National boundary: Basswood to Gunflint Lakes: [specimens] 6059-6155. No. 8 1883-08/1883-09

Chauvenet, W. M.
[s.l.]: [s.n.], 1883-08/1883-09

U. S. GEOLOGICAL SURVEY

FIELD SECTION BOOK

No. 8.

Aug. & Sept. 1883.

National Boundary
Basswood to Gunflint Lakes

H. M. Chauvenet.

6059 – 6155

Survey of the Pre-Cambrian Rocks of the N. W. States.

INSTRUCTIONS.

1. Ordinarily at least two pages of this book will be devoted to one section. On the left hand page place a map of as much of the section as has *actually been seen.* Denote rivers, lakes, marshes, etc., by the usual topographical signs. Denote the ledges of rock, when no structure is made out, by cross-hatching, making the cross-hatching cover as nearly as possible the areas occupied by the exposures. If the rock is a massive one, but still more or less plainly bedded, use the same sign with a dip arrow and figure attached, showing the amount and inclination of the dip. Denote slaty or other very plainly bedded rocks by lines running in the direction of the strike, with figures and a dip arrow attached as before. In all cases where there is the least doubt about the true bedding directions, indicate it by a query. To each exposure on the face of the map attach the number of the specimen representing it. In mapping the section count each of the spaces between the blue line as 100 paces, and twenty of these spaces as one mile, or 2,000 paces. Usually the southeast corner will be placed at the bottom of the page, or at the first black line above the bottom of the page, and at the right hand side. If, however, for any reason, it is desirable to show portions of an adjoining section, the southeast corner may be shifted up, or the map may be turned around and the north placed at the left hand side of the page.

2. On the right hand page place the notes descriptive of the exposures. Begin in each case with the number of the specimen, placing the number on the left hand side of the red line, after which give in order on the right of the same red line the position of the ledges as reckoned in paces from the southeast corner of the section, and the dip and strike when observable, for instance: 4025 | 250 *N.*, 300 *W.*, *Strike*, *N.* 6° *E.*, *Dip*, 50° *E.* Then follow with as full a description of the ledge as possible.

3. The ruling of the left hand page is also arranged so that a smaller scale can be used. Each one of the black lines may represent a section line and the red lines quarter sections and "forties." The scale of the maps may thus be reduced, if desirable, to two inches to the mile (the ordinary town plat scale.)

4. Collect a specimen from each separate ledge of rock, or wherever there is a change of rock on any one ledge. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be sampled, the position and extent of the ledge being marked on the map, with a note that it is of a rock identical with specimen so-and-so. Under the same conditions small sized samples, trimmed to a uniform size of 2x2½x¾ inches will be allowed, but in all other cases *large sized specimens*, trimmed to a size of 3x4x1 inches, must be selected, in accordance with ¾ 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. In all cases collect chips for slicing. All specimens are to have numbers painted on them, in white on a black background, in the field.

5. On the last twenty-five pages of the book give, as may seem desirable, a general account of the examination of the region mapped in the previous pages, correlation of observations, sketches, cross sections, etc., etc.

6. Forward this note book, as soon as filled, as registered mail matter, to R. D. IRVING, U. S. Geologist, Madison, Wis.

#8

International Boundary Line
Basswood to Gunflint Lakes.

Note book #2. (Chauvenet)

Beginning with the Portages
between Knife Lake and Basswood
and going through Gunflint
to South Lake including
the N. Lake beds.

To Sept 5th

Notes by W.M. Chauvenet
August. September 1883

This book covers that portion of the trip from Basswood to South Lake and contains the following towns or portions thereof.

T	65	- R	8 W
"	65	- "	9 W.
"	65	- "	10 W.
"	65	- "	7 W.
"	65	- "	6 W.
"	65	- "	5 W.
"	65	- "	4 W.
"	65	- "	3 W.
"	65	- "	2 W.
"	65	- "	1 W.
"	65	- "	1 E.
"	65	- "	2 E.
"	65	- "	3 E.
"	66	- "	6 W.
"	66	- "	5 W.
"	66	- "	4 W.

Between Knife or Mo-ko-man Lake and Basswood Lake - following the river course - are six portages. On either side the little stream at times crossing its bed - at times rising in low hills on either side and extending back some distance are the continuous slate quartzite formations of the east end of Knife described in Book #1.

The shore line between R 8 W. and Basswood Lake ~~can~~ in 10 W can not be drawn but all of this westward passage is in - and probably along the strike of - the great slaty quartzite formation

6059 is a thin bedded slate from East end of Tucker portage Canada. It dips 85° S. being almost vertical and its cleavage planes strike N 60° E It shows a slight cleavage or tendency to cleavage at right angles to this S.E. & N.W. with a dip on such joints of 45° N.E. Pyrites is also seen at times on these joints

T. R.

Can not put in Sucker Lake as maps are erroneous.

6060 A schistose looking slate from near middle of Sucker lake - striking N60°E with a sample.

6061 to show its joints and weathering which has all along characterized the slaty group. The top in place is marked with red in sample

Basswood lake begins in S.36-65-9W and on the East side of S.36'

6062 - juts into the lake and can not be distinguished from the many samples heretofore seen in this quartzite slate group. (Felsite perhaps)

6063. Immediately across the bay in S.2-64-9W. - the granite begins to show on the low points and seemingly without any defined bedding or jointing or other definable features. 6063 shows this granite which differs from true granite and is Syenitic the black mineral supposed to be Hornblende The name granite will however be used.

Gray in appearance.

6064 Immediately N. of it as the point

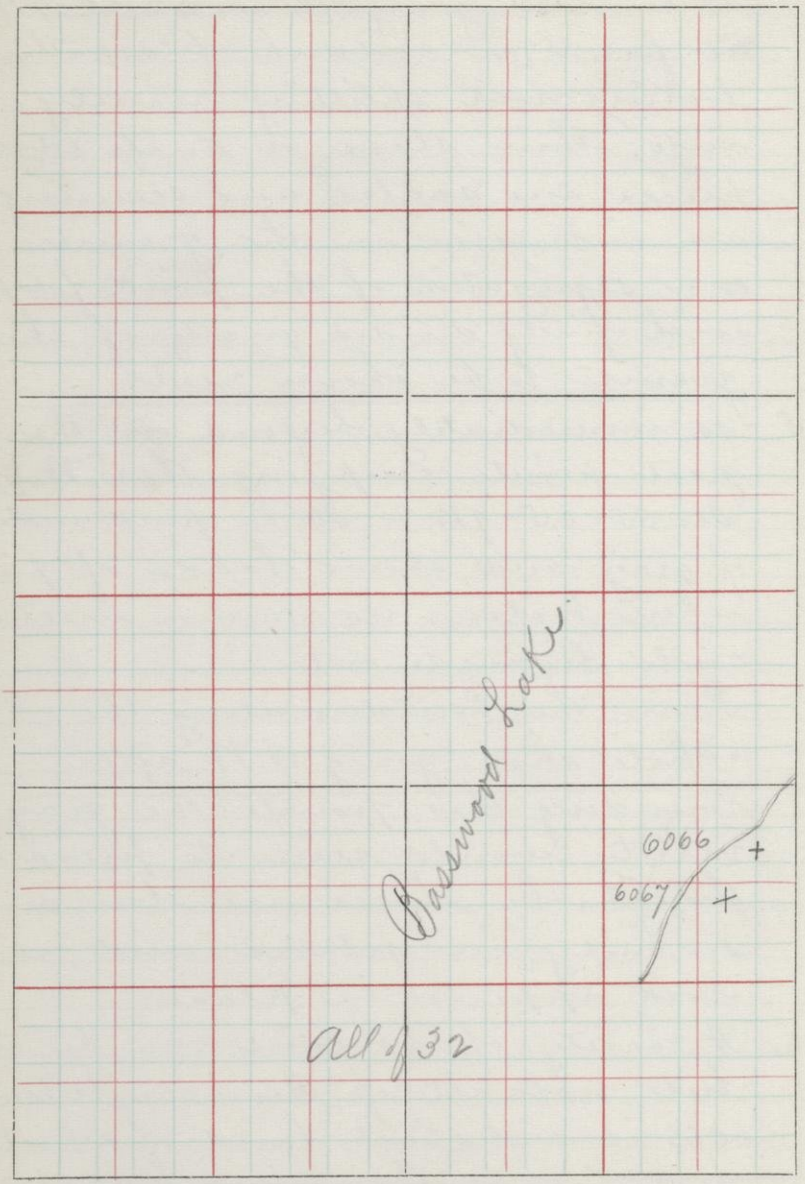
is rounded going N. in S2-64-9W. is found a reddish felaspathic looking rock splitting readily into thin slabs or knife edged pieces and scales and seeming an intrusion in the granite or a segregatim of the pink felspar with finely divided quartz of the granite to be shown next.

6065 – is immediately beyond on the great point occupying the S.W. 1/4 Sec. 35-65-9W. – It is pink instead of gray and shows bands of pink when broken – no common direction could be made out.

From the boulders along the whole shore going S.W. after rounding this point – the gray variety would seem to prevail though the shores are low and swampy in places and no rock appears in place.

6066. A variety of boulders can be seen but not all of them can be traced 6066 is a distinct band of schistose material in the pink (6065) variety of the granite

Sec 32 T. 65 R. 92.

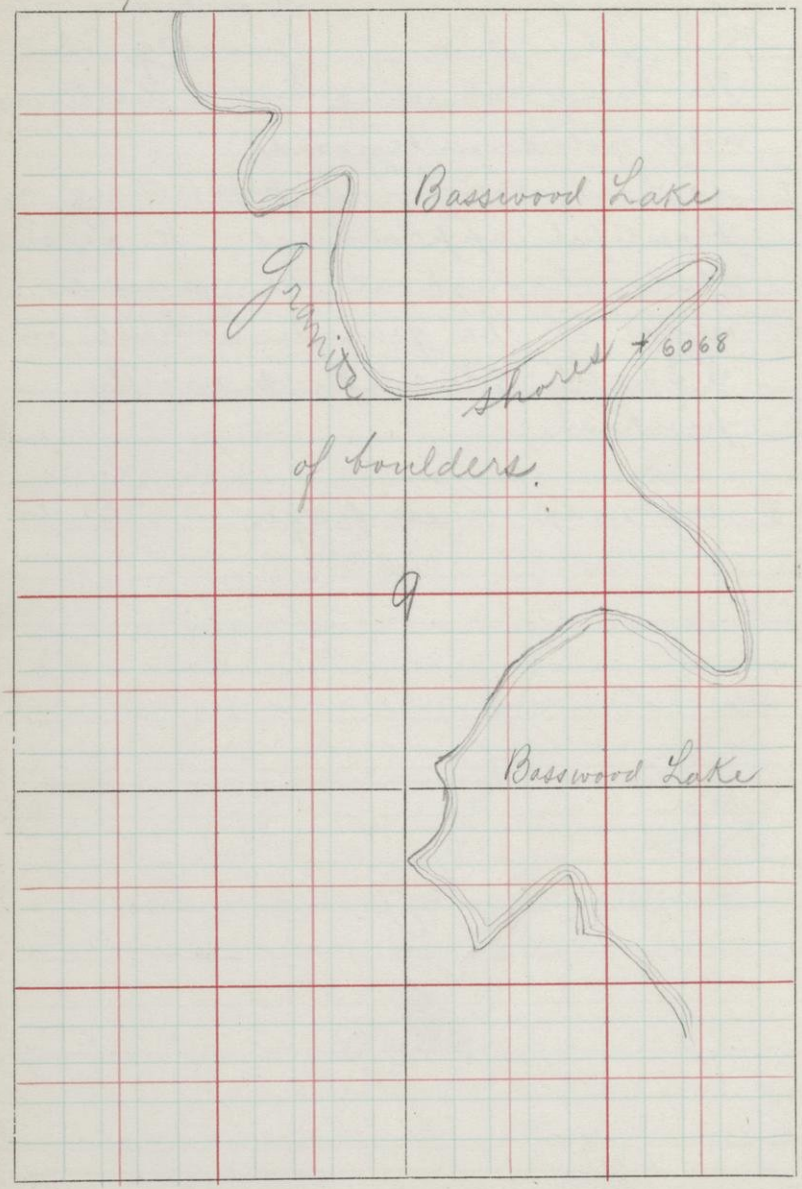


It is thus in place
Granite=g. Schist=s
The sand extending but a little way and not seen beyond.

6067 is here also found presenting a beautiful appearance. It is in spots throughout the ~~granite~~ mass of the granite which in S. 32 - 65 - 9 W. S.E.¼ is mostly pinkish

6068 see map next page.

Sec 9. T. 64 R. 10 W.



The granite occupies the whole area of Basswood lake in T's 64+65 R's 9+10 W.

6068 Taken in sec. 9-64-10 W. the most westerly point reached. Paul Morrison says the rock changes to a talcose slate at Pipestone falls. S of T 63-11 W. But time was not ~~sufficient~~ to visit this region

(not certainly in place)

6069 A granite with ? black mineral From Canadian soil on one of two small points opposite and directly N. of Sec. 5-64-9 W. a granite with very white fracture.

6070 The dividing line between the granite and the great quartzite group of Knife lake can be found in S. 1-64-9 W. ~~from this eastward to the little stream coming from S~~ [This is as near as the maps in my possession enable me to come - A meander corner on Basswood lake was found in S. 35-65-9 W. from this eastward to the little stream coming from

no bearings could be found.
On the Canada side at the point of contact the following may be seen. The gray quartzite lying against under and over the granite in strange confused masses

The different rocks are blended not divided by distinct lines as in the sketch. The confusion continues for 30 or 40 feet at this place, when on the east the quartzite slightly speckled prevails and on the west the granite - The granite seems influenced for many miles westward by blotches and inclusions of the green quartzite. The quartzite not at all affected after a few hundred yards.

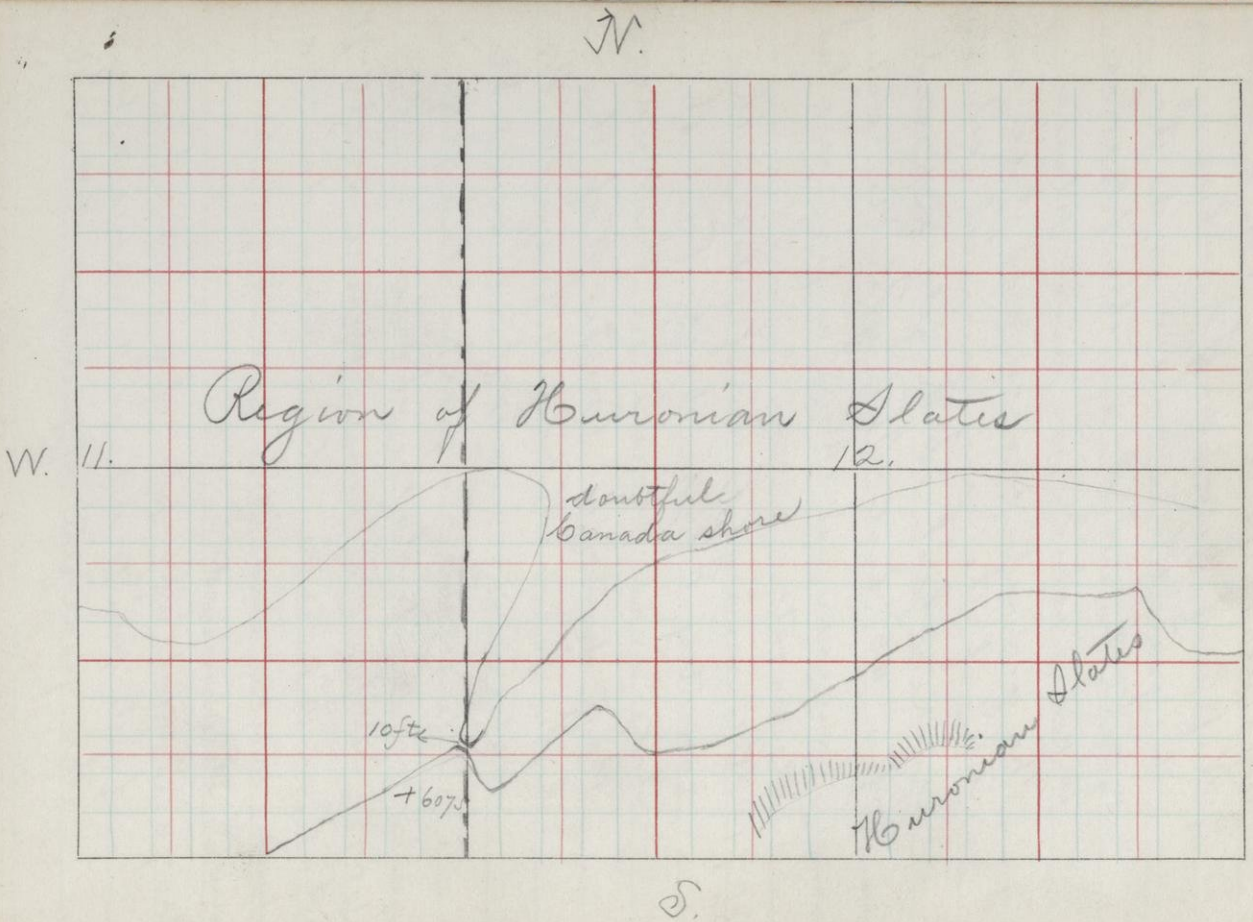
6070—shows a piece from this place giving an excellent idea of the blending of the two rocks and illustrating the above sketch.

This place is directly N.E. or a little N. of E. of S. 2-64-9 W. where again the granite is mixed with the quartzite which in this place is like a schist in most places. The granite covers and lies on top of the gray greenish schistose rock, which is largely exposed for 40 feet. The granite coating however is thin a few inches at most.

6071 Returning to Knife lake - the country 1 mile back from the lake was crossed on the Hudson Bay portages. 1 mile N of the lake for 6 or 8 miles from its W. extremity was thus seen. It differs in no particular from the Knife lake shores.

(6072 not a Basswood sample) Is from a point opposite S 2-64-9 W. and ½ mile N. in Canada. The strike and dip could not be determined

6073 Final sample of granite from first point where it appears beyond the quartzite. opposite 2-64-9 W.


N.
Sec 11-12 T. 65 N. R. 7 W.
Scale 1/2.
Region of Huronian Slates
W.
11.
12.
doubtful
Canada shore
10 ft.
+607
Huronian Slates
S.

6074 Final sample N. of quartzite to show some of its coloring as it mingles with the Basswood granite opposite S. 2-64-9 W.

Going E. from Basswood to Paganaga Knife lake lies wholly within the slaty quartzite group the limits of which E. & W. as fixed by this crossing are as follows

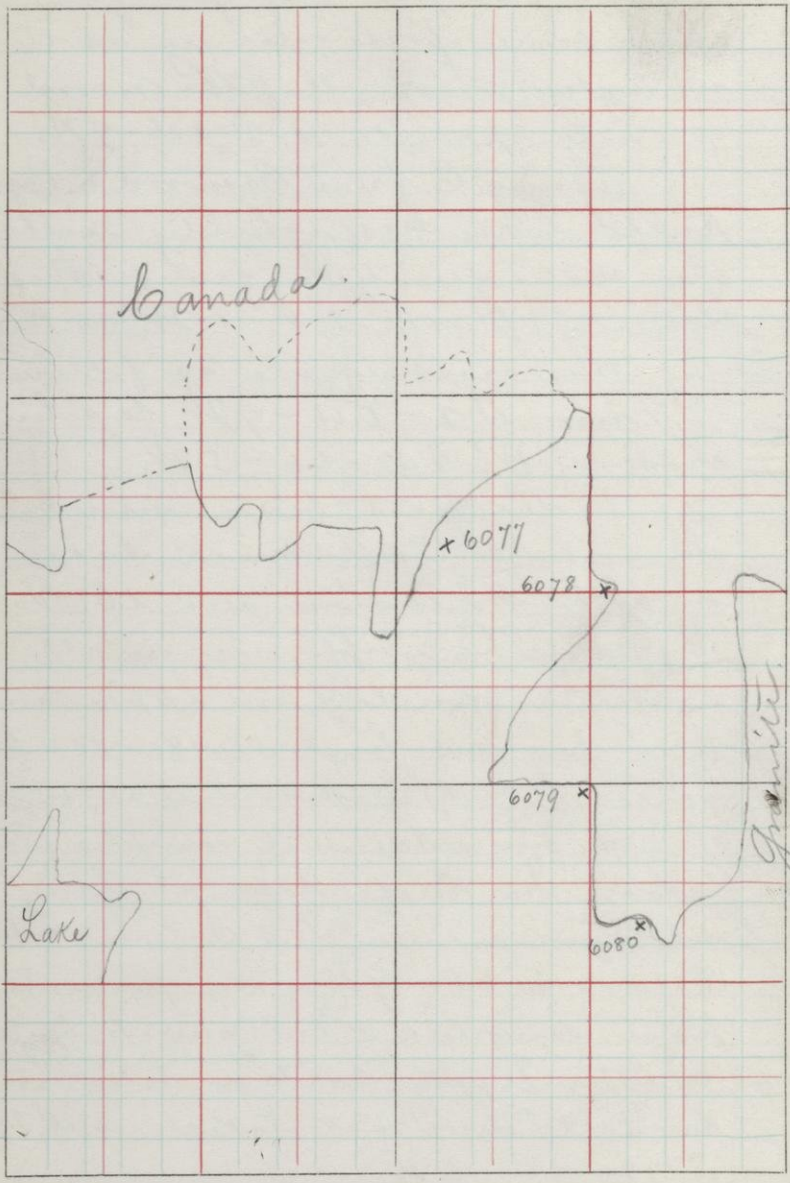
From S. 2-64-9 W. to a line crossing W½ S. 32-66-5 W.

The great beds continue throughout Otter Track lake on both Canadian and U. S. shores. The cliffs are in all respects similar in appearance and present high 50-80-100 ft. faces of broken down walls.

A few additional samples were
6075 taken. In Knife lake at the meander corner N. & S. line between S. 11 & 12 T. 65-7 W. see opposite page. sample = 2 contiguous layers
6076 At Otter Track portage between Knife & Otter Track lakes in S. W. ¼ S. 32-66-6 W.

As the granite of Big Paganaga

Sec 24 T. 66 N. R. 6 W.



is approached from the west in making the portage between Otter Track and North Western branch of Saganaga lake an intermediate rock is crossed. It weathers a dark brown but when fractured shows 1st that the brown weather color extends 1/4 inch from the surface exposed. 2nd that the rock is a pale greenish gray in mass

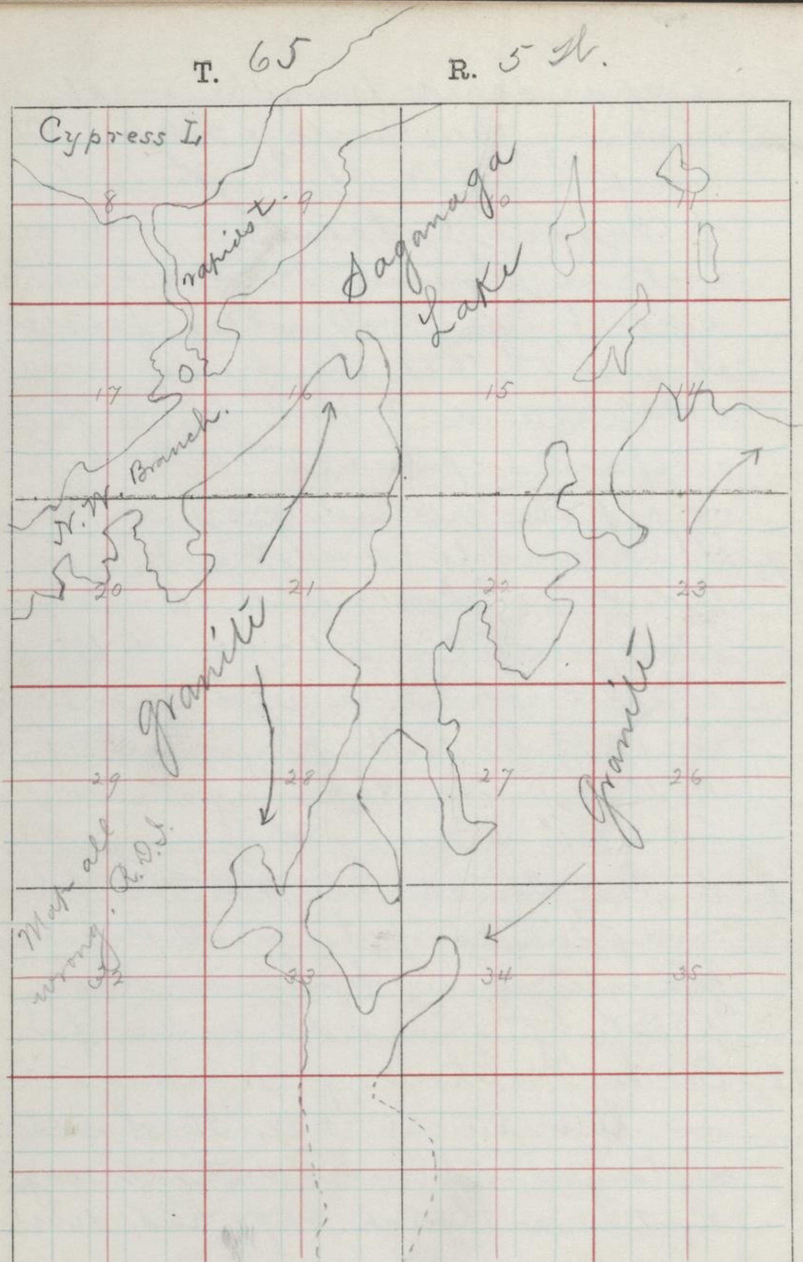
6077 This sample (sandstone) was taken at the E end of a small lake center S. 24 - 64 - 6 W. This location is just 1/4 mile west of the S.W. projection of the N.W. branch Saganaga lake.

On entering Saganaga in E 1/2 Sec. 24 - 66 - 6 W. the following modifications of the great Saganaga granite were found in three points lying in order named from W to E

6078 On the W. shore of Saganaga lake in Sec. 24 - 66 - 6 W. It shows a larger and more distinct crystal= =lization as though 6077 had developed a coarser grain.

6079 - a granite-like rock showing large

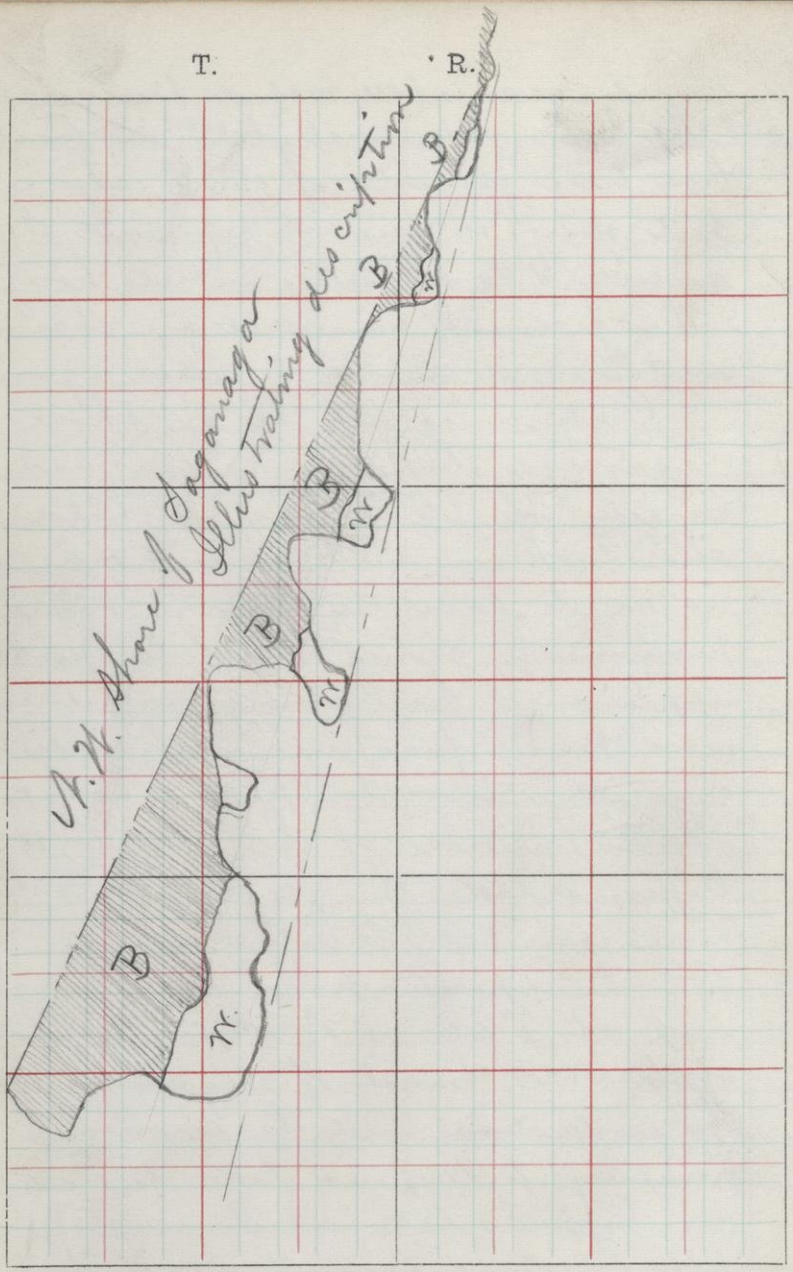
T. 65 R. 5 W.



Cypress L.
8
9
10
11
rapids
17
16
15
14
Saganaga Lake
N. W. Branch.
20
21
22
23
granite
29
28
27
26
granite
Map all wrong. R.D.S.
32
33
34
35

quartz grains (see map on preceding page)
6080 The rock differs slightly in fracture
from true granite of the E. shore.
but may be said to represent the
granite & to be fully in its horizon
The greenish minerals are character=
=istic and will be seen again
Continuing up the N. shore of
6081 Saganaga lake - a rather odd
variety of it seems to hold the
shore shown in 6081 weathering
so as to have the quartz grains
prominent giving a white speckled
-appearance but giving a greenish
-and brown fracture with indistinct
crystallization - Sample was taken
about 1 mile N of the outlet to
Cypress lake the great arm that
runs around Hunters island
On the opposite page is a rough
map of T 66. - 5 W. that the location
of the N. W. branch of Saganaga may
be understood and the erroneous
mapping of Cypress lake be shown
Cypress lake which is the
main water course to the N. W.
no course - no water whatever going.

T. R.



from Saganaga to Otter Track.

lies wholly in the Eastern end at all events in the great slaty quartzite formation of Knife & Otter Track lakes. The extreme S. E. points are in the granite which is not yet clearly defined but is largely a quartzite white and brown as shown hereafter.

The N. shore of Saganaga was followed 5 or 6 miles N. E. with interesting results. For two miles the light quartzite holds the shore (6081)

6082 At this point is seen to hold the upper part of a cliff the base of which projects into the lake. This base rock is black quartzite shown in 6083.

6083 – This point is the first where the great black quartzite of Knife & Otter Track touches Saganaga as it drifts against the granite and interesting phenomena of the line of contact are here exhibited

6084 Shows a case where the white & black quartzites join and this is to be found for long distances.

the shore line presenting a rusty red front at water level and receding to the high black quartzite hills further back from the lake. Sometimes clear quartz as in sample
6085 is seen largely exposed while further back from the water
6086 a dark greenish quartzite rises prominently. As the lake runs N. E. the whiter varieties become less frequent holding only the most prominently E. projecting points (see opposite page) and the black hills present cliffs to the lake front in all respects similar to the Otter Track exposures. The absence of the distinctly slaty beds and fracture being noticed.
(W. = white beds B. = black.)
6087 was taken from the main black black formation back some distance from the lake, it differs much from the Knife Lake rock and here rises in domes 100 ft. No strikes or dips indicated here or anywhere along the granite formation now about to be entered

R3

Turning Southward we now enter the long southwest arm of Saganaga which lies in T66-5W. terminating in Red Rock Lake (a misnomer) in T65-5W. Sec 4). The whole of this arm lies in granite.

6088 taken in Sec. 22-66-5W. near N.W. corner on W. shore.

6089 resembles 6081 and was taken further south in Sec 33-66-5W. on W. shore

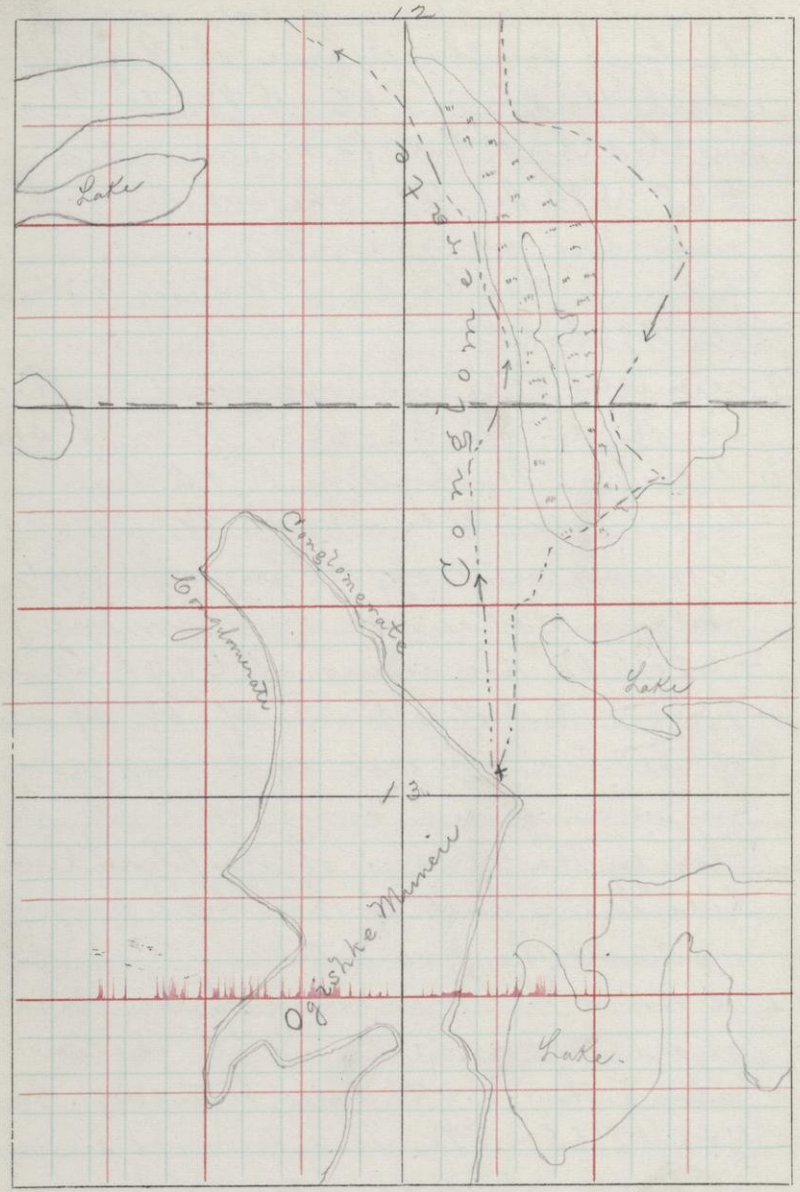
6090 taken on W. shore on N. & S line between Sec's 4 & 5-65-5W.

6091 Coming out of Saganaga into Island lake we find in Sec 7-65-5W. an island of 6091 which proves to hold part of W. shore of this lake to mix with the granite in a confused way but it is clearly the N. end of the Ogishkemunci beds to the east of that lake projecting against the granite.

6092 Shows the mingling of the black quartzite & granite as it occurs along the N & S. line between Sec 7 & 8 T65-5W. This town is surveyed and not platted yet.

6093 shows the greenish quartzite now

Sec 12 & 13 T. 65 R. 6 W.



entered in W. Gull lake – This sample was taken at the meander – witness Corner between Sec. 17 + 18-65-5W on S. margin of lake. Approaching Ogishkemuncie we cross the town line and come into T 65-6W. here in Sec. 13. we find a small stream running out of Ogishkemuncie up which we portage. As expected we cross the calcareous group. which can be found crossing the stream near halfway between Ogishkemuncie and Town line Lake = 6093A.

6093A

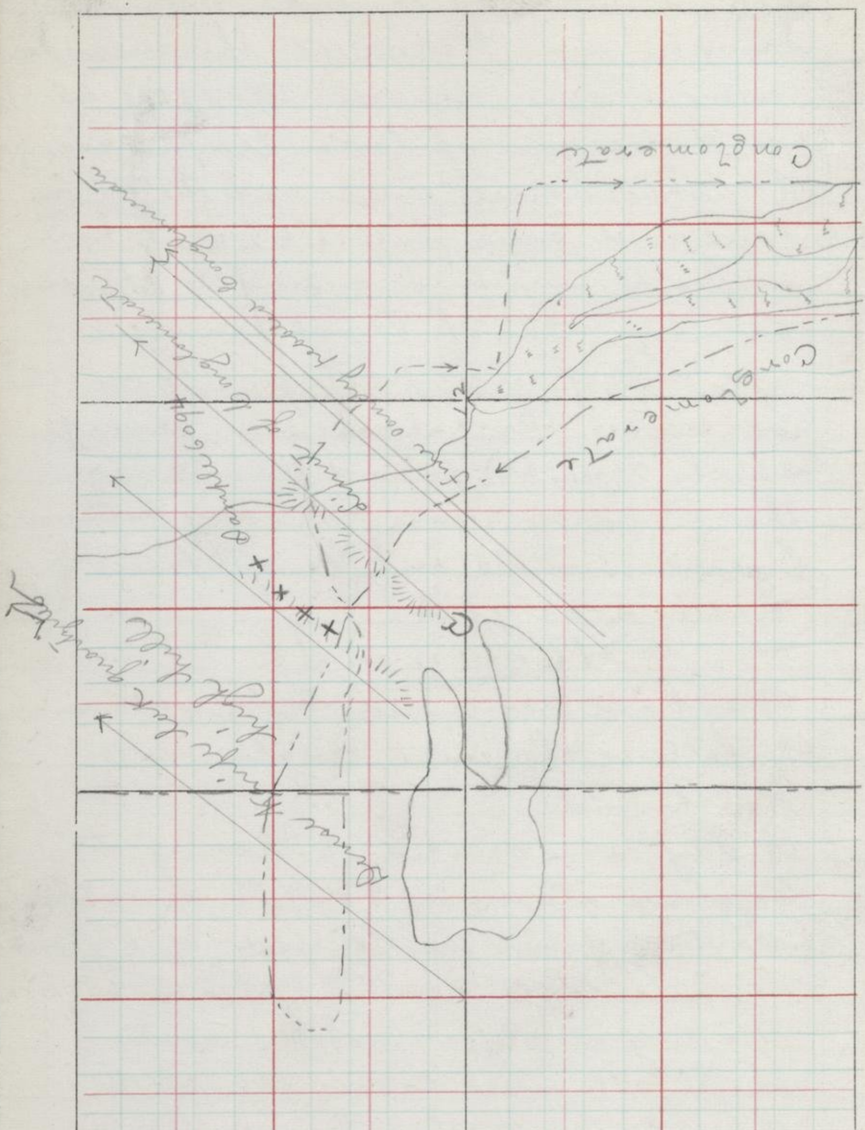
Resumé

We have returned to Ogishkemuncie to follow the great conglomerate Northward.

A day was devoted to tracing the Conglomerate in a N + N.W. direction starting from the N end of Ogishkemuncie lake in N.W. 1/4 Sec 13-65-6W.

Starting at A (see map) a route directly N. was taken then N.W. through Sec. 12. then W. into Sec 11. and back eastward across Sec. 12. then S. to Sec 13. + the starting point. The route.

Sec 11 + 12 T. 65 R. 6 W. Turn page



is indicated on the two maps.

The conglomerate was distinctly green with jasper till Sec 12. when it began to show less jasper - assume a general drab color. and at the N.W. course was preserved became sandy resembling sample 6044 (see N.B #1.) and at the "C" line where a deep valley divides it from the rocks beyond it ceases altogether.

Continuing N.E. we examined the whole of the shore of Island Lake. S. 4 & 5 - 65 - 5 W. (surveyed & not yet platted) and as has been shown followed the W. shore of the S.W. branch of Saganaga without encountering the conglomerate again. We conclude therefore since the granite begins at once in T 66. - 5 W. certainly in center of Sec 32. & N. of this that the conglomerate lies along this margin terminating in a point between the Otter Track quartzite & slate on the N.W. & the granite after entering S. 19 - 66 - 5 W. and abutting against the granite along the W. shore of the S.W. branch of Saganaga. It must

T. R.

Sample 6094 shows a faint speckled appearance due to the red jasper inclusions become almost microscopic - The influence of this jasper seems confined to the N. limit of the conglomerate.

The line between the conglomerate and the Huronian slates of Knife Lake is shown by no definite contact but by gradual transition by a variety of fine grained sandy conglomerate.

then cease in Secs 29-30-31-32. even if it does not cease before entering T 66 R 5 W. at all. It would be a serious undertaking to follow its limits in this burnt country. The trip here described brought me out in rags, and as no section lines remain - the work would be unsatisfactory as to its results.

The trip described in (N. 13 *1) to Sec. 22-65-6 W. together with the entering of Sec. 22. and Sec. 15 from the West ends.

6094 - The rock just beyond the N. conglomerate limit of Knife Lake sufficiently defines the N. line of the conglomerate in this town viz:-

Through S.W. 1/4 Sec. 28. - N.E. 1/4 Sec. 28 - S.W. 1/4 Sec. 22. - N.E. 1/4 Sec. 22. through Sec 14 - from S.W. corner to N.E. corner - S.W. 1/4 of Sec. 12. - N.W. 1/4 Sec 12. - Sec 1. -65-6 W. into 66-5 W. Secs. 30-31.

How far south it continues must be hereafter determined - Its S.E. limit is the N.E. shores of Ogishkemuncie, Lake.

The great Quartzite Slate beds W. of Conglomerate extend, generally, as follows. E. & W. lines.

The E. line crosses Sec. 28-65-6 W. striking N.E & S.W. or more definitely N 40° E - S. 40° W through N.W. 1/4 Sec. 22 S.W. 1/4 Sec 15. N.E 1/4 Sec 15 - S.W. 1/4 Sec 11 S.E. 1/4 Sec 2. - N.W. 1/4 Sec. 36-66-6 W. S.W. 1/4 Sec 25 centre of Sec. 24. - crosses the extreme E. point of Hunters Island, and comes out upon the N.W. shore of Sagangaga lake about 2 mi. N.E of the exit of the river flowing into Cyprus lake. Its W. line was crossed in Basswood lake as shown in first part of this book in Sec. 2-64-9 W. and followed 1½ miles N.E. in contact with the western granite range of Basswood lake.

Coming E. from Ogishkemuncie

we enter a town 65-5 W. of which we have no plats.

The greenish range. 1st mentioned as lying S.E. of the slate in Ogishkemuncie and first sampled in 6030 continues through town line, lake, and as has been shown (this book) is seen projecting N. into the granite area. on an island in Island lake in Sec 7-65-5 W. The whole of Island lake (called W. Gull lake by some) E. of this located greenish quartzite is in granite 1st seen on the E. & W. line between Secs 8 & 17

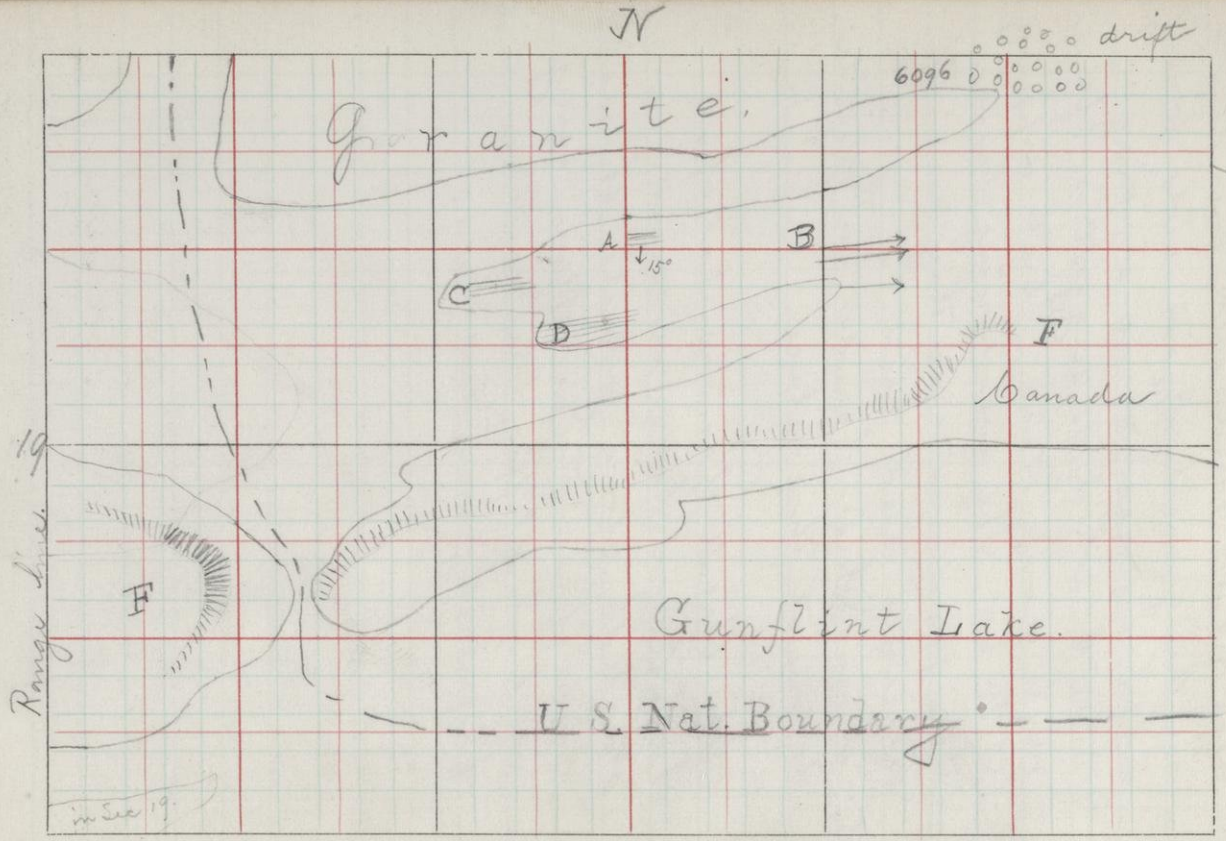
The whole of Sea Gull lake is in a granite basin and the granite probably extends far South. though where it crosses our route through T 64 Rs 1-2-3-4-5 W. is not understood though seen again on Mesabi Heights - southward.

On an island in Sea Gull lake at Witness corner on N. & S. line

Secs 10 & 11 - bands were found.
in the granite 3/4 in. wide forming
when exposed veins striking
N 40° E. which is suggestive of our
next group West. But dipping
S. W. 60° The weathering leaves
these prominent as they are
siliceous and hard.

6095 - shows these bands in the granite
taken at this place.

The Great Peninsula of
Saganaga lake is now
skirted along granite shores
of uniform type often rising
in high cliffs but more
frequently in ledges.


N
drift
6096
granite.
A
15°
B
C
D
F
Canada
19
Range Lines
F
Gunflint Lake.
U.S. Nat. Boundary
in Sec 19.
S.
Sec 19 T. 65 R. 3 W.

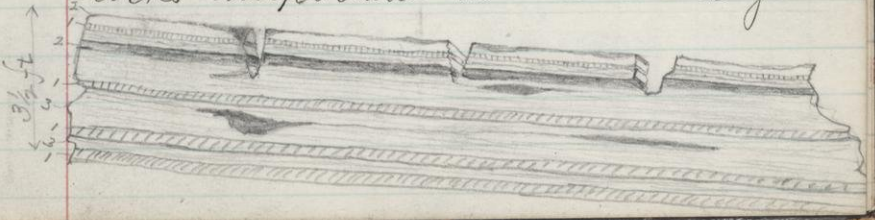
Gunflint Lake.

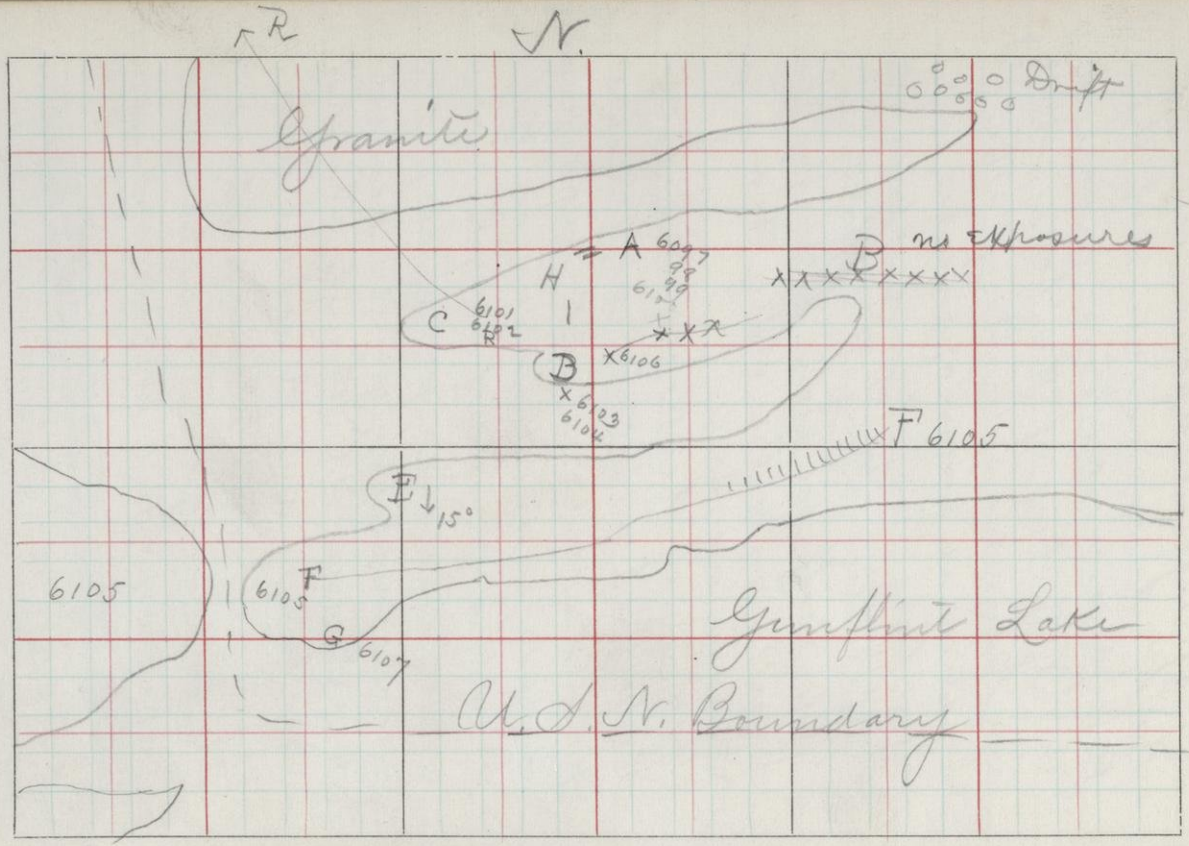
The first examination of the Gunflint rocks was made on the N. W. bay of the lake wholly in Canadian territory. The location is given opposite.

The long bay lying almost E & W. lies along the division line will be seen between the granite and the slaty bed containing Iron.

Following the N. granite shore the E. end marked drift was passed. and no rock was found in place in this area. of boulders - most of which were granite many quartzite.

6096. Is a sample of granite nearest its extreme S.E. limit. The shore was followed to A where the first rock in place exposed the following section. Animika Rocks important as nearest the granite




R.
N.
Granite
Drift
no exposures
A
B
C
D
H
6101
6102
6103
6104
6106
6107
F
6105
E
↓15°
S. 19
Gunflint Lake
U. S. N. Boundary
S.
Sec 19 T. 65
R. 3 W.

The strike of this section is E. & W.
dip 15° S. (verging to N. in general trends)

6097 The black bands are banded red jasper as shown in 6097 marked "2

6098 – 3 in 6098. The ▭▭▭▭▭ bands marked thus are iron ore more or less lean, and finely banded with the bedding. Of the whole = 6098 = ¼ in.

6099 The slaty layers are more or less decomposed, show brown and dark bronze weather bands and at times dense quartzite material 6 to 8 in.

6100 The lower member is dense hard rock, not easily got at and not splitting at all, into layers It may be more than 5 in. thick but it shows a distinct ledge of that thickness but probably is not the lower member of the group, the next being below water and doubtless the group accounts for the deep bay

The top of this slaty or iron group, could not be seen but at C the layers just above it not 50 ft certainly appear

6101 shows the lower member here (at C)

T. R.

6104-A appears at A. is very strongly magnetic and apparently below 6104 - The jasper is here again seen is in fact common to all these layers at A - B - C.

6104-B taken at B showing iron

6102-B A second specimen of this siderite looking mineral

At greenstone layer at R. interbedded in the quartzite probably 30 ft thick is porphyritic and is perhaps the same as is found on the island at I on the map.

exposed. It is a granular siliceous gray rock. showing iron in places and red streaks of the oxide of iron probably siderite (?)

6102 Immediately above it lies a
6102 A) lighter granular rock with
above 6102) uneven bedding showing a speckled appearance of brown at

6103. At D the beds continue upwards and overlie giving at 6103 a banded quartzite with twisted band lines above this

6104. A dense quartzite with coating and inclusions of iron.

6104A Ore (magnetite)

At E. the same beds continue giving
6104 B. accurate and satisfactory readings
Strike E. & W. - dip 15° S.
These readings were verified when the sun appeared an hour later.
The needle being acting badly near the rocks but not being influenced in the bay.

At F. F rises 100 ft a great wall of
6105 showing a broken down face of massive rock. upon which no satisfactory readings could be made

T. R.

6107 A is a porphyritic greenstone from island in Big Bay on N. shore of Gunflint just at the W. end of schist beds as seen on shore

6107 A is changed to 6155

The blocks on the crown have a dip of 15° to the N. but were not evidently in original positions It is a greenstone with rather coarse fracture.

In the slaty group the red jasper varies in thickness and is seen in concretions and knots about which the bedding planes are bent out of their course as shown in 6106.

6106 The jasper varies in color from a deep lake to brick red color.

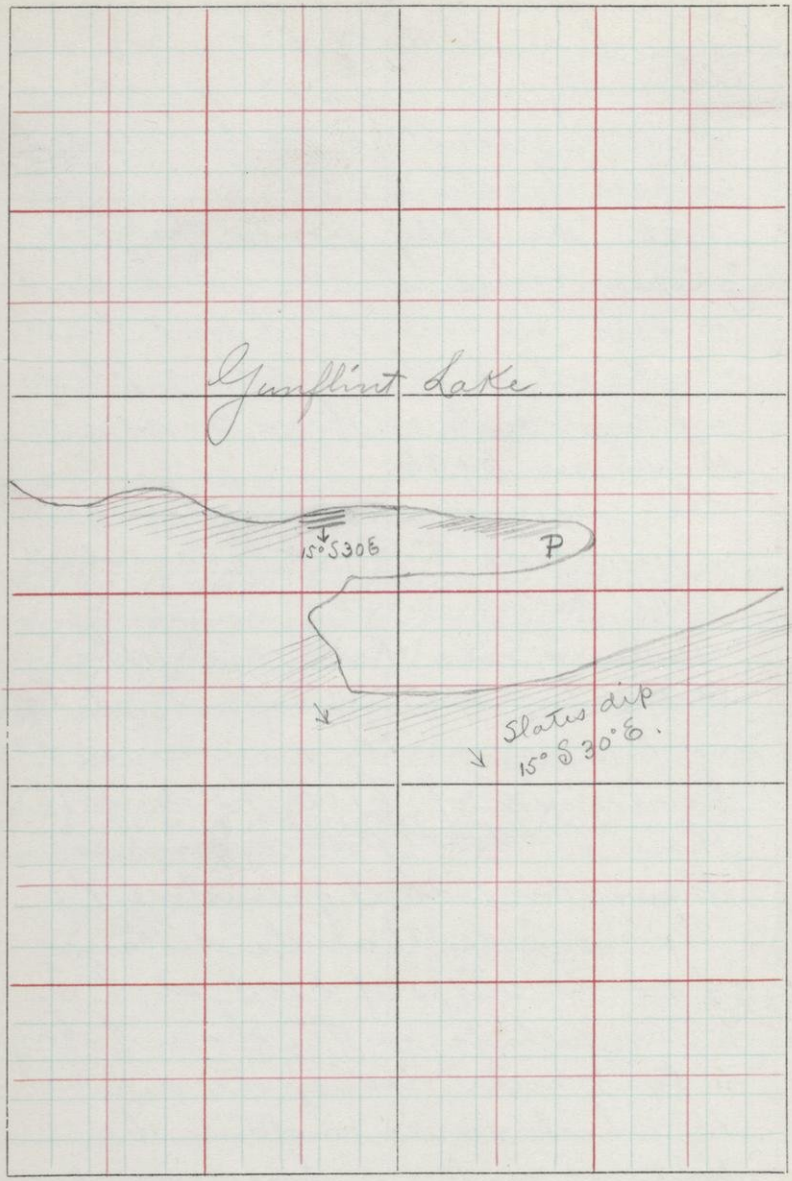
6106 taken at A

Coming over the ridge to the N. shore of open Gunflint at C we find a variety more dense & finegrained of 6105 holding the shore in low flat exposures

6107 Shows this rock (greenstone ?)

(6107) We estimate that the distance from the cliffs of 6105 at F.F. to the granite on N. shore of bay to be ½ mile taking the dip at 15° which seems constant the thickness on N. & S. line can be estimated

Sec 30 T. 65 R. 3 W.



The N. Canadian shores in the bay are granite only.

The point in Sec 19. - N. of the narrows is 6105. The slaty quartzite group cross it in low unexposed beds and disappear (?)(?)(?)

The west end of Gunflint lake is now under examination beginning at the narrows in Sec. 19 - 65 - 3 W. The coarse green= =stone 6105 holds the shore on the N. far up Cross river the little stream entering and crossing Sec. 24 - 65 - 4 W. The W. central end of Gunflint is low boulders and sandy shores without exposures but in Sec 30 directly S. of the narrows the point P runs east exposing slate in place. The exposures are small but good giving Strike N. 60° E Dip 15° S 30° E.

6108. shows this slate which is thinly bedded, weathering dark brown under wet moss and shows no variety in bedding with the exception

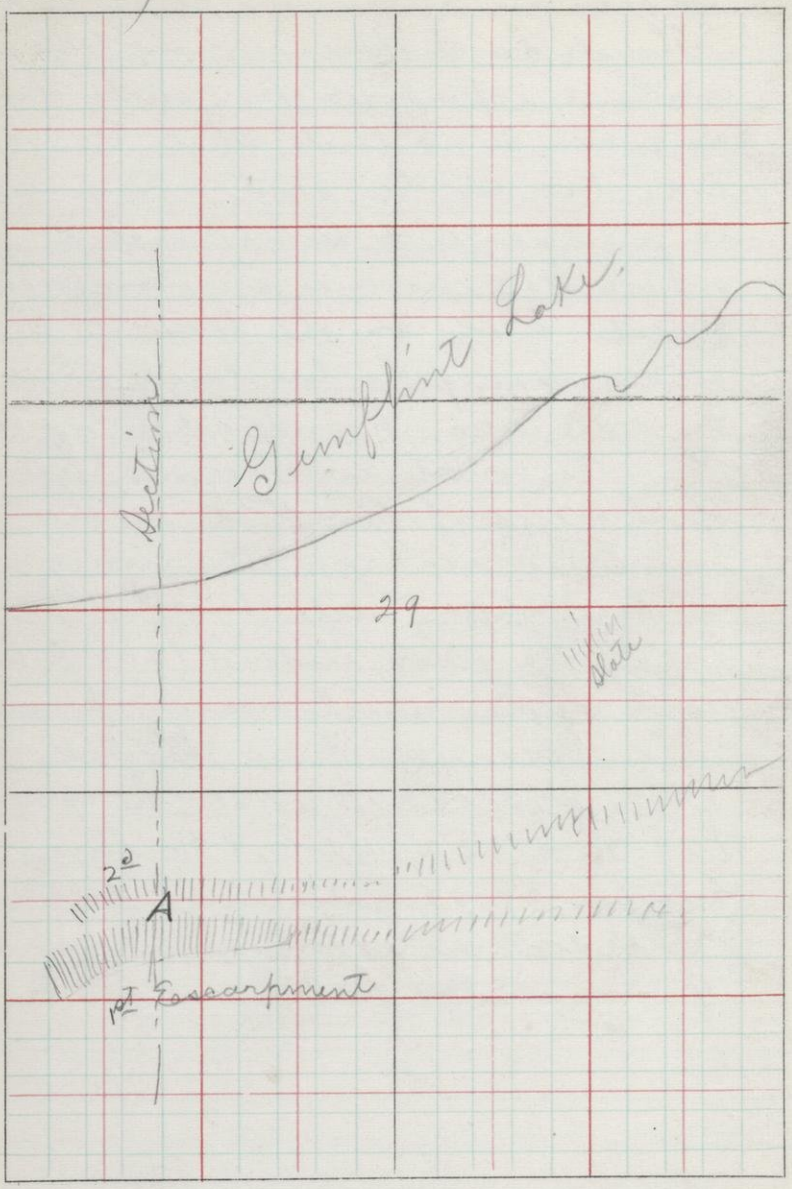
of occasional thinner cleaving planes
Though the S. shore is now low and without exposures for ½ mile back there can be no doubt that Gunflint lake lies in this slate group, which is now about to be approached, where its exposures are immense ½ mile back. On the lake in Sec 29 after crossing the low land, occupied by cedar swamps and aspen growth.

The most conspicuous feature of this end of Gunflint is the immense escarpment rising in a bare cliff ½ mile ~~back~~ S. of the lake. So great indeed (200 ft high) as to appear much nearer the water when viewed from the lake.

This great cliff is at the corner S. 29-30-31-32. the E. & W. line between 29-32. following its strike

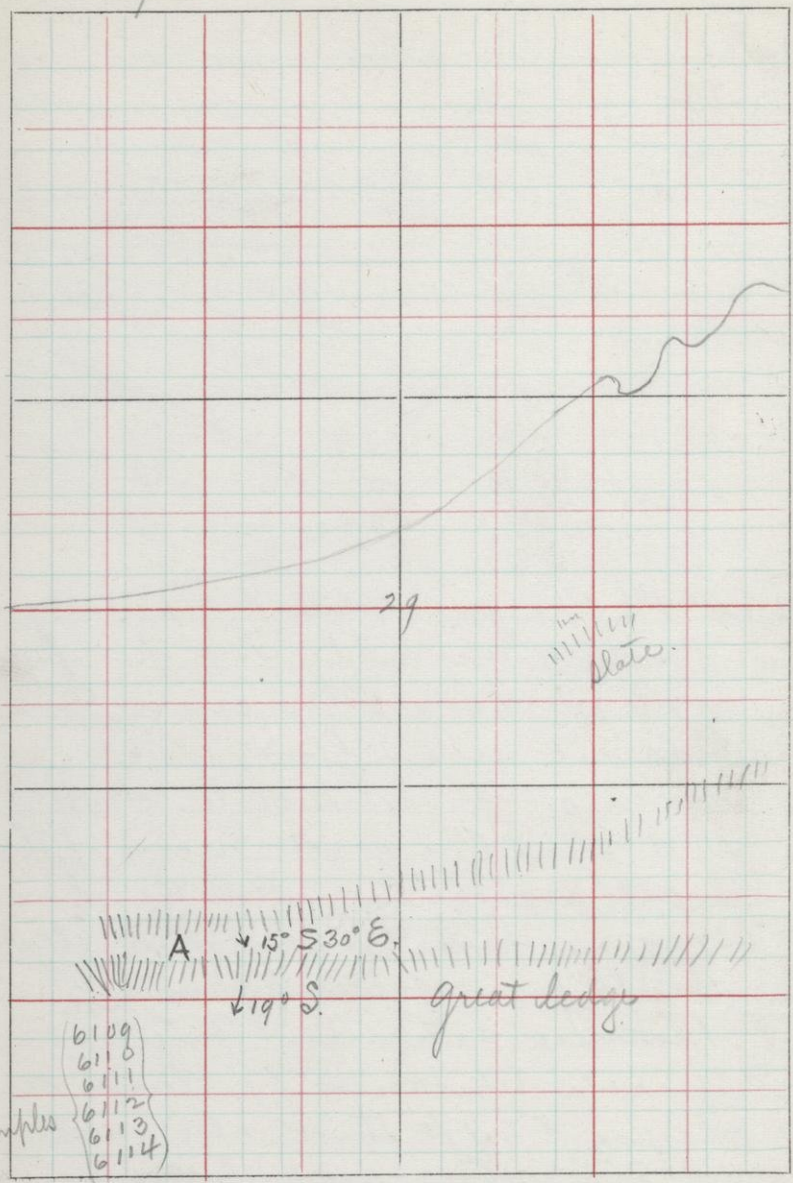
The section is immense and of interest as follows - at A

Sec 29 T. 65 R. 37 W



6109 v.e. 1st. The great slate bed probably extending one mile N of this face with perhaps other greenstone beds not seen. Good dial readings gave N. 60° E. dip 15° S. 30° E. The great mass of the wall weathering as on the shore (6108) is thin bedded and shaly the layers splitting into 1/16 in thickness extremely brittle & friable (thickness?) Some dense
6110 layers 8" to 1 ft. thick also exist
2nd " Above and lying over
6111 this slate is a dense greenstone

Sec 29 T. 65 R. 3 W.



Samples { 6109, 6110, 6111, 6112, 6113, 6114 }

similar to that found on the Canada shore directly N of this shown in 6107. This rock rises 75 ft. and can not be said to show indications of bedding at all. It breaks into rude triangular slabs with attempts to form 3 sided columns. Its main fracture joints as it lies seem vertical and across the dip, which can be seen on the smooth surface which it presents to the underlying slate. This joint shows us peculiarities the greenstone beginning immediately where the slate ceases.

Called Basalt by Winchell

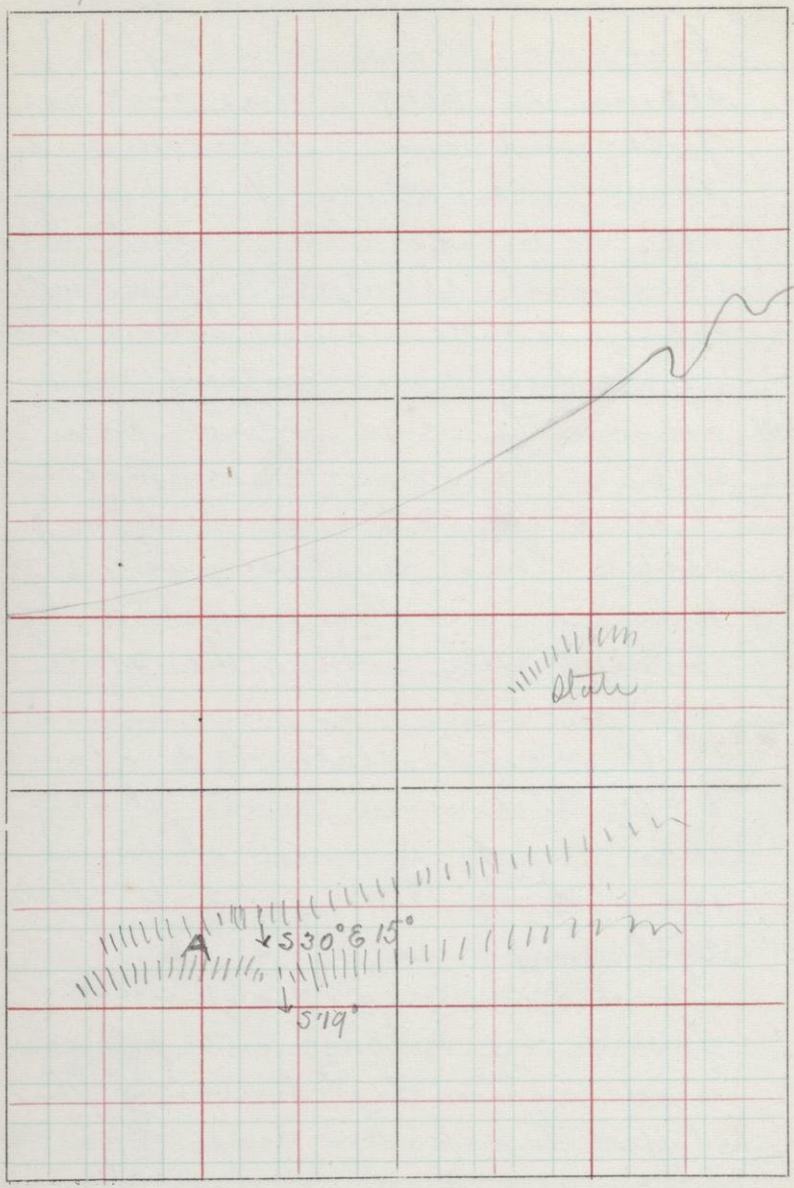
3rd A second slate bed, about 60 ft thick even more shaly than the first and showing some thick bedding 2"-4" of slaty rock in places

6112

6113.

Good readings (dial) were found by cutting out places and again by climbing the cliffs. In exposed beds we were surprised to find here frequent readings of Str. E + W. dip 19° S.

Sec 29 T. 65 R. 3 W.



6114.

4th The great capping diabase rising 100 ft coarser than the underlying one (2nd) and of slightly different texture in other respects it appears the same presenting broken masses and vertical joints

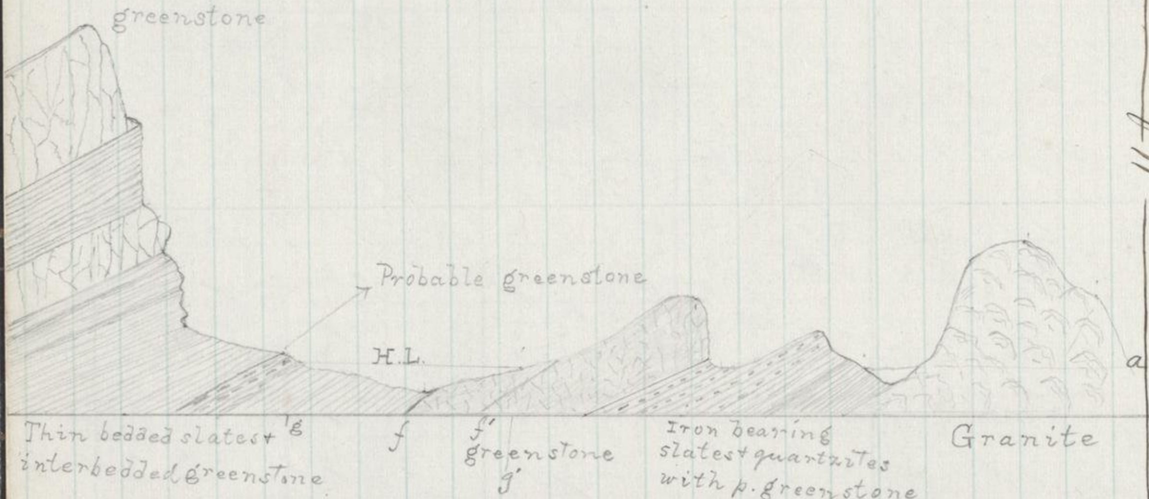
Sample numbers opposite their representatives 6110 being the quartzite thick bed in the lower slate and the thicker layers in the upper slate

6113

We have herewith represented the great ridge which divides Gunflint on the north from Iron lake one mile S. of it.

Following the N. shore of Gunflint Lake.

#11



Section across Gunflint lake E. of narrows W. end from N. to S. "a" = water line. g to g' = imaginary f to f' (see next page)

6115

If the section was shifted $\frac{1}{4}$ mile E. so as to pass through Sec. center of 29 T. 65-3 W. another member will be introduced at I, covered by the lake at the point where the continuation of N+S. between Sec's 29+30 crosses the center of the lake. Here a shoal indicates greenstone. $\frac{1}{2}$ mile E. after rounding a point with a shallow bay running E.+W. behind it a very peculiar appearance is presented on the shore line. a gray and sandy quartzite with often slaty d layers much decomposed often showing dense bands of resinous flint with a translucent fracture which are nodular and not continuous giving rise to the peculiarity of the rock which is weathering into a banded, ridged and rusty red rock, with these knobs of flint protruding The rustiness does not extend deep within but is due to the alterations of iron grains of Mg being seen, in the layers

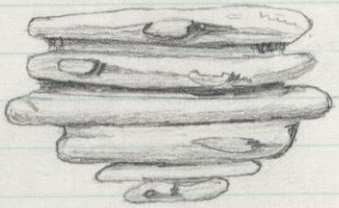
This outcrop is probably the lens 6101-6102-6102 A cutting the shore of the N. E. trending lake.

which are probably responsible for the rustiness. The only rock in place is tumbled down one reading on slaty layers gave Strike of N. 60°-70° E. dip 15°-20° S. another N. N. 25°

6115 shows the main variety

6116 The nodular flinty specimens

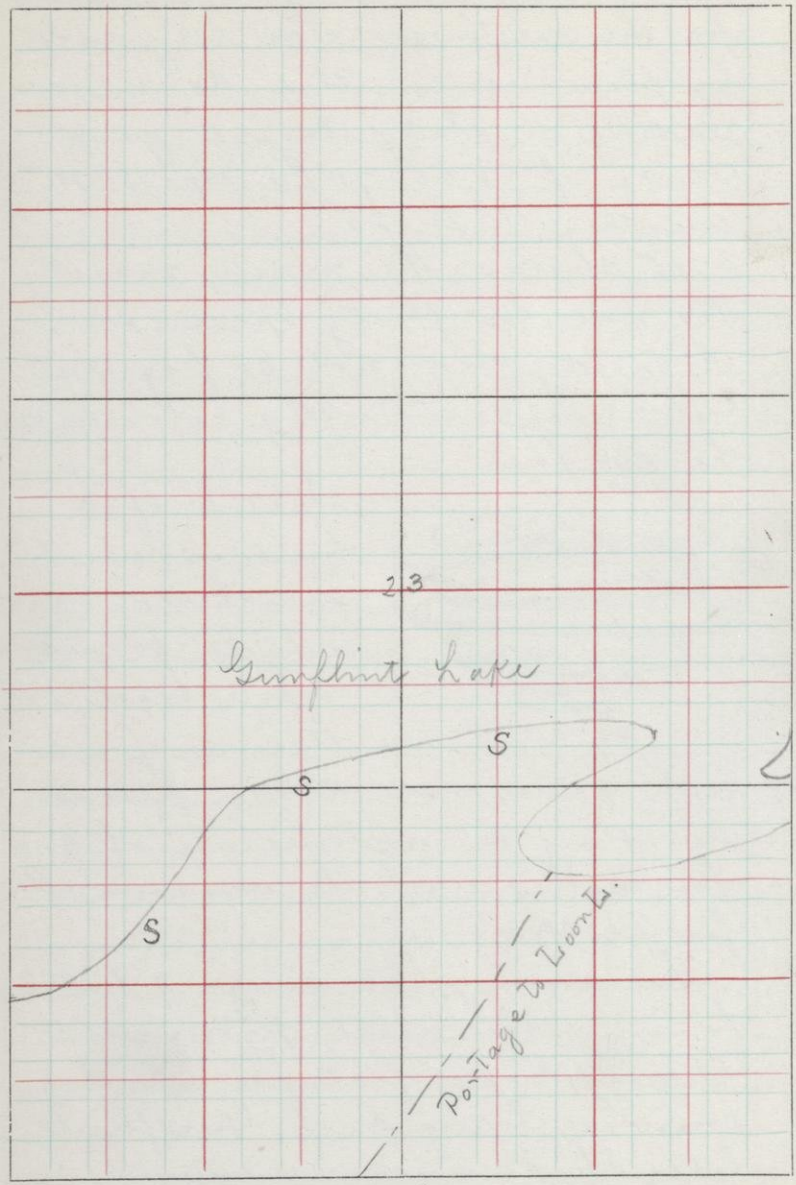
6117 A sandy bed not so frequent but always intensely colored on the surface.



Sketch of a boulder much weathered with which forms the whole beach is strewn for a mile eastward. Some pieces resembling a conglomerate of quartzite for matrix with the resinous flint for pebbles.

The ~~most~~ great range of hills forming the most prominent topographical features in the country lying S. of Gunflint lake. Strike away westward verging to S. for many miles

Sec 23 T. 65 R. 3 W.



and E. + N.E. further than Mud lake. The ridges south of the Saganaga granite yet N. of the Gunflint made of the rock 6105 also follow W. + S. + N.E. for many miles.

As regards the section given at the West end of Gunflint after further examination of the Animike, for such we take these rocks to be. the following additional facts are revealed.

1st 1st That at H. in the middle of Gunflint lake the water is only 3 ft deep. a long shoal rising at this point the bottom of boulders and broken fragments. This would indicate other harder beds occurring in the slaty beds and correct the impression that the slate is continuous across the lake.

2d Though the slate holds the S. shore across Sec 29 and is seen in mounds in places back from the shore on Sec 28 + 27 on Sec 23 where the shore runs N. E. for some distance S. S. S. a greenstone rock again appears and rises in low ledges.

Sec 24 T. 65 R. 37 W.

3d It rises prominently at the E. point of the little bay between Secs 23 & 24. and the rock at B is shown in
6118. No bedding being found but rude blocks and basaltic forms

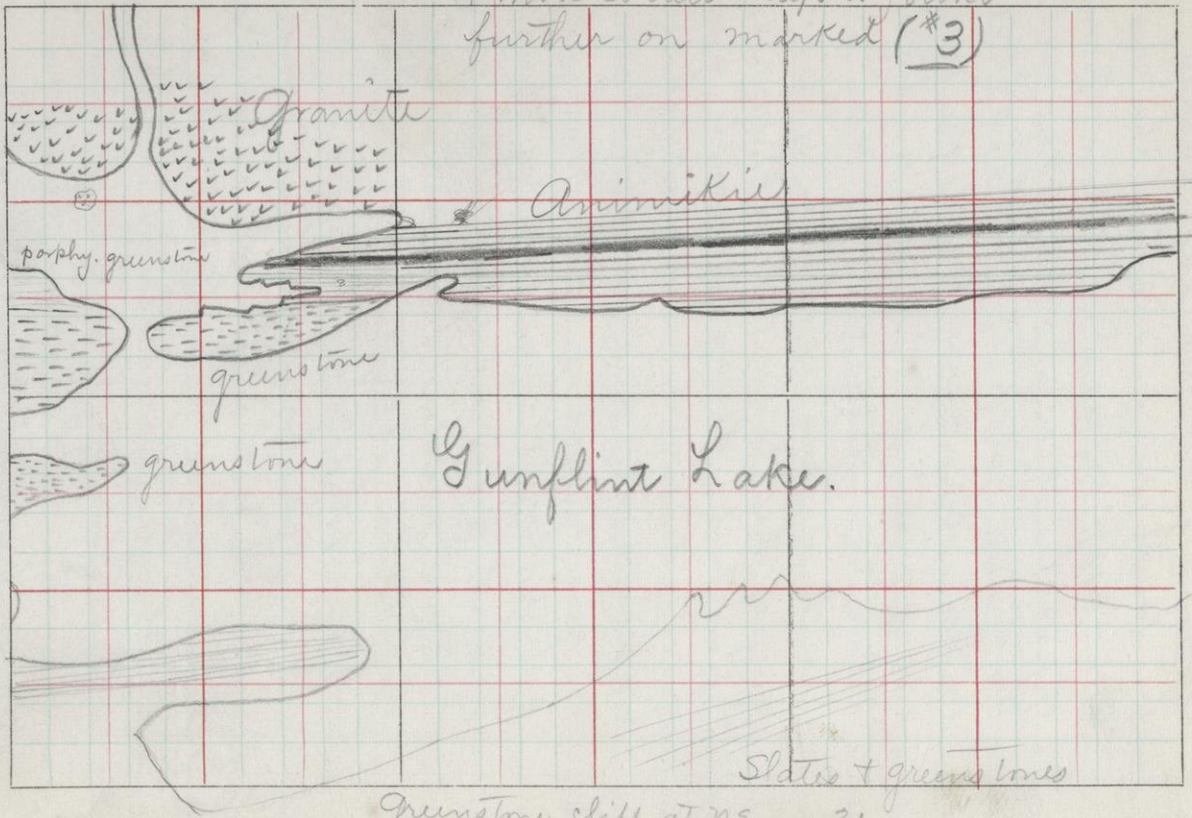
The group (if we consider the whole of the Gunflint beds as belonging to the same) may have many more members hidden by the lake. If we divide that portion N. of the narrows & nearest the granite from that S. on the great lake we can safely assume that not many more beds are to be numbered in the N. group.

The dense crystalline basaltic rocks forming the top bed (1) and the 3d in the section vary in their grain and fracture and in many respects show a varied composition yet they appear to be one great class of rocks, nevertheless & greenstones - at times porphyritic

Sec 27 T. 65 R. 3 W.

Following the Canada shore the lower range showing the rusty 6116.-6117 ceases in a low point opposite Sec. 28.-65-3W. and the main range of hills 200 ft on their tops above the lake, come in appearing to trend away N.E. When examined closely they are seen to differ materially from any of the beds on the W. end of Gunflint being massive gray quartzite with a speckled appearance due to clear grains of quartz and opague grains of quartz scattered evenly through a dark gray matrix. This gray matrix matter has a tendency toward a schistose structure interrupted by the quartz grains It is a handsome rock and weathers not unlike a granite When traced along the shore it shows varieties of structure often giving bunches of milky quartz, and again being entirely free from the speckled appearance the quartz grains disappearing

A more correct map is found further on marked (*3)



Greenstone cliff at N.E. cor. 31

and the true schistose structure of the gray matrix asserting itself so that the rock splits readily into long slabs and needles, and rattles down readily when struck with the hammer. The true relation of the two varieties could not be determined but they were apparently much mingled and confused. No dip or strike could be made out in the granular variety which is shown in 6119

6119 is roughly broken and jointed and if there are planes of bedding they are not apparent.

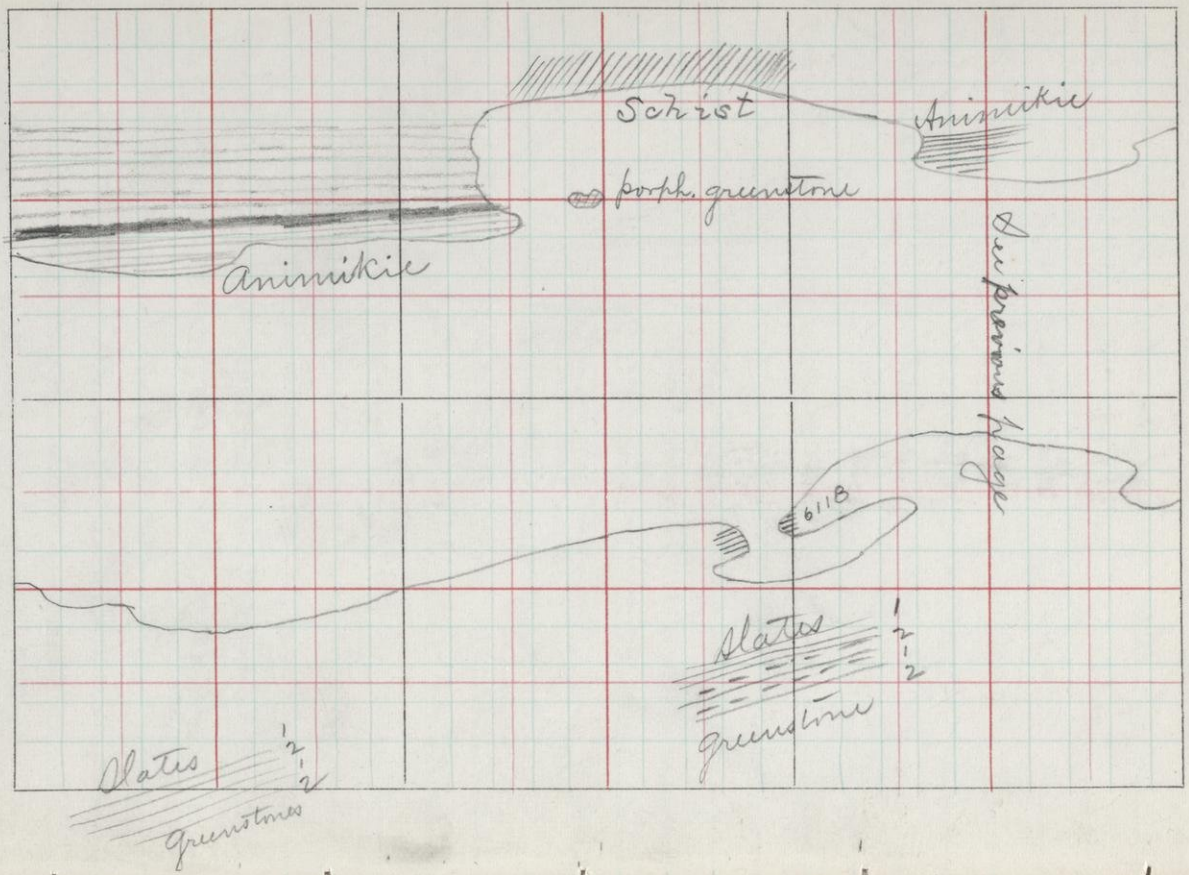
6120 shows the schistose variety, though in mass it gives no more satisfactory readings than the denser granular (6119) when struck it shows a bedding and splits into slabs the lines of this bedding giving a strike of N. 60° E. dip S. 30° E 82°-

Thus if this be the true dip it is quite on edge, against the granite which it approaches

N.

W.

T. 6 R.

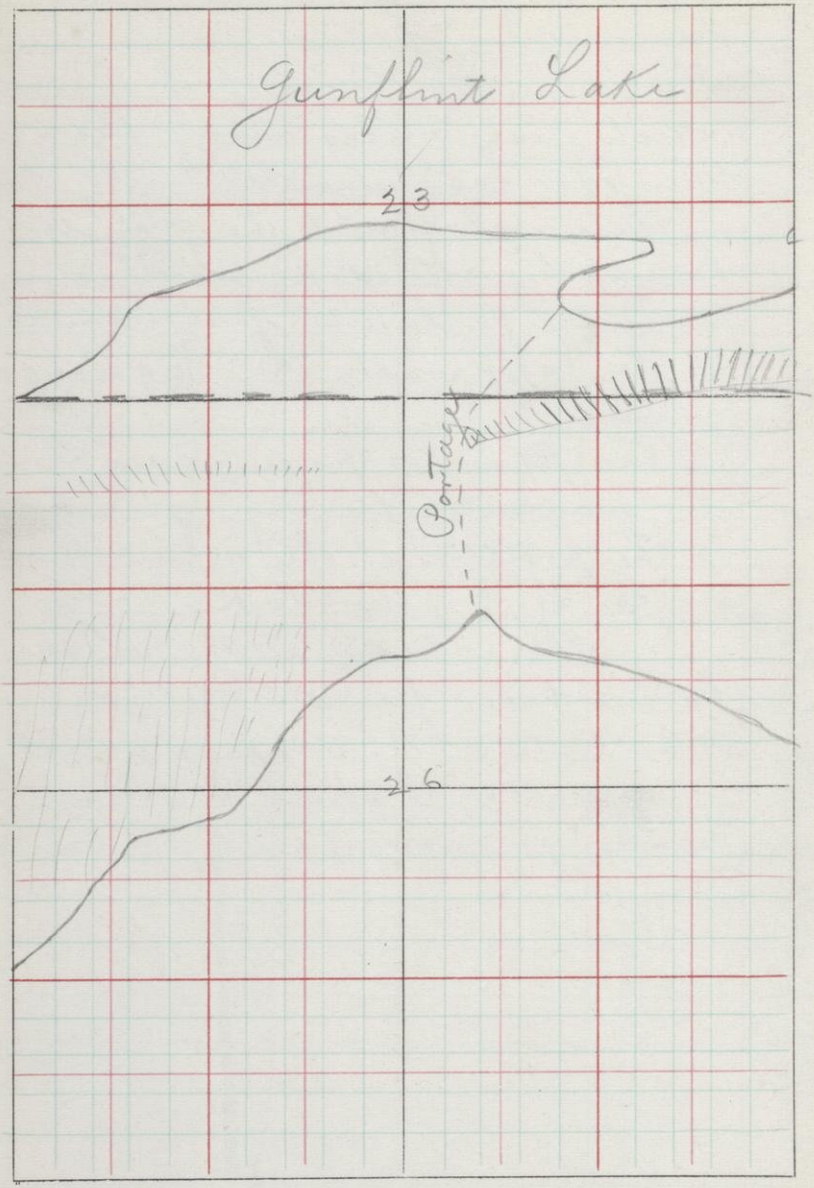

Schist
porph. greenstone
Animikie
Animikie
Sec. previously staked
6118
Slates
1/2-2
greenstone
Slates
1/2-2
greenstone

on the N. within 1 mile. There is here evidence of total unconformity The immense beds of this rock which rise miles away back in Canada can only be truly placed in their relations to the granite horizon by extended examination along the N. limits of their outcrop as they approach the Saganaga granite

The opposite page gives a map of Gunflint offering our readings of the position of the main beds at the W. ½ of the lake.

These beds on the N. shore having been found to strike N. 60° E. to E. & W. dipping south and on the S. shore similar readings more often N. 60° E.

Secs 23} 26} T. 65 R. 3 W.



Iron Lake

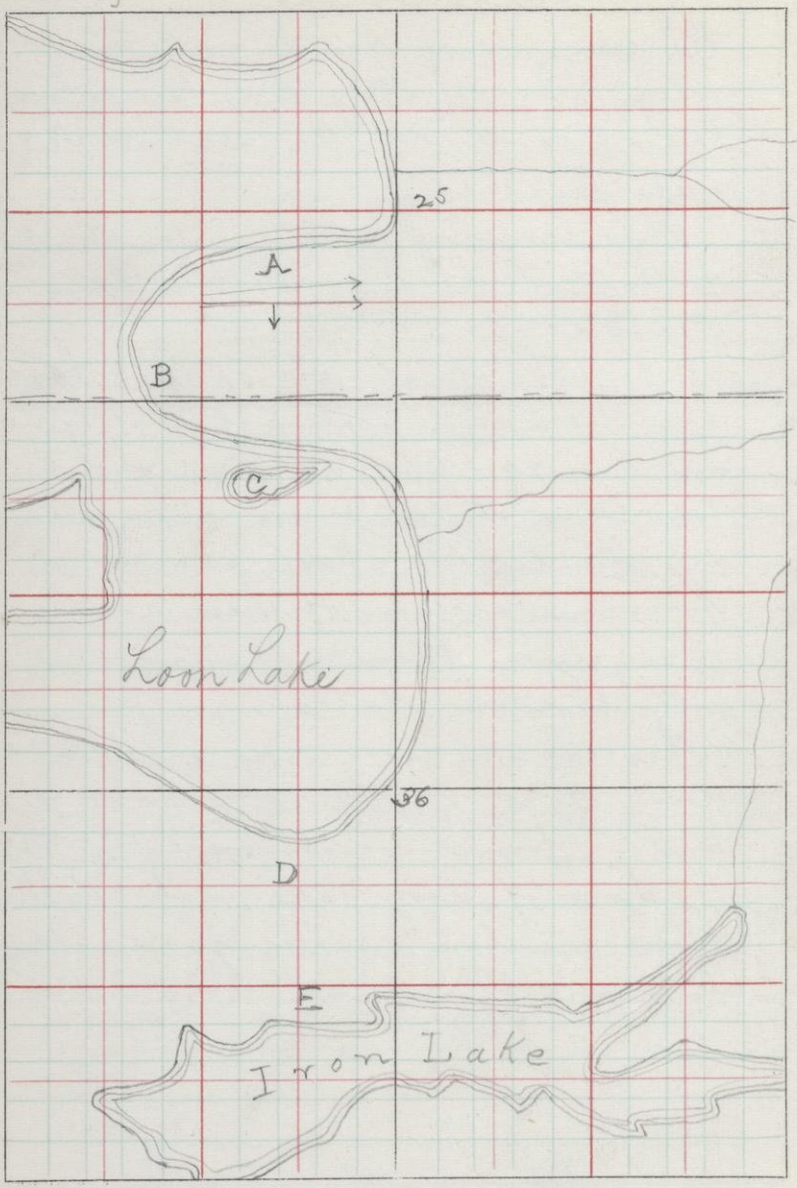
We now cross South over the great range immediately S. of Gunflint lake and develop the section N. & S. yet further.

This crossing was made at the portage to Loon or Miller lake, in Sec. 26-65-3 W.

The high ~~ore~~ range crossed here is a continuation of that given in Sec. 29-65-3 W. and the two top beds the only ones exposed. are similar to those shown in the previous section of these rocks, namely a basalt crown and interbedded slates.

This crown rock dips gradually down at 15° ½ mile somewhat less and is found occasionally on the N. shore of Loon lake, where the shores are low rising gradually N. toward Gunflint.

Sec 25 36 T. 65 R. 3 W.



Going E. & S. on Loon lake we first come at A upon a range of dense basalt with heavy slaty layers and thin bedded slaty layers underlying forming one of a series of high hills trending E & W. at E 10° N. and forming the whole S shore of Loon lake, presenting high cliffs similar to the Gunflint S. shore as will be shown. The strike dial on the slaty beds at A is E & W. dip 15° S. Samples & section will be given at a point further West.

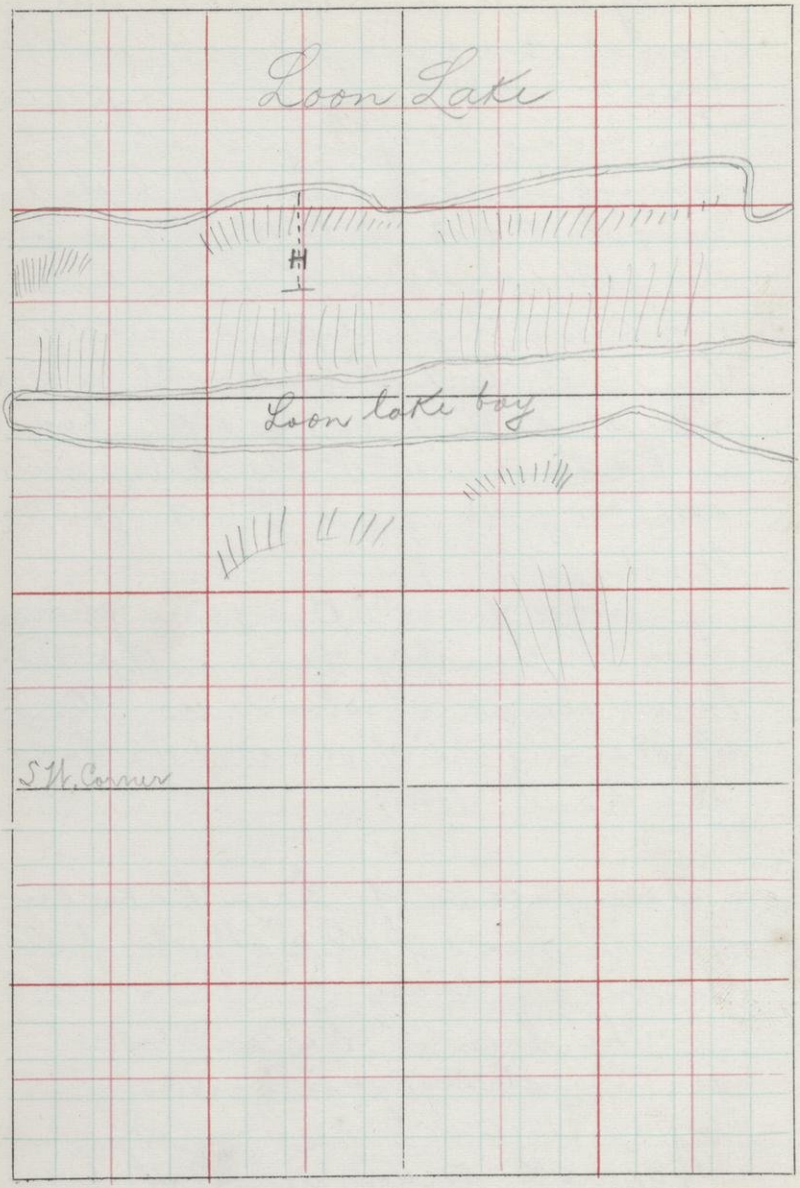
The point B again shows these W. trending beds – the basaltic layers occur on island at C. Following the S. shore of the lake we have. (over)

These gabbros of Iron Lake run pretty nearly W. S. W. to little Saganagog lake.

The Loon or Miller lake section strongly suggests

Agmok quartzites & slates,

Sec 35 T. 65 R. 3 W.



the continuation of the slaty beds interbedded with dense slaty bands alternated with granular dense basalt (diabase?)

At H a section was taken showing the nature of these beds as follows

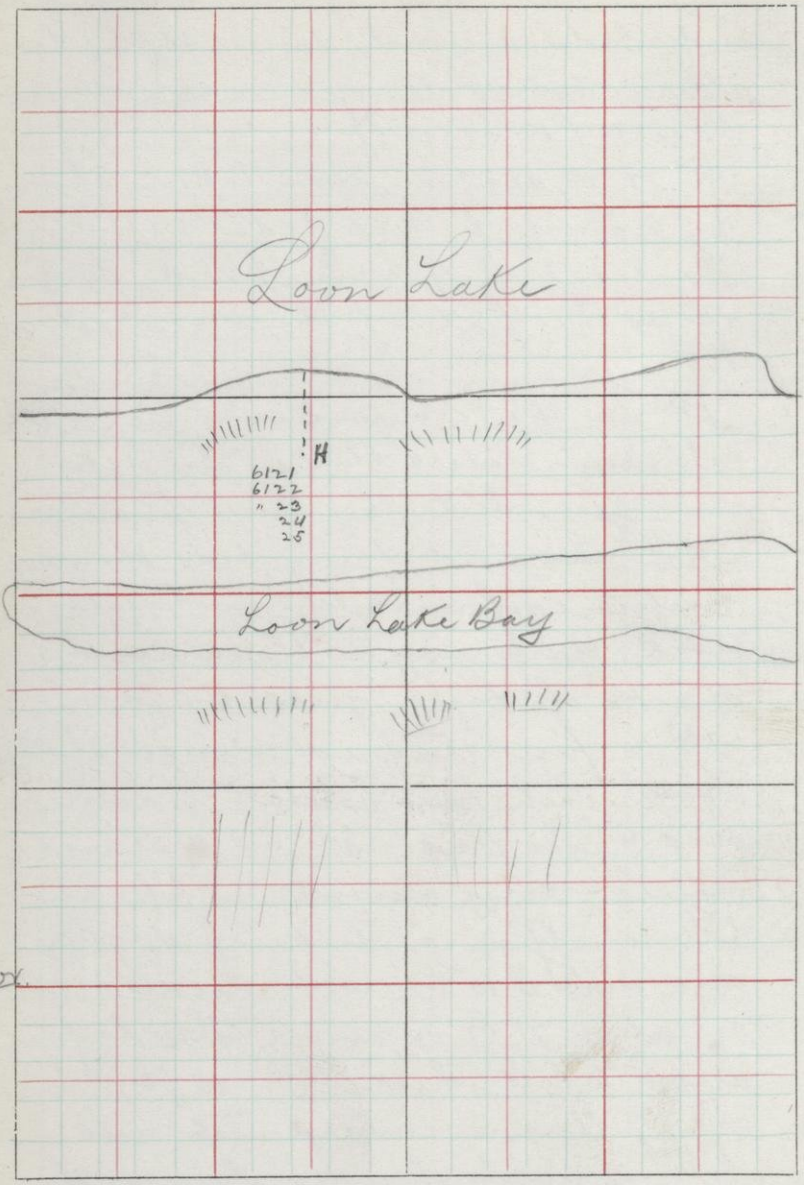
Vertical cliff very hard to get at so the feet of thickness estimated by eye.

6121. 1st on the crown rising in rude columns slabs & blocks the dip not seen but the line of contact with the underlying beds showing perfect conformability a basaltic rock dark gray to black with specks of light green 40 ft.

6122 2nd a fine grained dense slaty rock with conchoidal fracture and homogeneous - in distinct layers - very smooth on top and bottom. Giving strike of N 75° E and dip S 15° E. with needle (variation 7° E or more) The layers are 6" to 3 ft thick 15 ft.

6123. Slaty layers covered top and bottom with thinner layers of white and brown siliceous

Sec 35 T. 65 R. 37 W.



Cox.

coating showing very siliceous banding throughout giving paper scales in places and slabs $\frac{1}{8}$ to $\frac{1}{16}$ in thick, rotten on exposure & hinging down to blows of hammer = 1 foot.

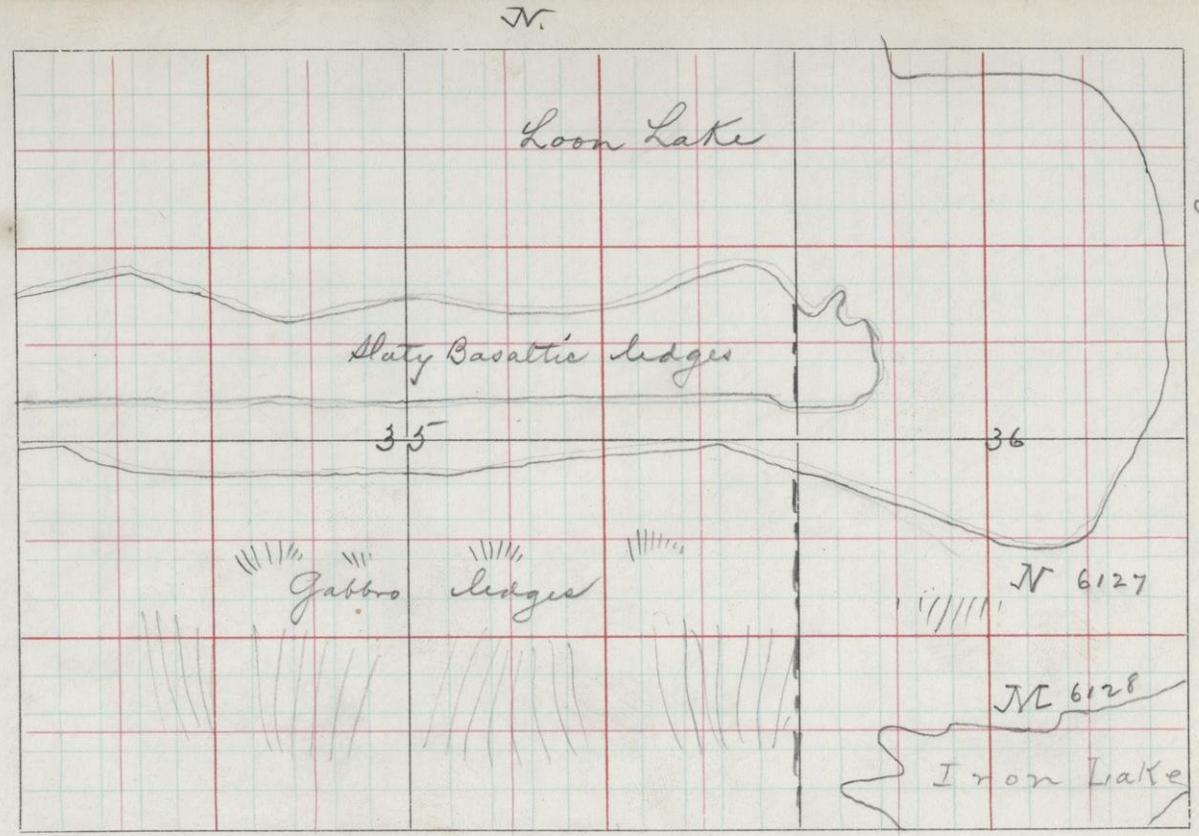
6124 Continuation of 6122 with greater tendency to thin bedding and possibly darker color 10 ft

A space of 20 ft hidden by falling lumps from the upper beds then

6125 showing at water level banded on weather surfaces giving interrupted blotches and lenticular spots thus

showing faint bedding lines when broken corresponding with the dip = running under the lake.

Again these abrupt cliffs on the whole S. shore of Loon lake which extends W. across Sec's 35-34-33 and into the 1st $\frac{1}{2}$ of 32 and again the gradual inclination southward.

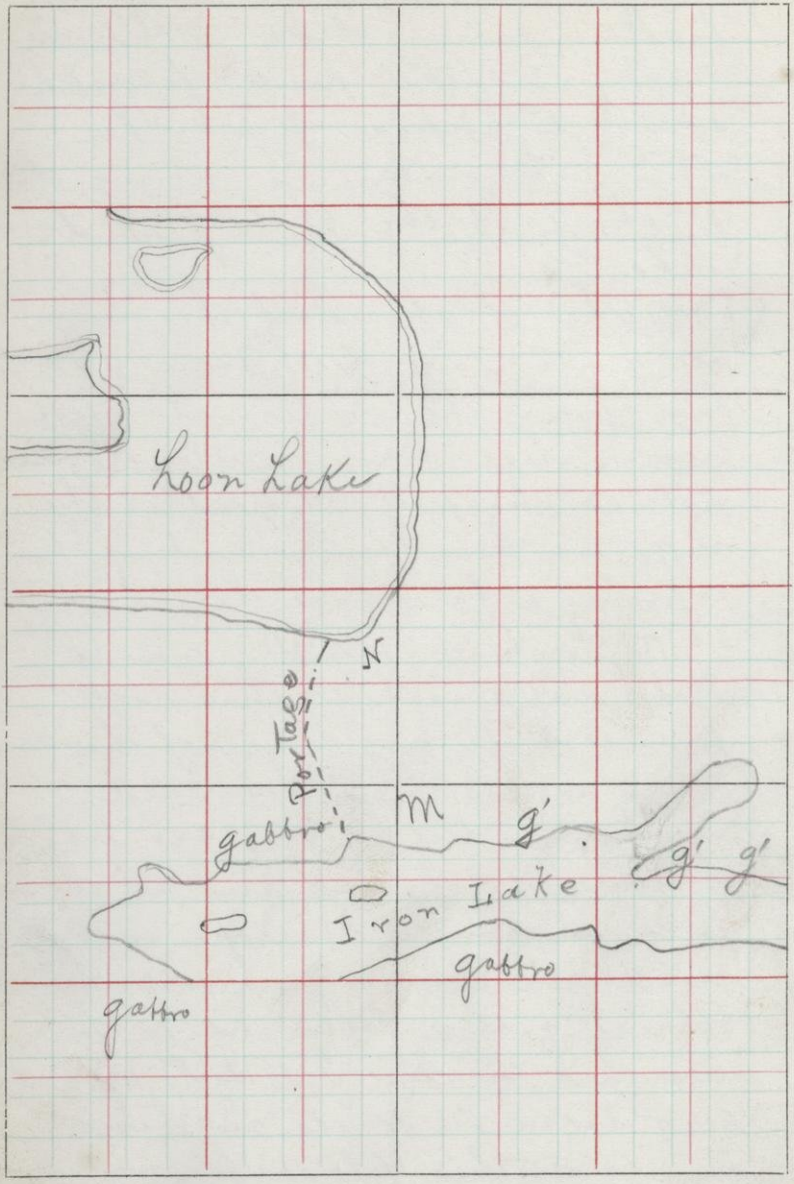

N.
Secs 35, 36 T. 65 R. 37 W.
Loon Lake
Slaty Basaltic ledges
35
36
Gabbro ledges
N 6127
N 6128
Iron Lake
S

6126 being taken at I. showing the basaltic crown beds at times developing the pink feldspar so as to appear pinkish. This rock continues along the N. shore of the S. bay of Loon lake

The S. shores of this bay are quite low. but some 500 yds back from the water at times nearer rise prominent domes not so sharply broken as the cliffs we have been describing but exposing a bare face here and there 20 ft high to the N.

6127 When approached, this rock proves to be no longer of the same group as has been described northward but a gabbro which a more open grain and as it is followed south develops into the great open coarse grained magnetite bearing gabbro. followed so far westward across T. 64 R. 1-2-3-4 W. 6127 taken at N. its northern limit at this place a coarser variety as you ascend to Iron lake

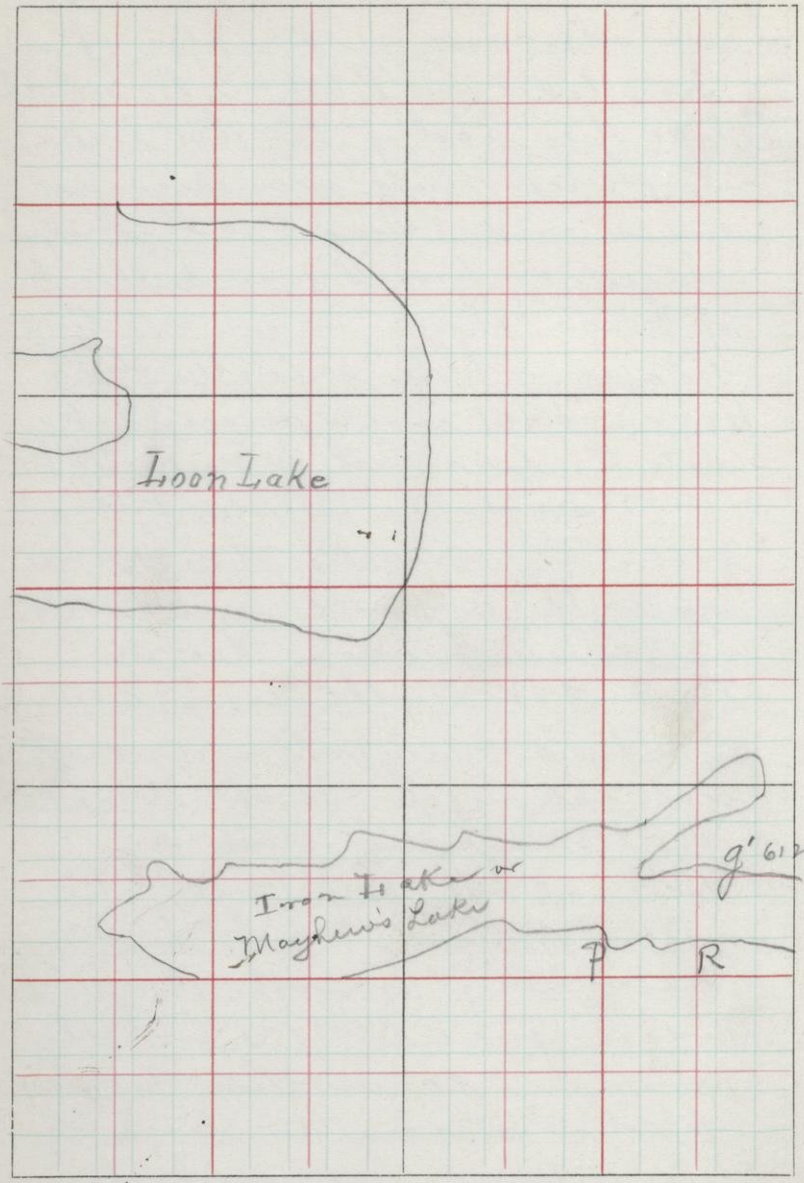
Sec 36 T. 65 R. 37 W.



6128 is seen in 6178. taken at M.
and other coarser samples from
Iron lake in T 64 - 2 W. which
lake lies wholly in this rock.
its shores being conspicuous
domes and ridges E. & W. striking
ridges. or possibly at little N.
of E. as shown in one or two
places, where smooth long
(100 - 200 ft) walls descended
into the lake with a strike N. 60° E.

Though the whole of this
gabbro is magnetic the grains
are well dispersed in most
instances but in Sec. 36.
T 64 - 3 W. at Mayhews location
we find an extraordinary
segregation (for such it appears
of the magnetic iron ore.
Here at G' G' G' (map) the
gabbro appears to rise in very
black very smooth dome like
ridges jointed N. & S. which
prove on examination to consist
of solid magnetite more or
less contaminated with the
other ingredients of the gabbro

Sec. 36 T. 65 R. 37 W.



It can not be said to lie in the gabbro as a vein but rather to form a part of it as the gradation and mixture of the two can be found throughout the mass. The ore occurs most conspicuously at G' G'. G'. and is 20 or 30 ft thick at each point though its limits can not be defined as swampy tags cover its extensions.

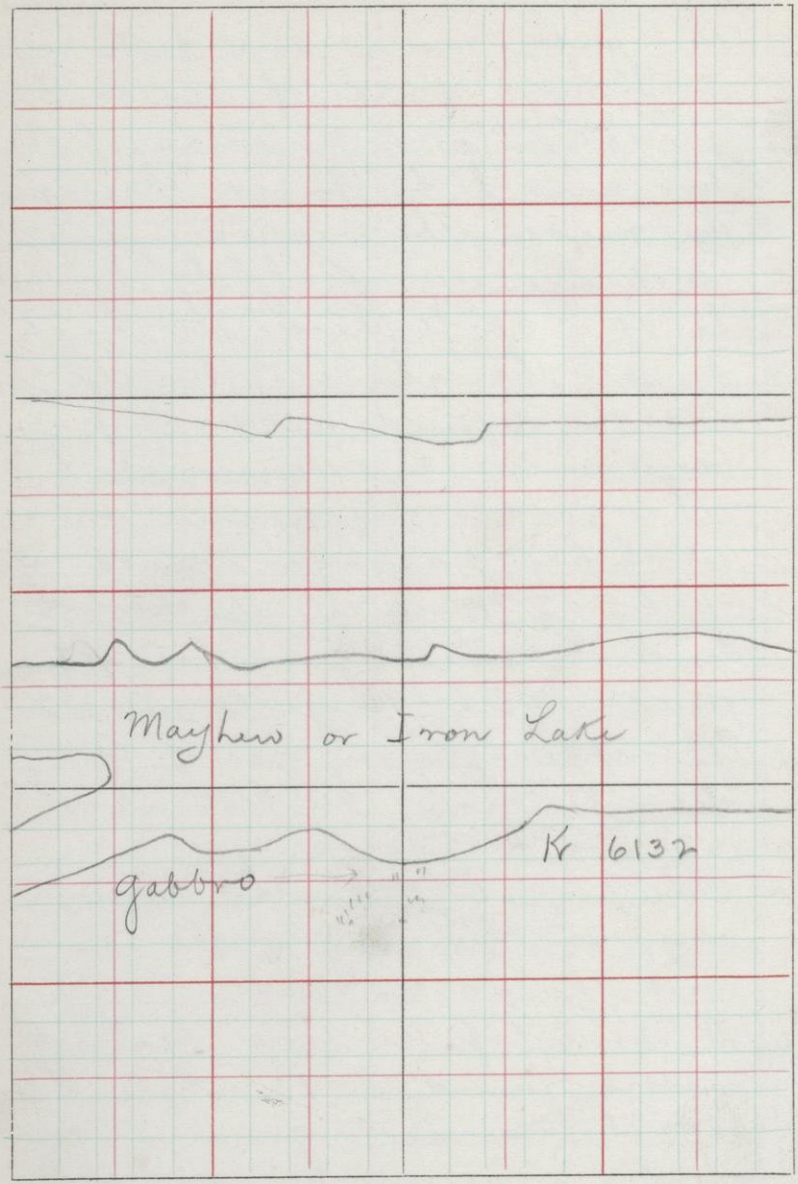
The gabbro disappears in a swampy passage across Sec 31-65-2 W. until at the E ½ Sec 3. it comes again at the point which projects into 32.

6129 Sample of iron ore at G' opposite map the best and purest here seen.

6130 Sample at G' in the iron to show the mixing of the ore with the gabbro mass.

6131 A variety of the iron bearing gabbro found at P while at R. the coarsest grained gabbro makes a brown powder showing shiners of diallage and leaving

Sec. 32 T. 65 R. 21 W.



a coarse rotten condition on the blocks as they weather.

Throughout the lake the rocks afford us no opportunity to read dips or strikes though their general tendency seems to be to titt southward in mass.

Continuing E. the whole E. end of Iron lake but a basin in the gabbro layers and
6132 sample 6132 shows a specimen well representing the whole taken at K in Sec. 32.-65-2W.

By reference to N.B. #1 1st half it will be seen that the same great gabbro covers the N. & central $\frac{1}{2}$'s of T's 64. R's 1-2-3-4 W. and was there sufficiently sampled for comparison

We have thus crossed every formation between Grand Marais and the granite of Saganaga lake many members & individual beds are no doubt wanting but the gabbro of Iron lake is the same as that of Dome

and Key lakes in the next Town South, and in fact of the whole cross N. & S. section there Attention is here called to sample 6011 — Book #1.

6133 An additional variety of gabbro from the west end of Iron lake

East Gunflint lake.

It remains to say that the slaty beds are not so characteristic nor do they ~~form~~ compose nearly so great a portion of the formation S. of Loon lake as they do in the S. of Gunflint where they are so marked a feature.

The eastern end of Gunflint is now under consideration

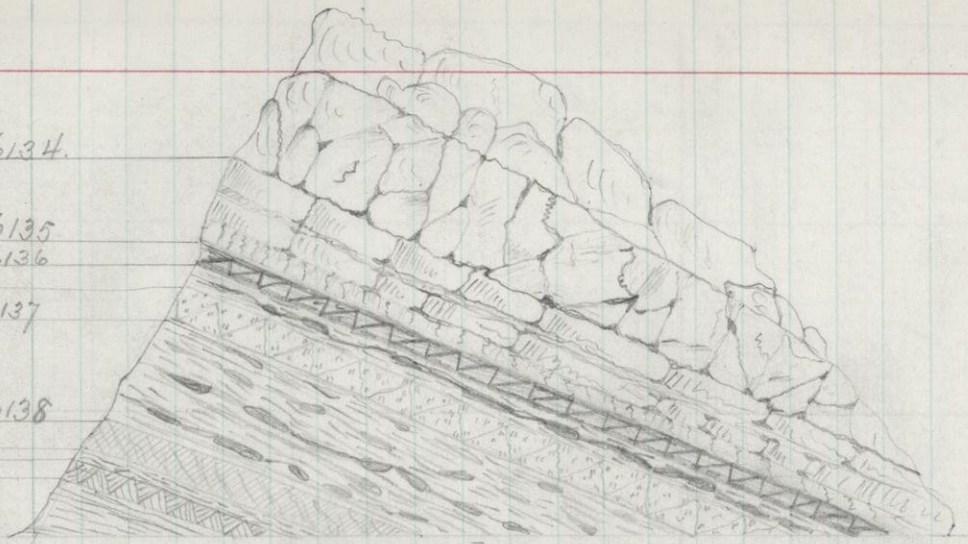
Low shores on the S. side are found beyond the limits of the lake, eastward but as a high range lately described & sectioned continues half a mile back from the lake and runs on to Mud lake

it is evident that the basaltic and slaty beds continue,

Crossing directly north from the line between Secs 23 & 24 - 65 - 3 W. we find the anmiter group holding the shore for some distance and 1st seen on a small point the next east of the granular quartzite & schists described under 6119 & 6120.

A better idea of these maps could be had if an accurate map of the N. shore could be had.

The section taken here is as follows



dip- here too great- true dip 10°-12°- S.E.

Strike (poor opportunity) 1. N. 40° E 2. N. + S

3. N. 60° E) all unreliable

apparent strike N of E. 5°-15°

6134 Is the granular dark basaltic shown in other samples

6135 Rusty in some joints weathering to a jaspery red in spots which do not extend within - quartzite fracture breaking in cubes at right angles to dip. ferruginous sand black on joints.

6136. A clear translucent flint brittle as glass somewhat wavy along its bedding

6137 Similar to 6136 but less pure in quality speckled on fracture

6138. The main shaly beds composed of thin bedded highly ferruginous scales including at no regular intervals but along marked lines the thicker wabing ferruginous seams with knobs and lenticular concretions about which the bands of shally thin sheets deflect

6139 A dense gray rock nearly similar to that seen before in 6100.

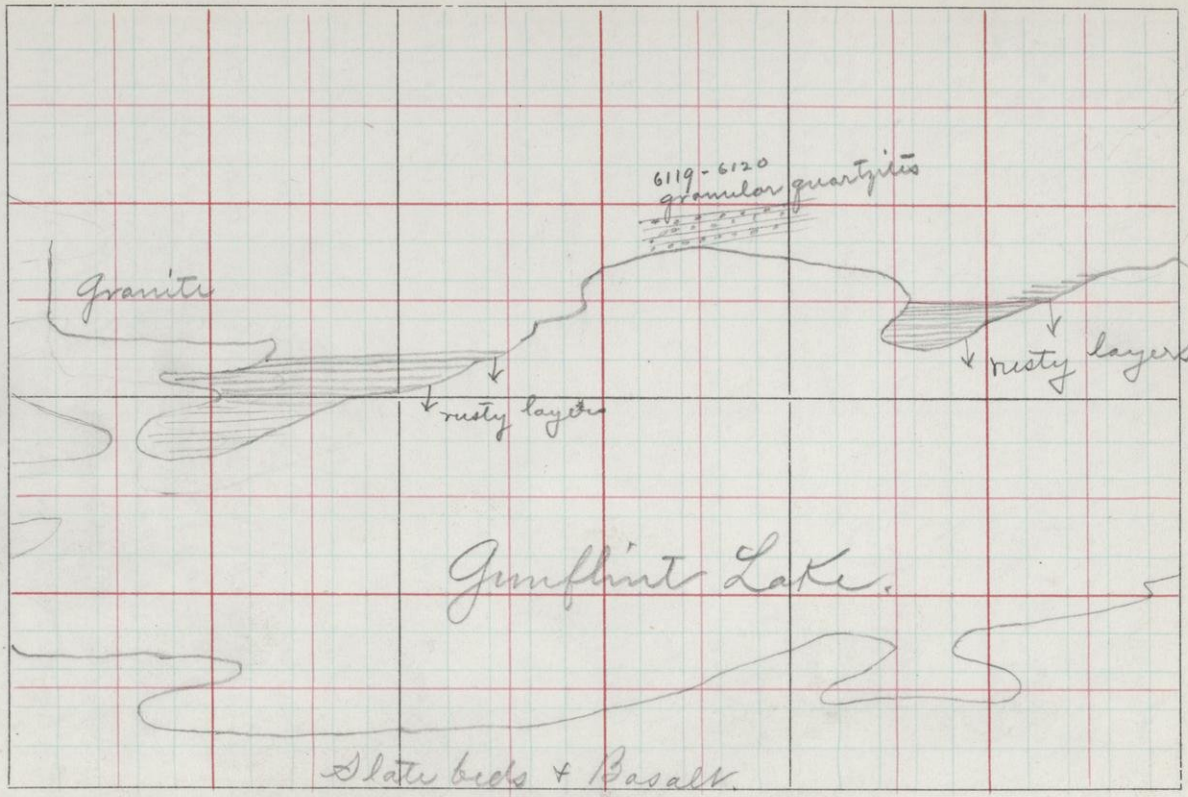
6140 A streak of azure like flint with opalescent luster and brittle fracture.

6141 The rusty red comes out on the shore immediately E. of the point just described after passing ⅛ mile over the top member of the section (6134) which comes down to the shore in inconspicuous ledges flat and without defined dip.

6142. These rusty ledges and beds too much broken to show their original position owe their rusty appearance to the black streaks and coatings on many of the quartzite layers which include knobs and concretions.

Since there is some doubt as to the true strike of these beds we must assume them to be the same as are shown in the section at 6136.

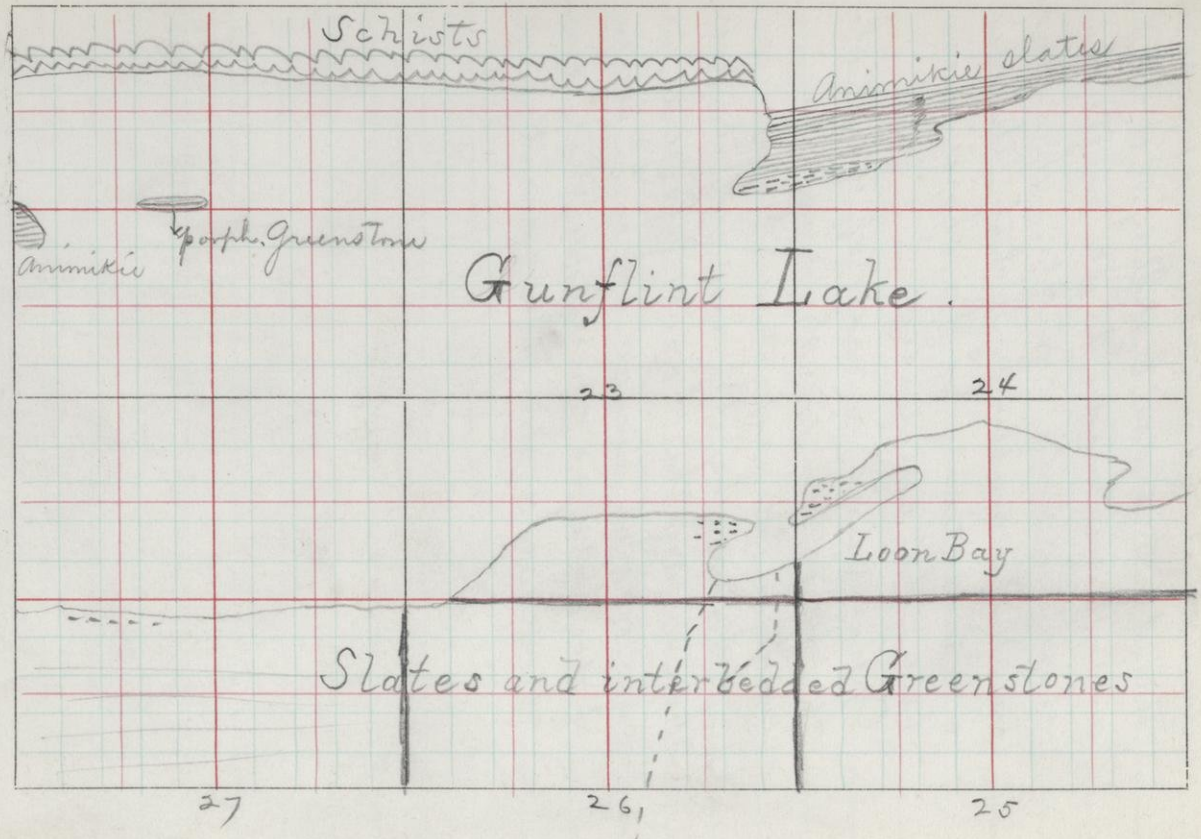
As regards the relation of the section on the point just given to the rocks and beds described under 6116 and 6097-6098 &c we must assume them to be the same until a better idea of the N. shore of Gunflint can be had. when a double series may be established But we have taken the trend of the lake.


6119 - 6120
granular quartzites
Granite
rusty layers
rusty layers
T.
river
R.
Gunflint Lake.
Slate beds & Basalt.

found it accurately mapped on the U. S. side (E. slightly N. 10°-15°) and have made sights on the Canada shore to verify results. This leads us to the conclusion that the beds are identical as the shore line helps the conclusion.

Opposite is a map of the N. shore as we follow it showing the location of respective beds.

Since the W. end of the lake shows only the basalt layers we can see no escape for a 2d series of ~~the~~ beds so conclude that our compass sights are correct.


Schists
Animikie slates
Animikie
Porph. Greenstone
Gunflint Lake.
23
24
T.
R.
Loon Bay
Slates and interbedded Greenstones
27
26
25

In "North Lake" as we enter from Gunflint coming E. the swampy low shores afford no clew to the under rocks but about opposite Sec. 17 - 65 - 2 W. on the Canada shore we again find 6134 in low exposures on a small reedy point.

6143. As the W. bay of the main "North Lake" is entered a small island gives a granitic looking rock. = 6144 (?) Syenite It rises in swampy land no other exposures near This is opposite E. part of Sec 16 - 65 - 2 W and immediately opposite in 16 - 65 - 2 W.

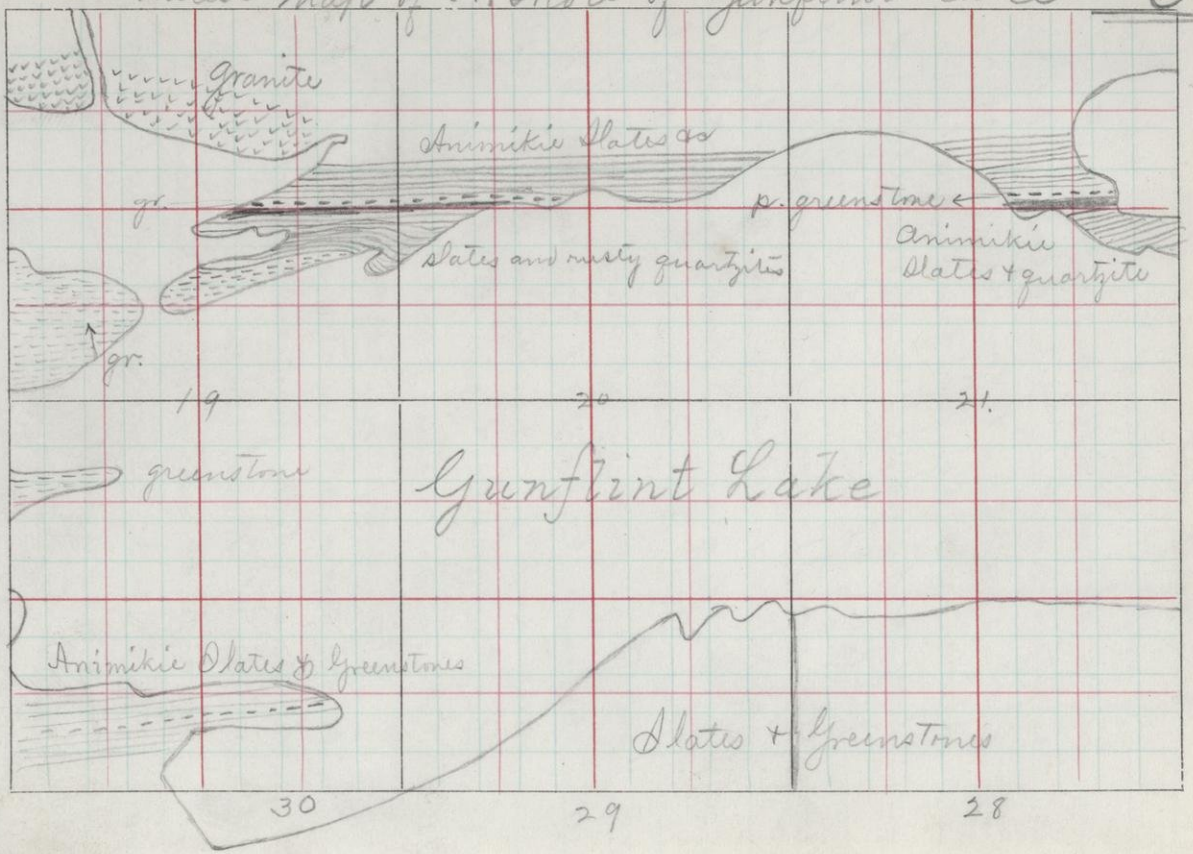
6144 The low shores begin to show jospery beds on the main points projecting N. E.

This jaspery rock showing in 6144 now alternates with the basaltic layers along two miles of the N. shore of North lake as it trends away sharply to the N. E.

It is not always red showing many varieties and mixtures of the basaltic layers.

6145 Opposite the line between Sec 26 & 27. It is seen to overlie for a

Latest map of N. shore of Gunflint Lake #3



trace the basaltic rock and to show white quartz inclusions 6145 shows sample with quartz.

6146 The basaltic layers and
6147 = more red jaspery layers

The true relations of the beds of basaltic and the quartzites can not be made out since the layers only appear immediately at the water level. and can not be found in the country N. of the lake at this place

Trip north of North Lake

With a view of further solving this jasper problem since no sufficient supply for the King Fisher conglomerate had yet been found I continued the N.E pursuit along the Canada shores or rather the N. shore of North lake. (It lies mainly in Canada

For three miles the shores are low but continue to give the quartzite 6145 and occasionally 6147.

Until suddenly a deep bay is followed that runs N. & E. and the country rises N. E. of it in great precipitous hills. presenting ledges

to the N.W. At this point I took to the woods and followed a N.E ravine over a mile until it came upon a country of rude bare low mounds and ridges - to the N.W. while the steep sides of the conspicuous hills just mentioned rose to the S.E. Paul Morrison here informed me that the country of low bare red and gray mounds ran all the way N. to Northern Light lake a lake as large as Saganaga lying N. of this point Probably continuing the Gunflint Schist These mounds were composed of smooth weathered masses of Syenitic rock the pink and gray varieties mingling. the pink at times prevailing on the surfaces at times the gray.

6148 shows the gray variety

6149 shows the pink variety similar to the 6143. seen to the N.

We conclude that we are upon a new country imagining these to be related directly to the Saganaga granite though that rock extends

N.E according to Paul a long way.
Turning to the S.E we ascend the high cliff which separates our ravine from North Lake,

As we ascend we find about 100 ft from the base a rotten ferruginous rock apparently thickly bedded. This condition of rock is found all the way to the crown where cliffs gives us no opportunity to examine more closely. The whole of the exposed rock is rotten, at times red with rust. giving unreliable strike of N. & S. – N. E & E. N.E. but seeming to strike N.E & dip 10°–12° S.E. It crumbles easily contains much iron is strongly magnetic No sun readings could be obtained here The lake may indicate the strike of these rocks.

6150. Shows the crowning layers on this hill and the red jasper is largely exposed. It is in large massed at times in angular blotches in the rock just described 6150 shows average condition. The jasper at times makes the rock appear a conglomerate It never appears in beds.

6151 Gives the shaly crumbling layers and they at once suggest the samples taken on Gunflint lake while the red jasper is in sufficient mass to relieve all doubts of the far scatted pebbles

Sloping 10-15° it makes the shore rocks already described 6146-47

These beds and doubtless the Animikie still trend to the N. E. taking us too far from our immediate field to permit following.

The greenstone beds with interbedded slates are followed to the E. See next book.

The map of Gunflint marked No 3 was drawn from compass readings along the whole N. shore and is the best approach to the shape of the lake herein attempted.

6152. Quartzite occurring with Chloritic schist at the N. side of central bay on Canada shore of Gunflint Lake

6153 Talcose slate occurring with 6152.

6154. Quartzite on N. shore of Gunflint with Calcite crystals like Teal Lake according to R. D. I.

6155 Porphyritic Greenstone from small island or 6107A. on N. shore of Gunflint marked 6107 A in this book.

N. B. Where numbers are scratched upon samples no notice is to be taken of them unless they agree with the bag label number

55 W. side - 27-28-29-30 T 65-4 W. Animikee. Iron with bedded layers

In 33 Bluff with vein.

From Aug 23 to Sept 8th

The region south of Sea Gull lake has not been entered.

Some notes will be found in regard to this region elsewhere

T 65 - R. V W. has not been returned though surveyed by McPhearson

The Gunflint beds should be traced across this town and the town directly E. before their true relation to the King Fisher and Agemok beds can be determined

From Gobbemichigamog. in N. R. 64 - 5 W. - the gabbro should be traced to Iron lake in T 65 - 2 W.

The probabilities are that the gabbro (coarse) crosses Sec. 28-29 in 65 - 4 W. as such samples were shown me from these points by.

Mr. Henry Mayhew.