New Brunswick and Eastern Nova Scotia, by R. W. Ells. 1885. (20c.)
219 Carleton and Victoria cos., by L. W. Bailey. 1885. (20c.)
242 Victoria, Restigouche and Northumberland counties, N.B., by L. W. Bailey and W. McInnes. 1886. (10c.)
243 Guysborough, Antigonish, Pictou, Colchester and Halifax counties, N.S., by Hugh Fletcher and E. R. Faribault. 1886. (25c.)
269. Northern portion and adjacent areas, by L. W. Bailey and W. McInnes. 1887-88. (25c.)
330. Temiscouata and Rimouski counties, by L. W. Bailey and W. McInnes. 1890-91. (10c.)
331 Pictou and Colchester counties, N.S., by H. Fletcher. 1890-91. (20c.)
358. Southwestern Nova Scotia (Preliminary), by L. W. Bailey. 1892-93. (10c.)
628. Southwestern Nova Scotia, by L. W. Bailey. 1896. (20c.)
661. Mineral resources, N.B., by L. W. Bailey. 1897. (10c.)
New Brunswick geology, by R. W. Ells. 1887. (10c.)
797. Cambrian rocks of Cape Breton, by G. F. Matthew. 1900. (50c.)
799. Carboniferous system in N.B., by L. W. Bailey. 1900. (10c.) } Bound together
803. Coal prospects in N.B., by H. S. Poole. 1900. (10c.) } Bound together
871 Pictou coal field, by H. S. Poole. 1902. (10c.)

IN PRESS

970. Report on Niagara Falls, by Dr. J. W. Spencer.
968. Report to accompany map of the Moose Mountain area, Alta., by D. D. Cairnes.
974. Copper Bearing Rocks of Eastern Townships, by J. A. Dresser. (10c.)
980. Similkameen district, B.C., by Chas. Camsell. (10c.)
982. Conrad Mining district, Yukon, by D. D. Cairnes. (10c.)
988. Telkwa valley, B.C., by W. W. Leach. (10c.)

IN PREPARATION.

Rossland district, B.C. (full report), by R. W. Brock.
Report on Prince Edward county, Brockville and Kingston map-sheet, by R. W. Ells.
Report on Cornwall sheet, by R. W. Ells.
Reports on Country between Lake Superior and Albany river, by W. J. Wilson and W. H. Collins.
Transcontinental location between Lake Nipigon and Sturgeon Lake, Ont., by W. H. Collins.
Nanaimo and New Westminster districts, B.C., by O. E. LeRoy.

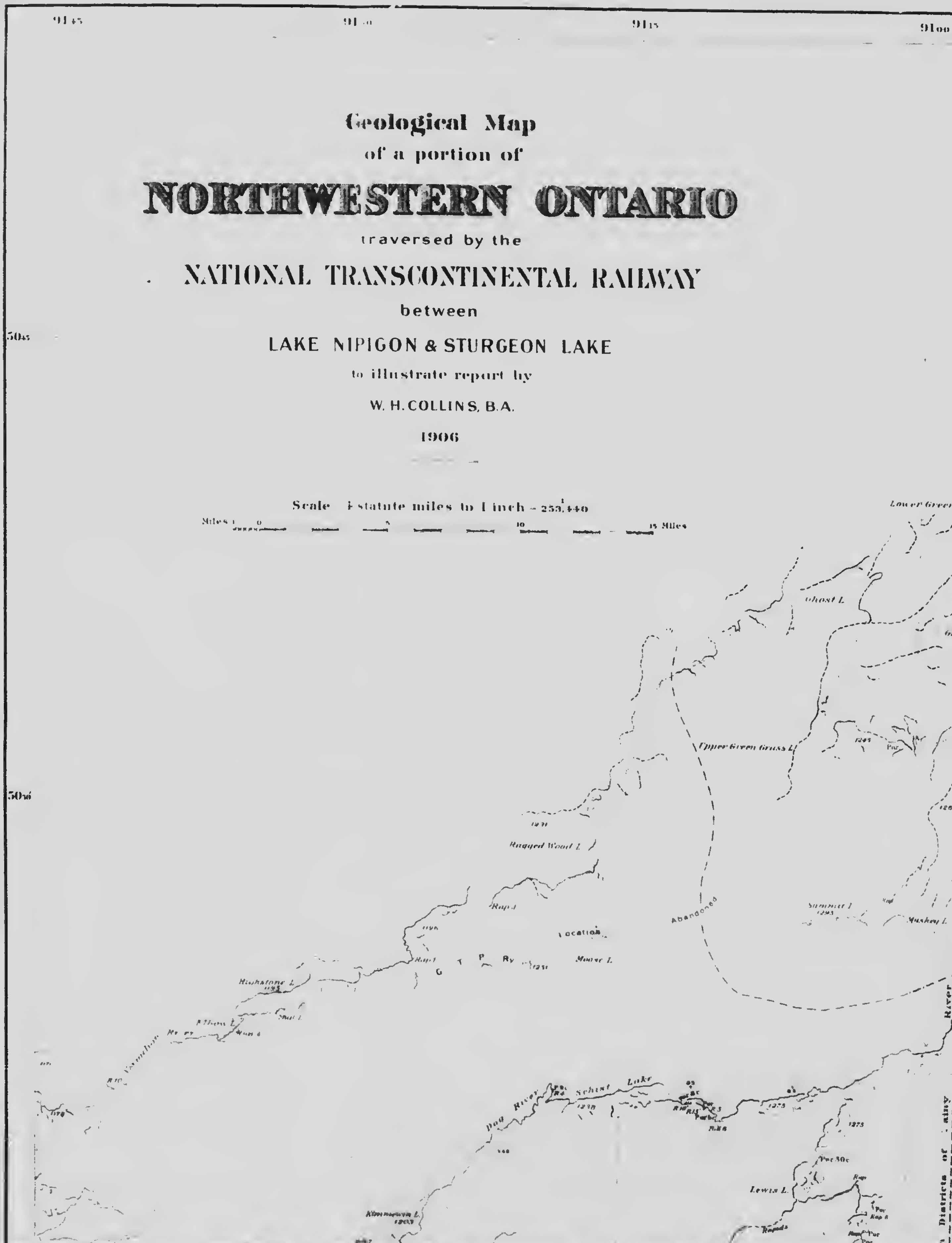
(B.—*Published by the Mines Branch.*)

On the location and examination of magnetic ore deposits by magnetometric measurements. Eugene Haanel. 1904.
Report of the Commission appointed to investigate the different electro-thermic processes for the smelting of iron ores and the making of steel in operation in Europe. (Only a few copies of this report are available.) By Eugene Haanel. 1904.
Final report on the experiments made at Sault Ste. Marie, under Government auspices, in the smelting of Canadian iron ores by the electro-thermic process. Eugene Haanel. 1907.

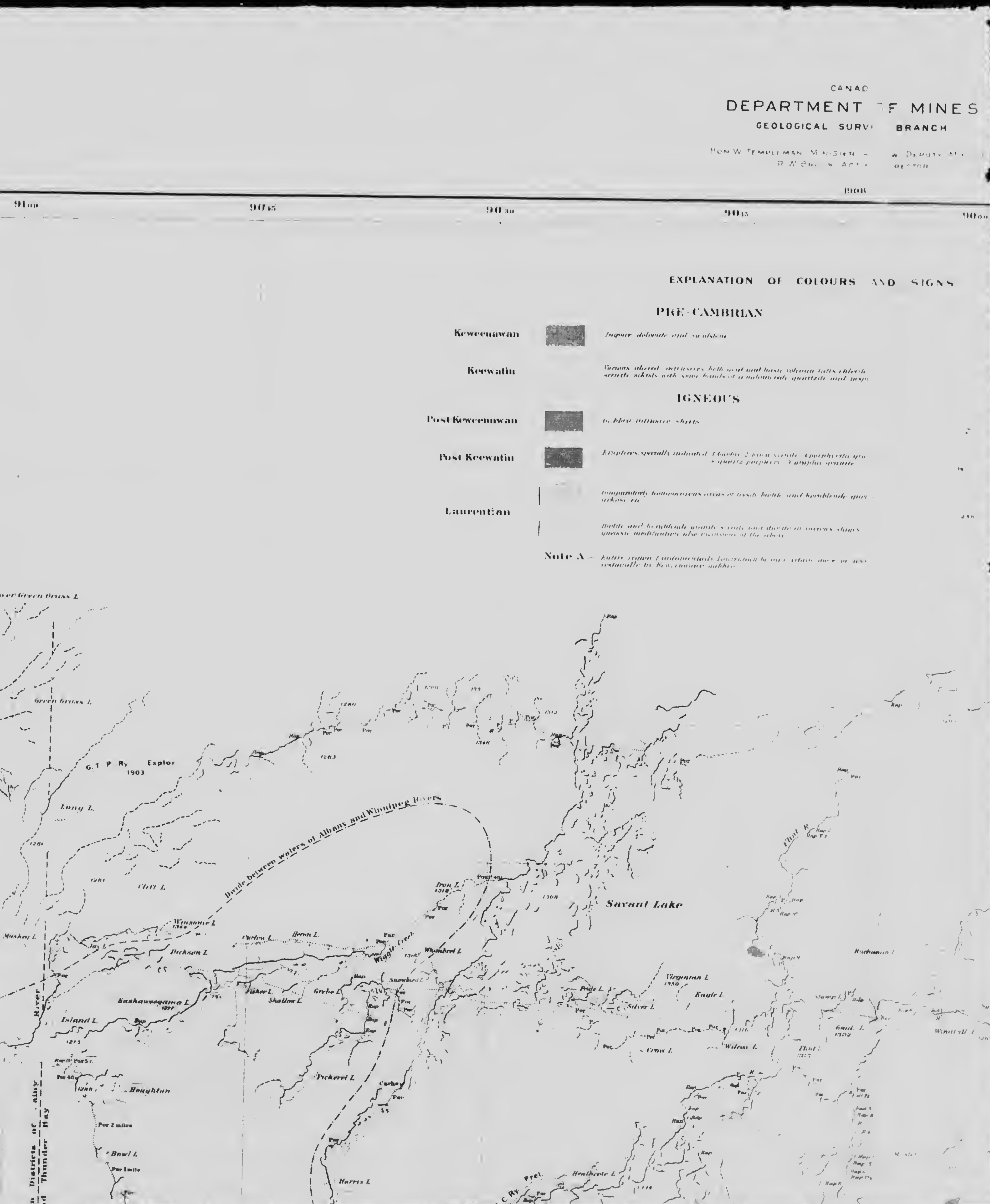
Preliminary report on the Limestones and the Lime Industry of Manitoba. J. W. Wells. 1905.
Preliminary report on the raw materials, manufacture and uses of Hydraulic Cements in Manitoba. J. W. Wells. 1905.
Preliminary report on the industrial value of the Clays and Shales of Manitoba. (Only a few copies available.) J. W. Wells. 1905.
Mica, its occurrence, exploitation and uses. Fritz Cirkel. 1905. (Only a few copies available.)
Asbestus, its occurrence, exploitation and uses. Fritz Cirkel. 1905.
Report of the Commission appointed to investigate the Zinc Resources of British Columbia and the conditions affecting their exploitation. W. R. Ingalls. 1905.
Report on the present and prospective output of the Mines of the Silver-Cobalt ores of the Cobalt District. Eugene Haanel. 1907.
Report on the Mining Conditions of The Klondike, Yukon. Eugene Haanel. 1902.

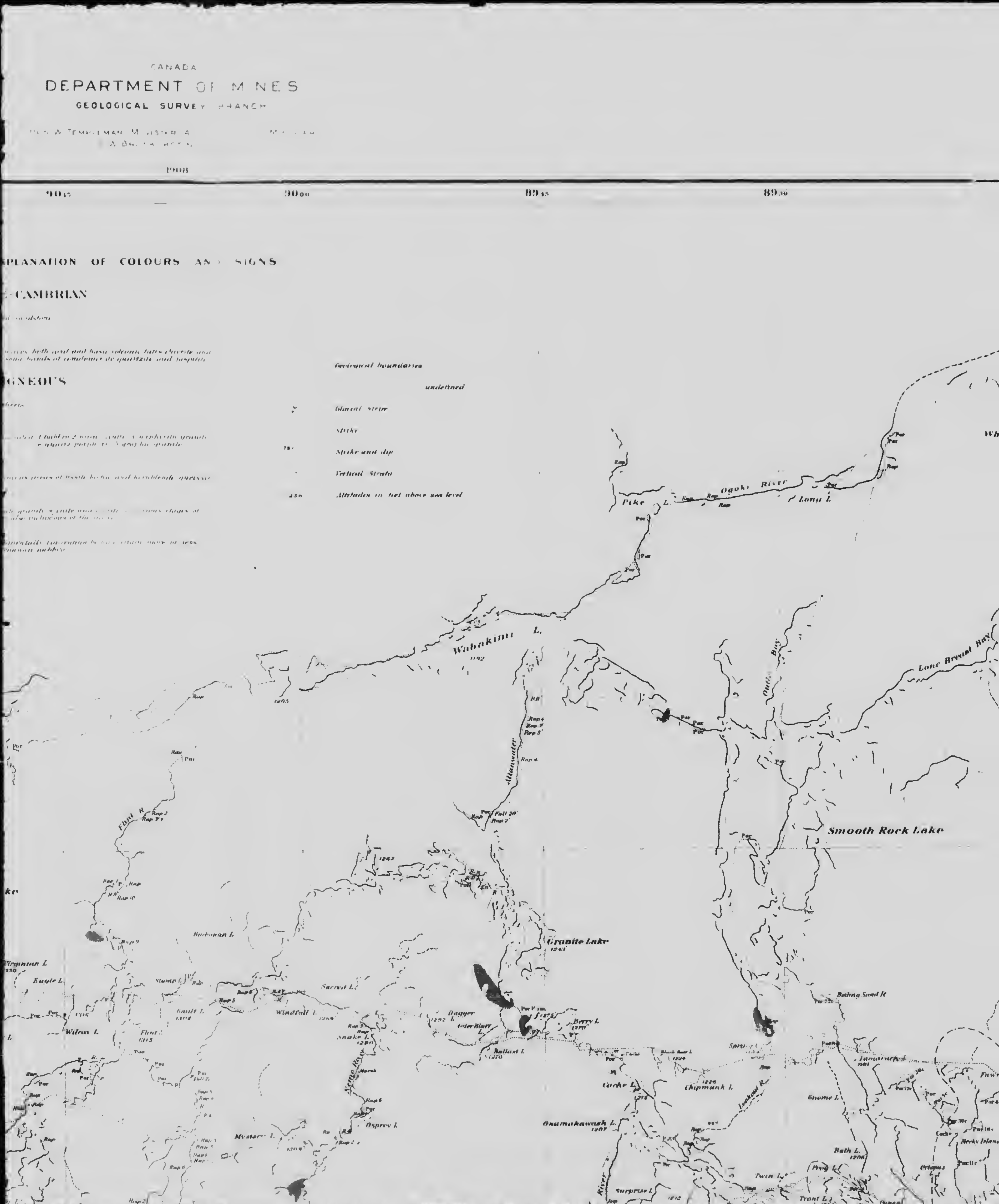
IN PRESS.

Monograph on Graphite. Fritz Cirkel.

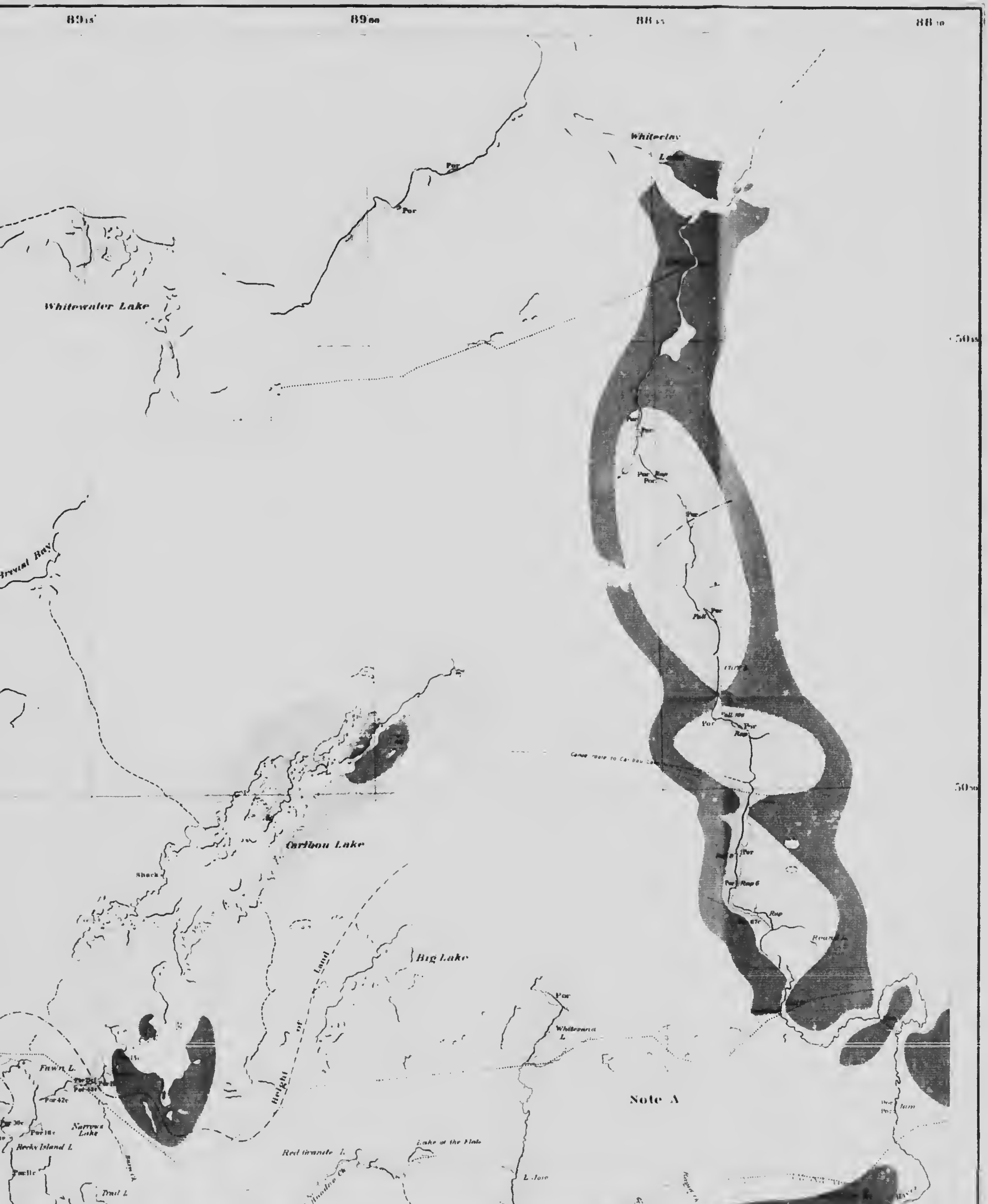


Geological Map
of a portion of
NORTHWESTERN ONTARIO
traversed by the
NATIONAL TRANSCONTINENTAL RAILWAY
between
LAKE NIPIGON & STURGEON LAKE
to illustrate report by
W. H. COLLINS, B.A.
1906
Scale 4 statute miles to 1 inch = 1/253,440
Miles
15 Miles
Ghost L.
Upper Green Grass L.
Ragged Wood L.
Abandoned
Location
G T P Ry
Moose L.
Summit L.
Muskeg L.
Richstone L.
Lewis L.
River
Dog River
Schist Lake


CANAD
DEPARTMENT F MINES
GEOLOGICAL SURV BRANCH
1908
EXPLANATION OF COLOURS AND SIGNS
PRE-CAMBRIAN
Keweenawan
Keewatin
IGNEOUS
Post Keweenawan
Post Keewatin
Laurentian
Note A
Green Grass L
G.T.P. Ry Explor 1903
Long L
Cliff L
Divide between waters of Albany and Winnipeg Rivers
Savant Lake
Winsome L
Dickson L
Wiggle Creek
Kashaweogama L
Island L
Houghton
Bowl L
Pickerel L
Harris L
Districts of Rainy River and Thunder Bay
Flint R
Buchanan L

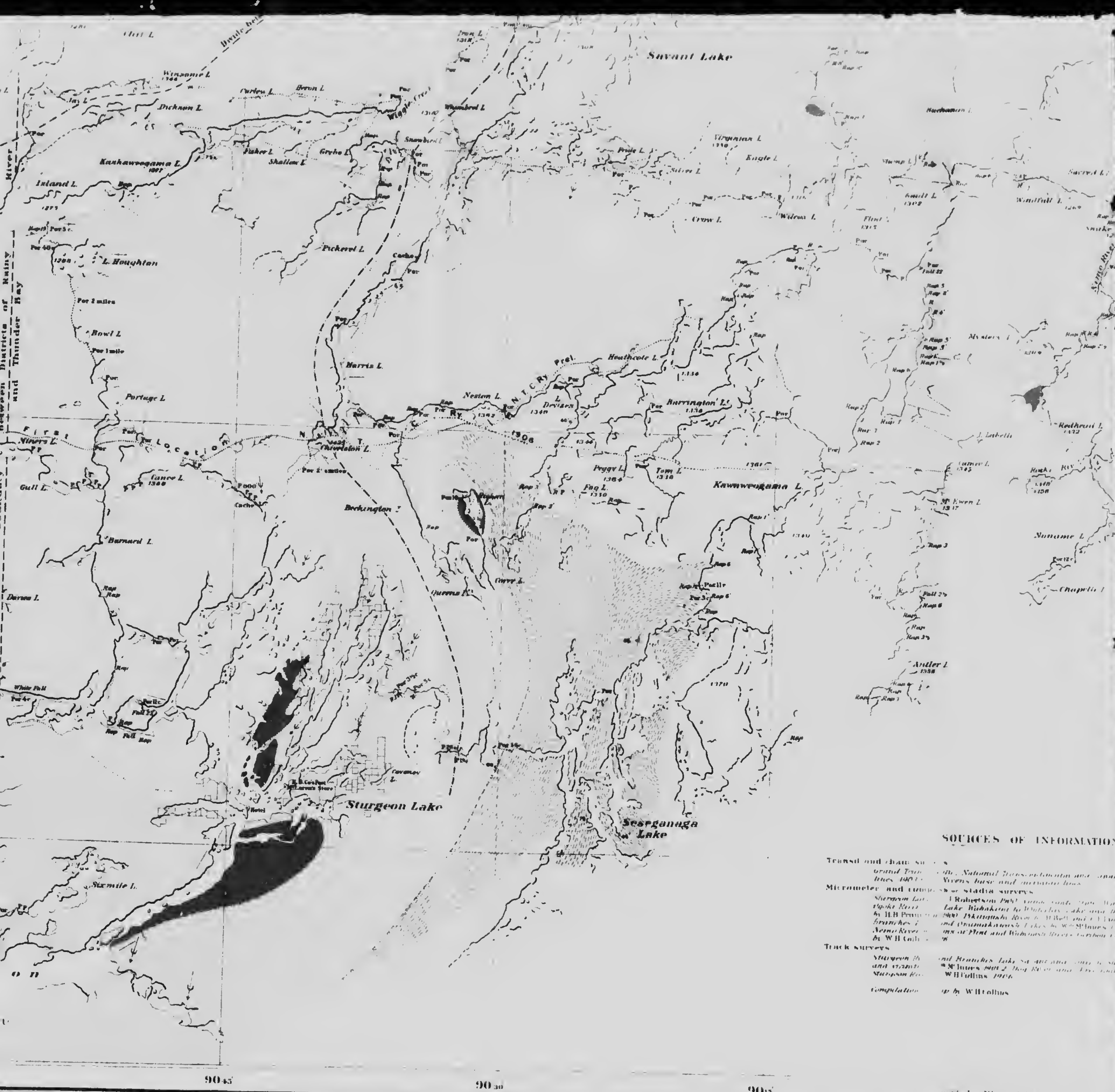


CANADA
DEPARTMENT OF MINES
GEOLOGICAL SURVEY BRANCH
1908
90°15
90°00
89°45
89°30
PLANATION OF COLOURS AND SIGNS
-CAMBRIAN
IGNEOUS
Geological boundaries
undefined
Glacial striæ
Strike
Strike and dip
Vertical Strata
Altitudes in feet above sea level
Pike L.
Ogoki River
Long L.
Wabakimi L.
1192
Lone Breast Bay
Allanwater
Smooth Rock Lake
Flint R.
Granite Lake
1263
Buchanan L.
Sacred L.
Windfall L.
Dagger L.
Otter Bluff L.
Ballast L.
Berry L.
Snake L.
Chipmunk L.
Cache L.
Gnome L.
Onamakawash L.
1207
Mystery L.
Osprey L.
Bath L.
Twin L.
Surprise L.
Trout L.
Frog L.
Baking Sand R.
Tamarack L.
Rocky Island
Virginian L.
Eagle L.
Wilcox L.
Flint L.
Stump L.
Sault L.

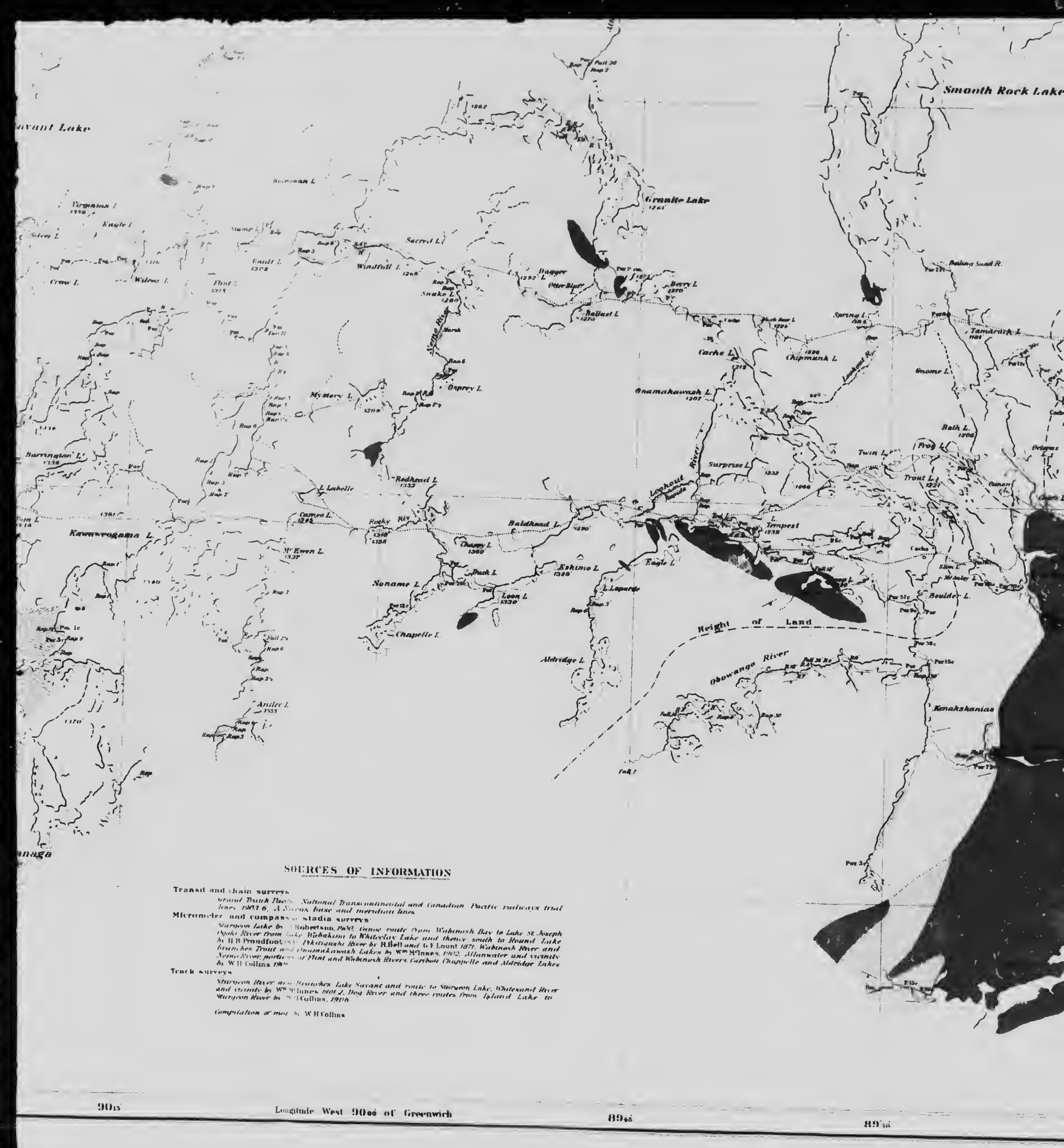


Whitewater Lake
Caribou Lake
Big Lake
Height of Land
Fawn L.
Narrows Lake
Rocky Island L.
Note A

C.O. Senécal ... Geographer & Chief Draughtsman



Savant Lake
Sturgeon Lake
Sesganaga Lake
Kashaweogama L.
Inland L.
L. Houghton
Pickerel L.
Harris L.
Portage L.
Bowl L.
Dickson L.
Winsome L.
Curlew L.
Byron L.
Fisher L.
Shallow L.
Grebe L.
Snowbird L.
Virginian L.
Eagle L.
Crow L.
Widow L.
Buchanan L.
Windfall L.
Mystery L.
Heathcote L.
Neston L.
Barrington L.
Devizes L.
Peggy L.
Tom L.
Fog L.
Kawaweogama L.
Redhead L.
Labelle L.
McEwen L.
Sonome L.
Chapelle L.
Antler L.
Burnard L.
Gull L.
Canoe L.
Bickington L.
Sixmile L.
Savant L.
First
Location
N. T. C. Ry.
Divide Between Districts of Rainy River and Thunder Bay
SOURCES OF INFORMATION
Transit and chain surveys
Micrometer and compass or stadia surveys
Track surveys
Compilation
90 45
90 30
90 15
Longitude West 90 00 of Greenwich



Smooth Rock Lake
Granite Lake
Sacred L.
Windfall L.
Snake L.
Dagger L.
Otter Bluff
Berry L.
Ballast L.
Virginian L.
Eagle L.
Silver L.
Crow L.
Widow L.
Flint L.
Gault L.
Mystery L.
Osprey L.
Redhead L.
L. Labelle
Cameo L.
Rocky Riv.
Baldhead L.
Kawaweogama L.
McEwen L.
Barrington L.
Noname L.
Duck L.
Loon L.
Chapelle L.
Antler L.
Eskimo L.
L. Laparde
Aldridge L.
Eagle L.
Lookout River
Surprise L.
Tempest L.
Onamakawash L.
Cache L.
Chipmunk L.
Spring L.
Lookout R.
Tamarack L.
Gnome L.
Bath L.
Frog L.
Twin L.
Trout L.
Boulder L.
Height of Land
Obowanga River
Kenakskanias
SOURCES OF INFORMATION
Transit and chain surveys
Micrometer and compass or stadia surveys
Track surveys
Compilation of map by W.H. Collins
90 15
Longitude West 90 00 of Greenwich
89 45
89 30

No. 993
Price 10 cents