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Vermilion Iron Range: eastern portion, no. 1: [specimens] 28115-28281. No. 310 Summer of 1898 - July 1 - Sept 13

Bayley, William Shirley, 1861-1943

[s.l.]: [s.n.], Summer of 1898 - July 1 - Sept 13

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U. S. GEOLOGICAL SURVEY
FIELD SECTION BOOK

9-891

LAKE SUPERIOR DIVISION.

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 number attached, showing the direction and amount of the dip. Denote a shaly or other very plainly bedded ledge by right parallel lines, and a ledge having a secondary structure by wavy parallel lines running in the direction of the strike, with dip arrow and number attached as before. The greatest care must be taken to avoid confusing slaty or schistose structure with bedding, and in all cases where there is the least doubt about the true bedding direction, 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 lines as 100 paces, and twenty of these spaces to 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. The ruling of the left-hand pages is also arranged so that, if desirable, a larger or a smaller scale can be used, eight inches, two inches, one inch, or one-half inch to the mile. With the two-inch scale, the squares outlined in black represent sections, and those in red, quarter sections and "forties," while the space between the blue lines is 200 paces.

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, the latter always being expressed from the north; for instance 4025, 250 N., 300 W., *Strike, N. 78° E., Dip 50° S.* Then follow with a full description of the ledge. When topographical maps are used for locations this paragraph applies only in part.

3. Collect a specimen from every ledge, or wherever there is a change of rock on any one ledge, taking care to get fresh material, unless for a special purpose the weathered surface is desired. In case of trips made on foot or in canoes, for long distances, neighboring ledges, unquestionably of one kind of rock, need not be specimened. The position and extent of the ledges not specimened should be marked on the map, with notes that each is of a rock identical with specimen so-and-so. Under the same conditions small-sized specimens, trimmed to a uniform size of $2 \times 2\frac{1}{2} \times \frac{3}{4}$ inches will be allowed, but in all other cases *large-sized specimens*, trimmed to a size of $3 \times 4 \times 1$ inches, must be selected, in accordance with section 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. Specimens should not be placed together without protection in the collecting bag, as the fresh surfaces, important in determining the character of rocks, are thus destroyed. They should be damaged by no temporary mark, but the numbers should be at once marked in at least two places upon the inclosing paper or cloth bags. Specimens may be permanently marked in camp by painting the numbers upon them in white upon a black background, using Silver White and Ivory Black oil tubes for color, with turpentine as a diluent.

4. 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.

5. Forward this note book as soon as filled as registered mail matter to C. R. Van Hise, U. S. Geologist, Madison, Wis.

310

Vermilion

Iron Range

Eastern Portion

Summer of 1898 - July 1 - Sept 13

W. S. Bayley

Oscar J. Wells, compassman

No 1

The work of the season of 1898 occupied the whole of the months of July and August and the first half of September for the entire party, and the first 22 days of the last named month for a portion of the party.

The crew consisted of

W. S. Bayley	} Geologists
J. W. Clements	
C. K. Leish	

Ira B. Weller of Antrim, Mich	} Comptroller
Oscar J. Weller do.	
Leonard Hoffmann of Iowa, Minn	

Erick Erickson	} Packers
John Bloom	

Alex Robertson, Cook

The country covered extended from about the west line of Range 10 to the west end of Greenlick Lake.

July 3.

Studied the Kawishiwi river from
Head Main Portage in Dec. 30. 1863-10
as far west as Farns Lake. The water
was so high that it was with difficul-
ty that the shore could be examined.
The exposed portions of ledges were all
small and their relations to the sur-
rounding ledges were obscured by water.

Hb. Sc.

28115

From small ledge in South shore of
river in Dec 30. 63-10. About 100 paces
from west end of Head Main Portage.
The rock is a fine grained, black,
Lombardic or micaceous schist or
gneiss. It weathers reddish.

Hb. S.

28116

About 200 paces further west. This
is a small ledge of banded rock in the
water. Its darker bands are like 28115
but more schistose. With these are
fine grained lighter layers that look
like small veins or dykes of felsite?

Hb. Sc.

28117

Further west, near the west Sec. line
the rock is well-bedded, with a strike
of about N.E. and a dip of 50° to N.W. The
bedding appears like and to the alterna-
tion of a dark schist like 28115 and
layers of a light yellowish-pink fine-

Hb. So.

28118

grained micaceous granite?

Hb. So.

28119

The entire point marking U.E. from about 300 W. of E. line of Sec 25. T. 63. R. 11 consists of a micro-granite? or

humble greenish-grey - a rock very much like 28115 but a little more schistose

Beyond this, to the west, the rocks are practically the same.

The point about 500 E. of the west line of Sec 25 is a knob of fine grained granite? like rock, similar to 28118 intruding green-schist? that are in very small quantities. Indeed the green rock is in such distinct bands in some places that they look very much like dykes. The main rock is a red-weathering pink or purple rock that may be a slightly altered phase of 28119

On weathered surface the point looks as though composed of the ordinary schist-granite? complex.

Think, however, we have sedimentary rocks that may be altered by the presence south of them of the white? Iron granite?

On the south shore of the river, about

H.S.
28120

on line between Dec 25 and 26 is a little cliff extending about 60 paces along the river. The rock in it is practically the same as 28119. It is much banded, but strike and dip could not be obtained because of heavy weather. The rock is described as "evidence of igneous" in the field notes, but from what has been said of other rocks in the vicinity, should now pronounce it sedimentary.

H.S.
28121

All along the shore to the rapids near D. G. Cor. Dec 26 the same rock occurs at intervals in cliffs.

Sl 7
28122

On the south side of the rapids it is a little more schistose than elsewhere. On the shore where west line of Dec 30 crosses it, the rock is much more schistose. The strike of the schistosity is E.W. (magnetic) and the dip 75° S.

The little knob at the mouth of the Kawishwi river, where it empties into Farm Lake shows a beautiful exposure of conglomerate which is best seen in the Farm Lake side of the point.

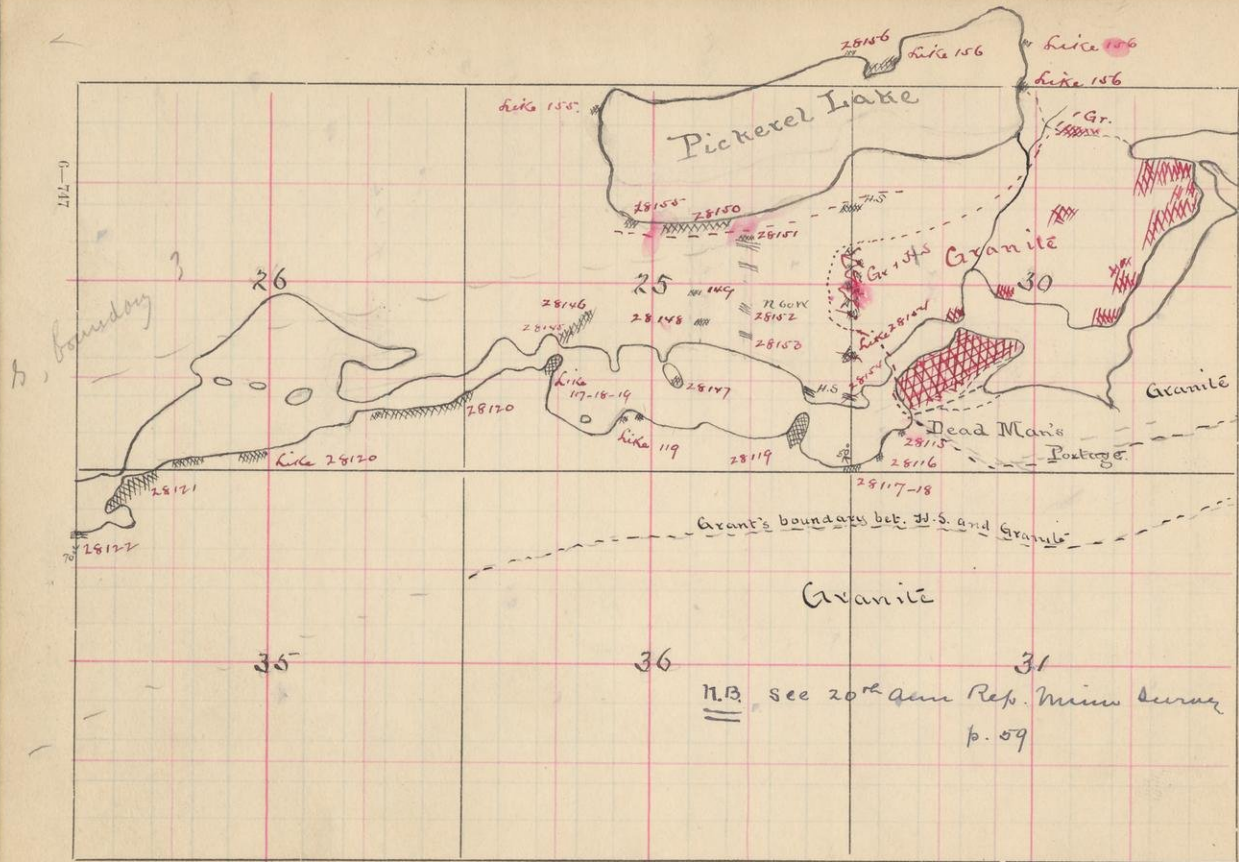
We find here bands of pebbly conglomerate interbanded with layers of a dark and light banded rock like those in the river to the East.

The bands are interstratified in layers 6 in to a foot wide with conglomerate bands of about equal widths. The predominant strike is N. 80 W. and dip 80° N. The best exposures are covered with water. They should be re-examined. No relations of the conglomerate with other rocks could be detected - as the conglomerate knob stands alone with swamp around it.

Specimens:

- { 28123 Dark band interstratified with cong.
 { 28124 Lighter bands. Recrystallized granite (?)
 C { 28125 Showing thin banding planes.
 { 28126 The conglomerate is schistose with the schistosity parallel to the banding. It contains large granite pebbles with their long axes parallel to the schistosity, in a schistose matrix very like 28123.
 C { 28127 Matrix, with pebbles showing in end of specimen.

P. 10 & 11



C 28128 another specimen of conglomerate exhibiting better pebbles.

Cgl 28129 Some beds of the conglomerate contains long narrow fragments of black quartz that look as though they might be one or chert fragments;

Cgl 28130 and others containing banded fragments resembling jasper.

The ledge is about 150 paces wide from N. W. T. at the water's edge.

28131 In the very middle of the conglomeratic layers are thin beds of a pink weathering rock very much like felsite or a very fine grained red quartzite.

South of the conglomerate ledge is a little break occupied by low ground, which was covered with water at the time of our visit. Beyond this is a

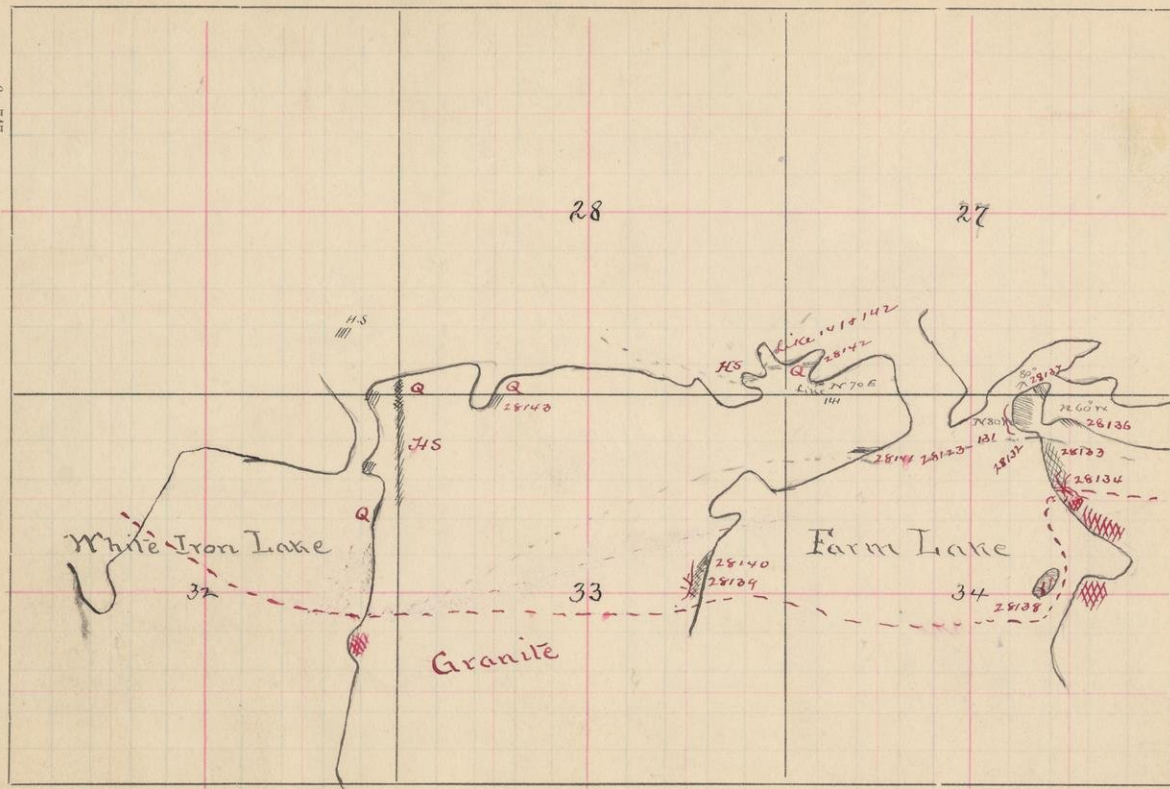
low ledge of a quite different rock looking like gneiss. Close inspection however discloses in it an occasional pebble-like mass, hence it may be a non-conglomeratic bed belonging to the conglomerate series. This rock extends south to the little valley which cuts off the hillock, on the point, from

S.

T. 63

R. 11

6-747



from the country to the South.

Immediately South of the valley rise hills that are composed of an entirely different rock

Hb. Sc. ?

28133

That portion of the hills nearest to the Conglomerate looks very much as though composed of a gray gneiss or granite?

Hb. gn.

28134

A little further South it looks like Hornblende-schist - and this is cut

Hb.

28135

by dykes and veins of red granite, most of which is coarse grained

28133-134 may be like the material interbedded with the Conglomerate that has been changed by intrusion of the granite? If so then Conglomerate is fragmental series older than White Iron Granite?

If 28133-4 entirely different rock from the rocks interstratified with Conglomerates - then latter may be younger than the granite? i.e. it may belong to a series of rocks younger than the Green-schist series cut by granite? And 28133-4 may be members of the green-schist?

July 4

Hb. gn.

28136

Examined East side of Conglomerate ledges. At place indicated on map found ledges of schist like those East, striking N. 60° W. It is much cut into the little folds pitching high to the N.W.

C. 28137

28137

At the narrow into the lake is a large exposure of light colored rock that I take to be fragmentary. It appears to be a recrystallized granite. This is north of the Conglomerate.

Examination of these ledges suggests the idea that all the rocks bordering the river from Dead Man's portage west are members of a sedimentary series to which the Conglomerate belongs as the lowest member.

"Geology Island" is the name given by Winchell to the island in Fann Lake situated in the NW 1/4 NE 1/4, S. 34 T 63-11

[15th Ann. Rep. Minn. Survey, p. 82-89.]

He describes it as a complex of syenite, Diabase, mica and horn blende schist etc.

Beginning at South he finds:

1. Mica-schist - Dike U. 61° E. Dip S.E. 75°
intersected by dykes
2. Granite grains, grading into dike
vertically and laterally. Intersected by
granulite and dykes
3. Mica-schist cut by dykes
4. Diabase or gray waste.
5. Mica-schist
6. Hornblende schist

etc.

All these are described as forming
unfathomable bed etc. which at the same
time constitute a complex cut by
granite and other dykes and veins.
Examined carefully to discover whether
or not we have here some funda-
mental - complex.

H615
25138

Found in the south side of the island
splendid exposures of hornblende-schist.
This is cut by granite dykes, which in
places swell out into large areas
that may look like boulders.

Some of the small veins are puckered,
others are pinched. In some places
there are obscure evidences of the pres-
ence of granite boulders in the schist.

but these are regarded as lenticular masses of the granite^d around which the schists wrap.

Am inclined to think we have in this island the same schists as are found in the Kauristien river and on the East side of the Lake near the granite^d contact (viz: 2812-1) and that the schists^d are practically the same schists that are found north of the White-Drun granite^d in the N.W. side of White-Drun Lake.

Crossed over side of Jam. Lake.

Hfs.
28139 About west of island in the west shore is a high bluff of lam. blue de. schist, which a little back from the shore gives place to a granite^d. Probably the granite^d intrudes the schist.

F.P.
28140 A little further north along the shore is a mass of porphyritic rock in the schist near the water's edge.

H.M.^s
28141 The schist with int. granite^d occurs along this shore to the north. At the point indicated by the specimens the rock is banded with about an E-W strike

Continued west around the shore to White Iron Lake to look again at the cherts on East side of White Iron and those at Silver City. The of course the water was so high that mine openings were 5 or 6 feet beneath the surface.

1.C
28142

At S. side of Edstemmuck flatter bays near line between Secs. 24 & 28. is an exposure of the banded rock like 28141, and just north of this is a quartziferous banded rock which reminds me strongly of the white iron cherts. It is a Jasperiferous quartzite that strike N. 70° E and dip vertically.

On westernmost point is a Hornblende schist - Specimens collected last year. This rock is quite different from those collected on the Kamskimi though both kinds of rock are called Hornblende-schist. It is more like a typical schist.

My notion is that this rock is a green schist - that is an metamorphic rather an igneous schist, while those to the east are sedimentary.

On the west side of the little bay in N.W.

100
28143

1/4 Sec 33. is none of the quartziferous
 rock like 28142. This strikes approx-
 imately 30 E of N and dips high to N.W.
 Ran south in west section line of Sec
 33, crossing rock like 28143 until reach-
 ed point 60 paces south of corner.

Hb. 5
28144

Then found small hills of hard
 schist like specimen.

From this point to 500 S. where we
 were stopped by high water are the
 same schist & apparently striking
 nearly N-S.

Granite occurs in many boulders in
 point 200 S. of 1/4 line Sec 33. Belong-
 ing to the place.

See last year's notes for
 Geology of E. shore White & Iron Lake.

July 5

Went west to W. line Sec 25. T. 63 R. 11
and worked shore Eastward.

At point found 500 E of W. line of
Section is the west end of a ridge that
is largely moss-covered.

#6.5
28145

#6.5
28146

A little way up in the hill a green-
stone ledge was found and back of this
about 150 paces a more typical green-
stone schist - showing transition into
a hornblende schist. The main ridge
seems to be made up of this rock.

The island of the $\frac{1}{4}$ line Sec 25 is
principally a heap of loose boulders
the ledges at water's edge being and
beneath the surface.

M. 9.
28147

On the S.E. part of the island however
is a little cliff composed of a complex
of greenstone and various schists as-
sociated with gneiss. The cliff is
isolated. The rocks are green schists &
intruded by granite & in all probability
it.

Ran north from river to Pickers
Lake about 300 paces East of N.T.
 $\frac{1}{4}$ line Sec 25.

M. 9
28148

At about 100 paces from shore found ledge of dense hornblende gneiss or greenstone schist, much like 28146. It is badly jointed into columnar blocks.

M. 5.
 28149

At about 275 from shore is a little hillock of practically the same rock though it is a little grayer.

S. M.
28150

At the lake shore greenstone schist occurs abundantly. There seems to be a difference between this rock and those represented by 28148 and 28149 which are more like those on the south side of the river.

From lake shore went East 200 paces and struck the river.

H. 9.
 28151

At 750 of turning point is a small ledge of banded greenstone under a cover of moss. Am not sure whether this is a porphyritic greenstone or an acid rock.

H. 5.
28152

is a more typical hornblende schist from 4140 of turning point. Its banding strikes N. 60 W and its dip is about vertical.

H. 5.
 28153

Another specimen of the hornblende schist at 5250.

This rock is very much like that. to the north, but in weathered surface it exhibits complicated contortions.

Section lying between D. 25. T. 63. 11 and
Dec. 30. T. 63. 10.

Near shore of Kawishewo rises great ledges of Lamblede schist cut by small granite dykes. It is contorted, possesses the usual characteristics of the schist in this vicinity and strikes about N. 60 W.

Large Exposures of ^{red} granite associated with some Lamblede schist. The granite is intruding. Other similar ledges showing the same association occur as far north as 225 E. of 10 pish. North of this is a single Lamblede schist exposure and beyond this to the Cape drift hills.

It is evident that the granite is a portion of that which occurs so prominently at Dead Man's Passage.

All the rock in Pickens Lake, so far
as could be determined from the few ex-
posures above the water, is greenstone
8.9. Olchish.

28155

From S.W. corner of lake

891

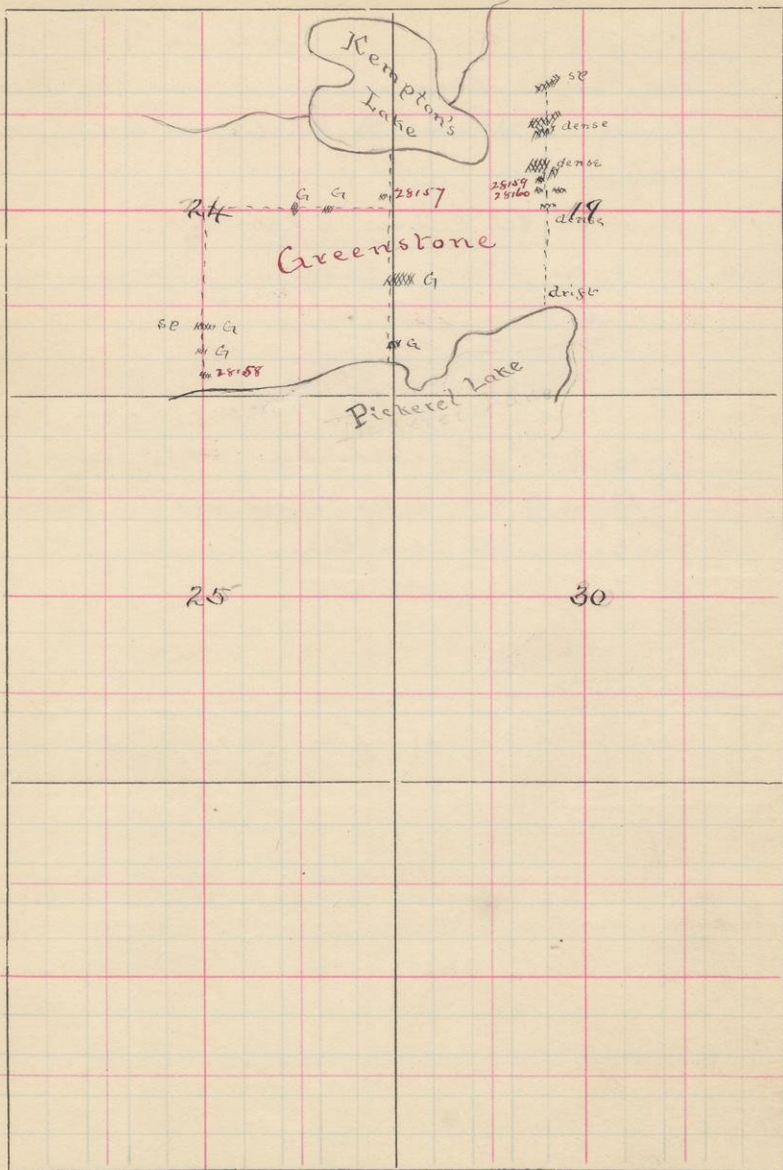
28156 U. side of lake, just W. of meander
corner.

At 425 paces from river in Postage
trail into Pickens lake the last ex-
posure of granite was seen. This is
evidently the northern limit of the rock
in this neighborhood.

S. $\frac{24}{25} \frac{19}{30}$

T. 63

R. 11/10



July 6

Went in from Pickers Lake north on line between Dec 19 T. 63-11 and Dec 24 T. 63-10., over greenstone as far as Kempton's Lake, then went west half mile to center of Dec 24 and back to lake again.

J. E.
Bout

28157

The greenstone is the fine grained variety, much of which is spheroidal is a specimen of the dense, or fine grained variety, at 1050 N. 1020 W of J. E. cor Dec 24.

At 125 N. 1000 W same corner is the only ledge of rock met with on the run that is not of the fine grained or spheroidal variety.

J. E.

28158

This is a coarse divided that may be found an impregnation vein or coarse dyke in the finer greenstone.

Made another run north from a point near East end of Pickers Lake - the run following line 250 W. of the U.S. center line of Dec 19.

All the ledges observed in this run are also of the dense greenstone.

At 1100 N. 1200 W of SE cor Sec 19 however
the greenstone is cut by dykes of a
white quartz porphyry. Despite
relations could not be observed on
this particular ledge, but from ob-
servations made over and over again
elsewhere there can be no doubt that
the porphyry intrudes the greenstone.
Specimen porphyry from what looks
like dyke in greenstone

Q.F.P.

28159

Q.F.P.

28160

Basis phase of same rock. This phase
exhibits no quartz crystals. It is from
peripheral portion of porphyry mass
near contact with the greenstone. May
have absorbed basic material

The ledge at 1500 N. 1000 W of SE cor
same section is a knob of brecciated
ophenilitic greenstone which also is
cut by porphyry like 28159-160.

July 4/98

Made passage from Kaministiquia
river to Stone Lake and a trip
around this lake

The shore of the river is bordered
by cliffs and high hills over which
the passage trail runs. The predominant
rock in the trail is a spheru-
litic greenstone.

1. C
28161

About $\frac{1}{3}$ of the way across the trail
however is a small bed or seam
of Jasper that runs approximately
E-W, but at one place bends north-
ward around a knob of greenstone
and gradually dies out both E & W.
The width of the seam is only 5 or 6 ft.
and its length over 100 paces.

2. C
28162

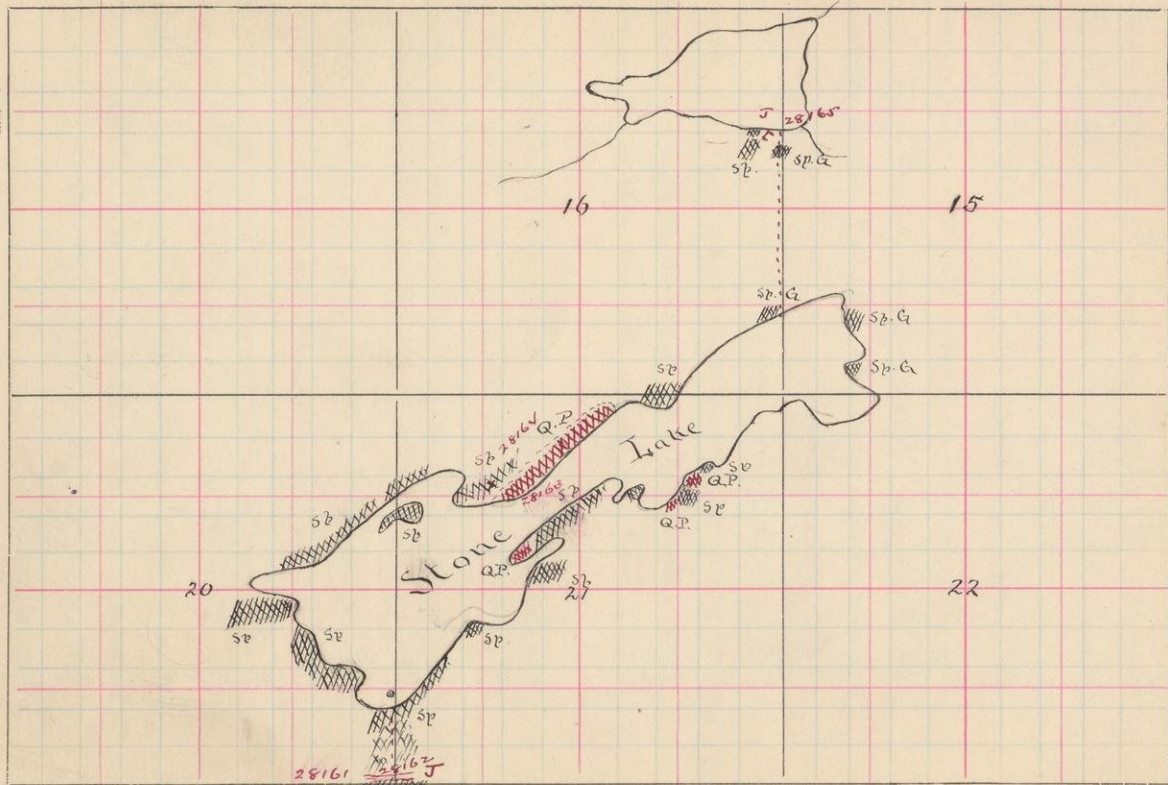
The Jasper as well as the spherulitic
greenstone is cut by a mass of per-
phyritic greenstone and the spheru-
litic rock by dykes of quartz. Porphyry.
The north and east shores of Stone Lake
are like with spherulitic greenstone
except on the east side of the point
of land just east of the W. line of
Sec 25.

There is a large mass of a white

S. 20 16 15
22

T. 63

R. 10



En. P

28163

h. 28

28164

granite & porphyry which apparently
cuts the greenstone

In several places at the west end
of the lake are little piles of white
boulders that may mark the position
of ledges of this rock, i.e. dykes in the
greenstone.

Both the greenstone and the porphyry
are much jointed and the white rock
is quite schistose along Schlieffen. The
greenstone is also schistose in places
and these show contortions that re-
semble flow lines. The schistose bands
run around the ophiolite's parts
and envelope them in a complica-
ted fashion.

The quartz-porphyry occurs also
at several places indicated on the
map, along the South shore of the
lake.

After making circuit of lake went
along section line to little lake in
U.E. 1/4 Sec.

The first 675 paces was through
swamp.

At 200-390 ft of 1/4 part are ledges

spherulitic greenstone.

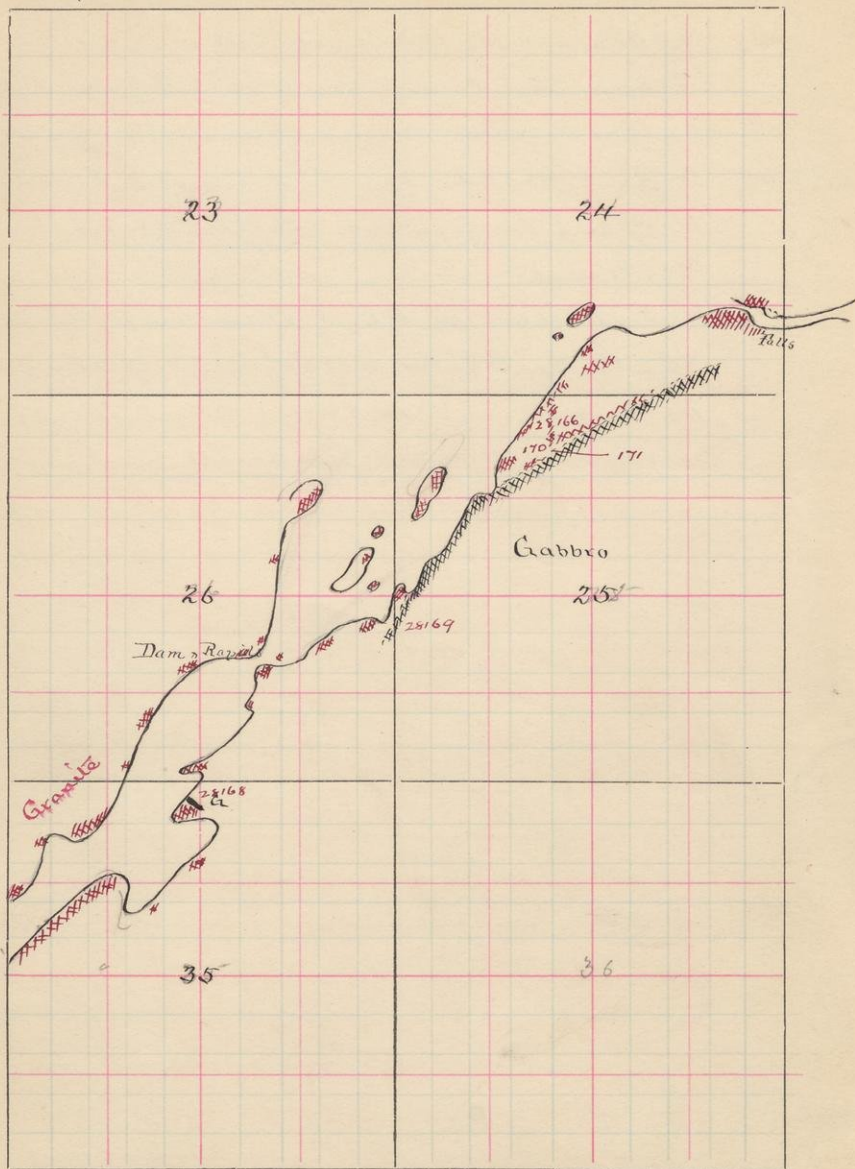
1.2
28165 Near the lake, in a windfall and covered with moss found a small ledge of Jasper, of which could learn nothing so far as its relations are concerned.

Went west a short distance along the lake shore and found greenstone, so that it is probable that Jasper is in very small quantity.

S. $\begin{array}{c|c} 23 & 24 \\ \hline 26 & 25 \end{array}$

T. 63

R. 10



July 8/9

Examined E. shore of the Kaunistu river, South Branch along Sts. 25, and 35. J. 62 R. 10 and Dec 3 in J. 62 R. 10.

Both shores as far as examined are granitic except as specifically indicated.

hr
28166

Characteristic granite from near meander corner in U. line Dec 25.

hr
28167

Granite from E. shore South of turn line.

Mr. W. G.
28168

Where U. line Dec 35 crosses the river is a diabase dyke cutting the granite. Could not be decided whether this is an apophysis of the gabbro or not.

gabbro

28169

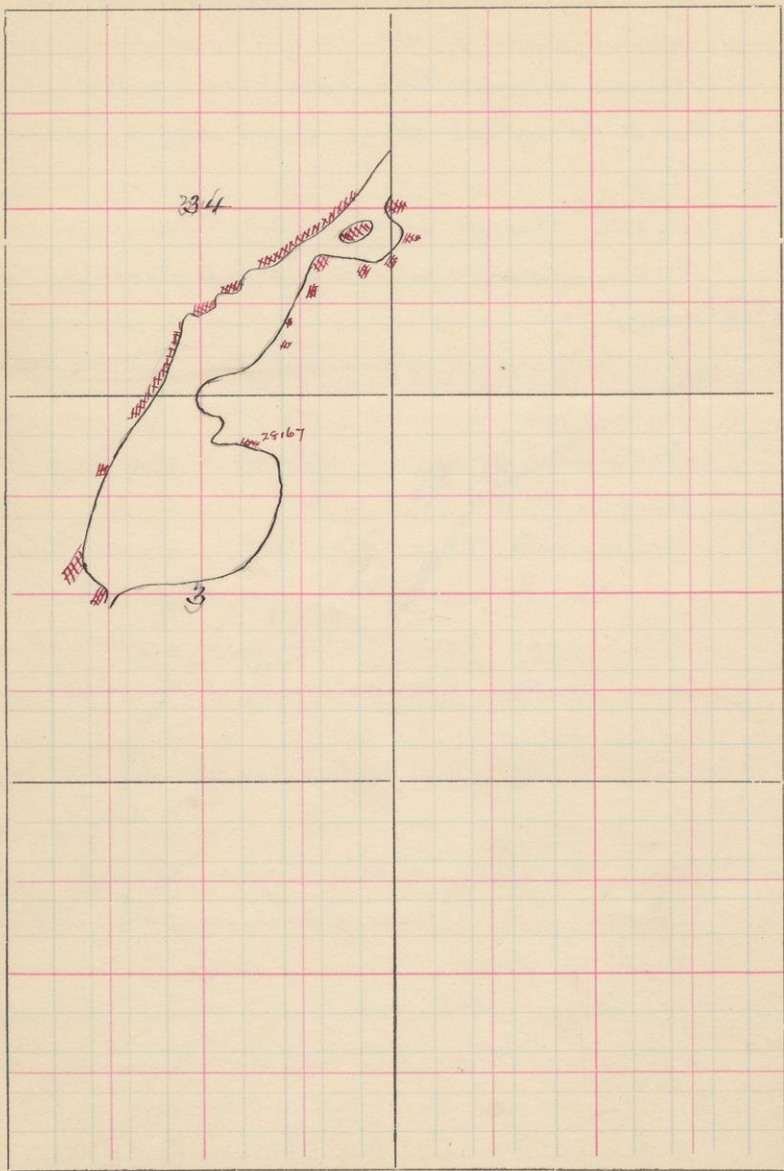
Near the W. post Dec 25 the first exposure of gabbro was seen. It forms bluff bordering shore for about 700-750 paces. It is a medium coarse phase, that is full of coarse areas of white feldspar shot through and through with needles of hornblende.

Ran along the outcrop between the granite and the gabbro but could learn nothing definitely as to relation.

S. $\frac{34}{3}$

T. $\frac{63}{62}$

R. 10



of the two rock. The contact where seen is very sharp. The red granite is cut by fine grained red granite veins or aplite dykes. Near the contact with the gabbro it appears a little more basic than elsewhere and approaches the gabbro in general appearance. There seems in many places to be a transition between the two rocks. In these cases naturally the contact is visible.

The transition rock in a few places is broken into round masses and these are cemented together by chlorite-schist.

At 3008 is one of the transition forms. The rock looks like granite in weathered surface, but on a fresh fracture the quartz is visible.

N.B. Location 3008 of Meander comes in N line Sec 25.

W.M.
28170

W.M.
28171

July 11-12
With Prof Van Kine to Moose Lake.
See Prof Van Kine's Notes

July 13
Went to Twin Lakes.

July 14.
Drove N. side N. Twin Lake saw
north on range line, finding fine
grained, spherulitic greenstone on
lake shore and for 900 paces north.
At this point, on west side of line
is a sharp ridge trending a little
N of W. comprised exclusively of a
coarse grained diabasic greenstone.
The knob was isolated so could not
get relations with spherulitic green-
stone, but imagining it to be a great dyke.
At 1200 N the dense greenstone is cut
by many dykes of white quartz-per-
phyry, which near its contact with
the greenstone is a little more basic
than usual.

J.D.
28172

Q.D.
28173

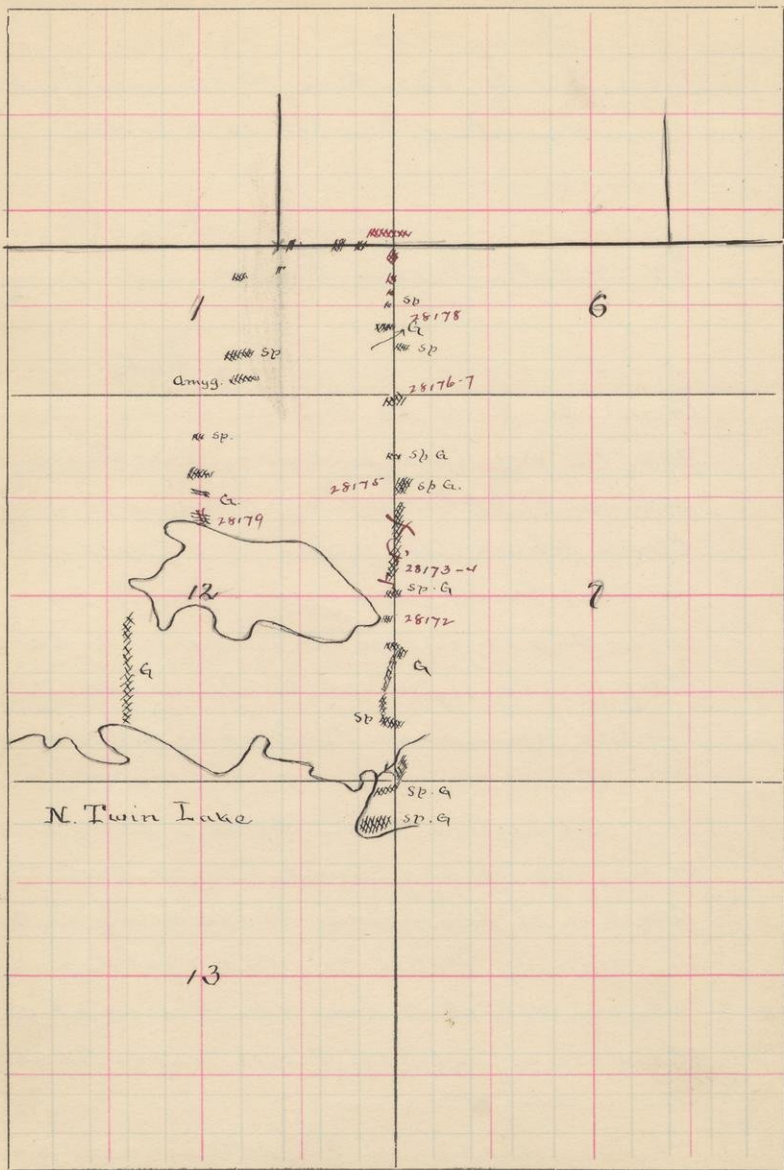
July
28174

The greenstone, on the other hand is
schistose in elliptical areas and is

S. $\frac{1}{7} \frac{6}{12}$

T. 63

R. 10/9



stained brown with decomposition products.

The greenstone and porphyry continue to 500 ft. of sec 6. the porphyry being here largely in excess.

Beyond this to the west, as far as 500 ft. from corner is porphyry.

28175 Dark greenstone at 1662 ft of sec 6.
12. J. 63-10.

At the O.E. cor sec 1. the spherulitic greenstone is beautifully amygdaloidal. The amygdaloids are large white bodies sometimes occurring singly, sometimes arranged in lines. They are more common in the interstitial portions between the spherules than in the material of the spherules themselves, though in many cases they are present also in these.

9. cl. sp. The rock possesses a few struts and is beautifully pitted.

28176 Showing weathered surface of amygdaloid.

28177 Amygdale

The N.E. cor sec 1 is 500 paces N of the O.E. corner of this section.

9

It is at the base, or near the base of a large hill of quartz-porphyr, that rises steeply to the north.

Ran west from this corner 500 paces over spherulitic greenstone and porphyry, then S. to Dec. line, west 200 paces and south little lake in Dec 12. Went around W. side of lake and continued S. to U. Twin.

The rocks in the Southern area are all greenstones and porphyry until reach little ledge on South side of swamp at 1600 of U. T. post, Dec 12. There we have a very schistose greenstone with schistosity striking a little N. of W. It continues to the lake and at places is intersected by porphyry.

Between the little lake in Dec 12 and U. Twin lake is a practically continuous ledge of greenstone some of which is fairly coarse grained, but the major portion of which is the usual spherulitic variety.

H.S.

28179

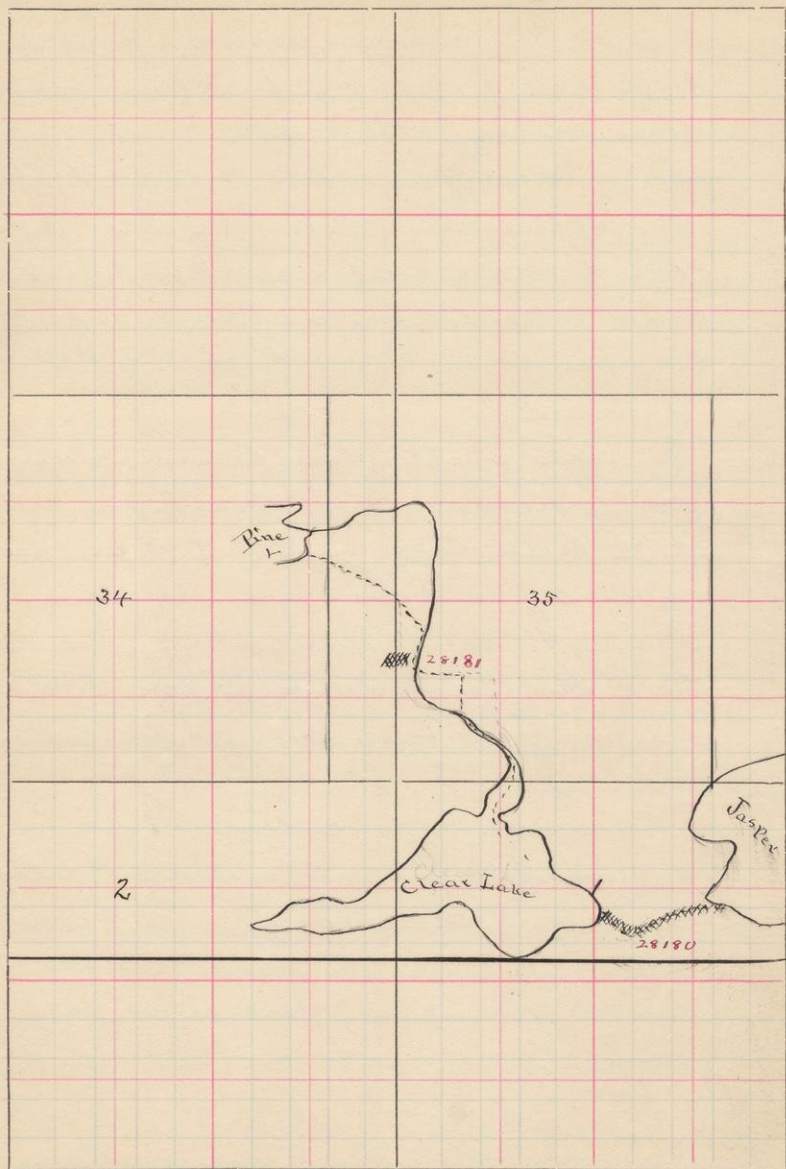
QP

28176 (?)

B. $\frac{64}{63}$

T.

R. 10



July 15.

Started on trip through Clear, Pine and
Wind Lakes.

b. 21

28180

The Portage trail between Jasper and
Clear lakes runs over greenstone hills,
in which the greenstone is of the usual
kind. On the eastern part of trail
the rock is cut by porphyry.

The portage trail between Clear lake
and Pine lake is largely through swamp.
To the west of the trail where it crosses
the stream

H.

28181

are great ledges of jointed greenstone
angularly filled with greenstone peb-
bles and with angular fragments
of same rock that weathers white.

Clements decided this rock where
he crossed it to the west.

It seems to belong with the greenstones.

July 16.

Examined carefully the island in the South end of Pine Lake, on which Ege-
man found Conglomerate.

The high Southwest end of the island
consists of a dense, ringing, green rock
irregularly gashed and jointed. On many
places in the weathered surface it is
seen to be spheroidally pitted, the spher-
oids being bordered by a rim of white
weathering feldspathic material.

h.c.
p.d.28182

dense green rock from the S.W. end of island.

h.c.

28183

fragment of one of the Spheroids

The rock looks like the usual spher-
oidal greenstone.

h.c.

28184

To the East the rock breaks down from
a cliff. It becomes more schistose and
in a fresh fracture has a fragmentary
texture.

A little further East the weathered
surface appears conglomeratic. Small
fragments of a white-weathering rock
sprinkle the smooth surfaces.

h.c.
w.f.28185

This is a more fragmentary phase.
The fragments have a lighter color
than the matrix. With these frag-

200. fragment
28186

minerals are others that weather red or pink, like a granite? but which in the fresh fracture look much more like a gneiss. There are also in the rock sharp edged masses of a banded Jasper; but am not sure that they are not infiltrations.

H. Tull C
28187

at the Eastern end of the island the conglomerates and Schistose limestones of the rock are well marked. The rock looks remarkably like a conglomerate, but it is noticeable that there are no quartz pebbles in it. The strike of the Schistosity is N. 65-70 E and the dip almost vertical.

Am inclined to think the rock a tuff, but it may well be a true conglomerate.

V. Tull C
28188

The little hillcock forming point in the center of the S.W. 1/4 Sec 35 is rock like 28186-7, with a little more definite fragmental texture.

The small island south of island in which 28183-7 are found is composed of a Schistose, gray-weathering, shaly looking

J.
28189

rock, with a schistosity a little N. of E. It looks very much like a slate. Could see no bedding, but there are present structures which are possibly slate laminar, crinkled and contorted.

N.Y.
28190

The East shore of the Southern bay of the lake is a high bluff rock that looks more like greenstone than any thing else I have seen. It is slightly schistose.

Sl + No
28191

Towards N.E. the bluff takes on a little different aspect. The rock is jointed with smooth joint planes. It is massive and is spangled in fresh fracture surfaces with little specks of quartz and biotite.

W.
28192

Specimens taken from blocks that have evidently fallen from cliff are filled with little black specks that look like slate inclusions.

This would seem to indicate that the rocks are fragmental, i.e. graywackes; and yet if this is so the source of the slates is unknown.

If the rock is ^{not} fragmental as it would

seem plain that it is an intruding
younger than the slates in the neighbor-
hood.

Went in on portage trail that runs
East from north bluff. All along the
trail for 260 paces. The rock is schistose
or slaty - so that it resembles very
closely a slate? Three phases are dis-
tinguishable

Sl
28193
Sl
28194

} Between 100 and 200 paces from
lake on trail.

* Sl
28195

260 paces from lake.

*
bit
28196

From little point north of mouth of stream
300 N. 300 W of E 1/4 sec. 35. Schistose
rock that looks more like gneiss than
like fragmentals.

Along the shore in the N.W. 1/4 sec 35
we find a small ledge of slate? at
about 1600 N. 1500 W of E. Cor. Sec 35 on
the south side of bay.

The point making the northern side
of West Bay to the south is a dense gray-
ish-green eruptive, or at any rate, a
massive rock. This forms the back-bone

*
28197

Point

28198

of the Point. On its North side and at the west end it breaks down into a swamp. Here the rock is schistose.

It is a purplish green schist that looks not unlike a fragment at the water's edge in the N.W. corner

28199

28199

of the bay South of the above described rocks is a ledge of platy rock that I believe to be a greenstone; and on the South side of this same bay is what appears to be a schistose greenstone again. The ridge South of this is a massive gray diorite.

28200

28200

It may be that the schists are sheared peripheral portions of massive gneiss.

The rocks on the shore in the N.E. 1/4 Sec 31 are not very different from those in the west shore, described above. is a schistose greenstone from little point N. of 28196. Schistosity strikes about N. 60 E.

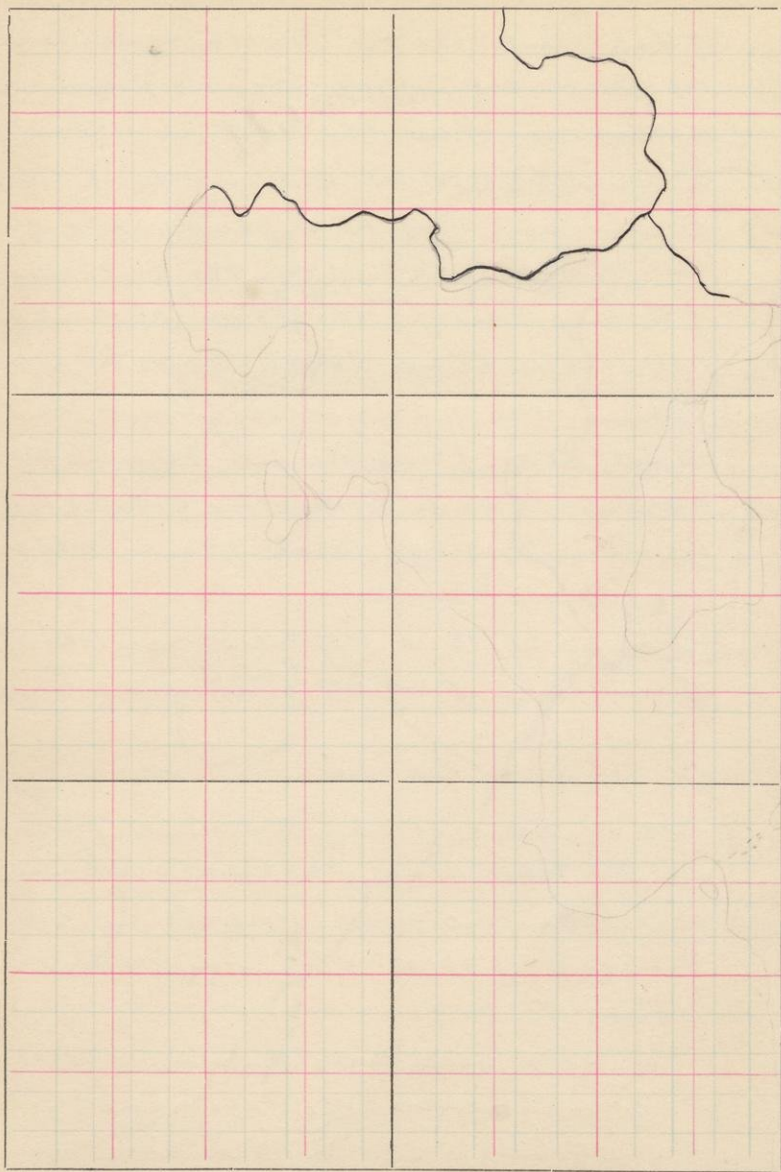
28201

The moderately long point marking S.W. is composed of a dense, schistose light green or gray rock very much like 28182. Schistosity - normal, N.E.

S.

T.

R.



with about $N 60^{\circ} E$ strike. At the Ex-
trême end of the point the rock is
distinctly slaty, resembling the rock
in the Portage trail. This slaty phase
is cut by veins of calcite, and its lami-
nae are often cemented by the same
substance so that it appears banded.

28202

The island of Thiockine is also a schis-
tine greenstone. In general it is like
the other schists; in the main land
but its laminae are crinkled and
the rock is cut by veins of red quartz.
At the west end of the island the tex-
ture and general appearance of the
schist indicates that it was originally
a tuff.

28203

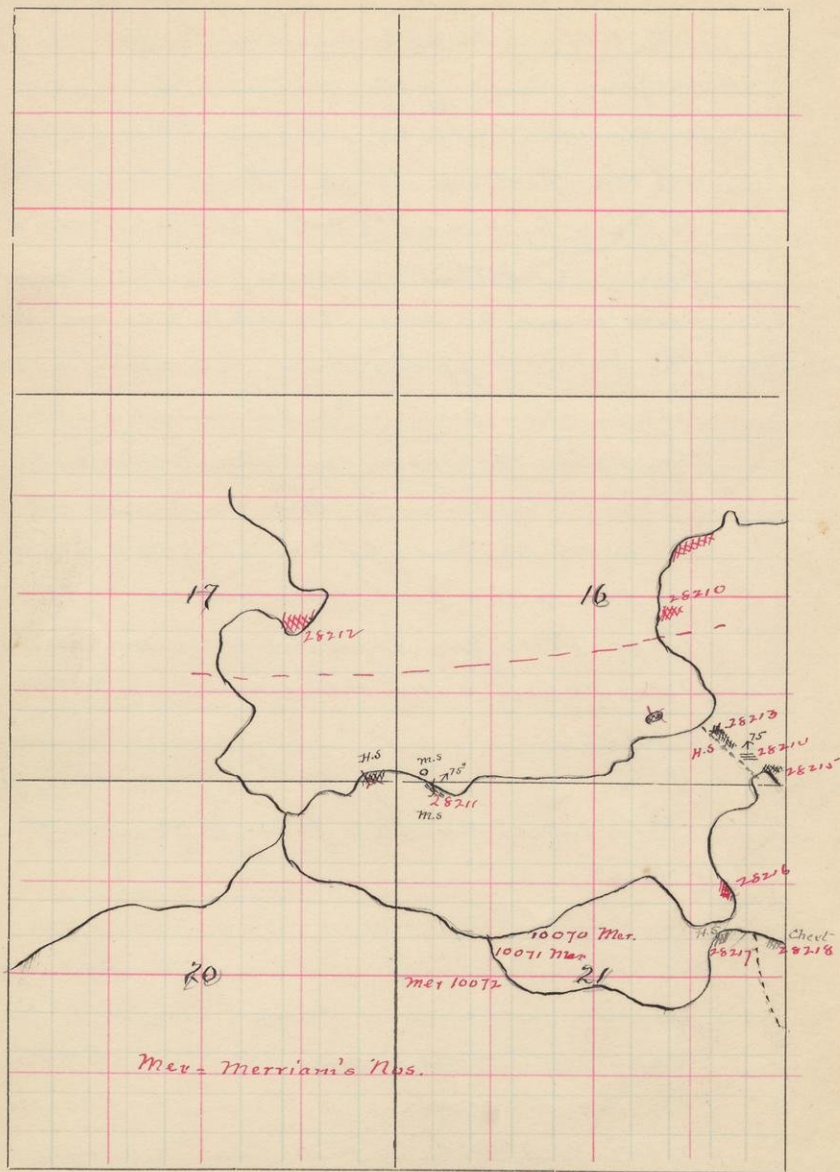
From N. side of Point North Island.
This also seems to be a greenstone
schist.

It is impossible for me to dis-
tinguish between fragmentals and
squeezed ophiolites in this case.
The microscope will have to decide in
most cases whether the names above
given are warranted or not.

S.

T. 64

R. 10



July 17

Trip from Pine Lake to
Basswood

Went through Rice Lake and
from thence U.E. over passage
trail into stream and down
stream to Rice Bay of Basswood.
On south side of bay of Rice Lake
just before reach outlet find
several ledges of green-schist. These
ledges extend with intervals as
far as the E. line Sec 22.

G. Smith F.P. (E.H.)

28204

On south side of stream a little
west of point where it opens up
into pond is a small ledge of white
schistose rock that looks like a
fine grained granite or an acid
porphyry. It is jointed closely, produc-
ing a schistosity striking about N.W.
in stream at about the U. line Sec
22.

G. Smith F.P.

28205

G.

28206

G.F.P.

28207

in stream at about 400 ft of O. line
Sec. 14.

These rocks are apparently both
greenstone schists, but they are more crys-
talline than the schists both south

and are apparently gradation phases between these and more typical Lumblandia and mica schists?

51

28208

28209

On south side of Rice bay of Basswood Lake is a fine grained, banded mica-schist and in the island in this bay a Lumblandia schist striking about S. The Lumblandia schist is cut by stringers of granite?

On the east shore of Rice bay a few more ledges of schist were observed. The southeasterly granite ledge is on little island near the S.E. Cr. Sec 11. This is the coarse red, characteristic Basswood granite?

Coasted along Basswood to about the center Sec 17, finding granite and Lumblandia schist predominating.

The schist is badly outcropped and is filled with granite and quartz veins. The area in which these rocks occur reminds me more strongly of Basal Complex areas than any other districts examined in the past two years, and yet it seems probable that we have

here first what we find at the northern boundary of the White? Iron granite? viz: Contact rocks originating by the intrusion of sedimentaries or green-schists? by granite?

The granite is thus younger than the surrounding rocks, but whether it is younger than the sediments to the south cannot be ascertained until the nature of the contact rocks is discovered.

M. S.

28210

From East shore of bay in Sec. 16.

M. S.

28211

cf. Merriam's "5623"

is fine grained mica or hornblende-schist - banded - from S. end of bay.

The southern and eastern sides of this bay show only a few ledges but these are all of mica or hornblende schist.

Jr.

28212

The granite occurs in a great ledge in the point near the center Sec. 17, and in veins and dykes cutting the schists.

Portage Trail between Basswood
and lake in Sec. 21-22. T. 64-10.

br
28213

Porphyry cutting Hornblende-schist
86 paces from shore of Basswood.

H. Sc.

28215

Hornblende-schist, dipping 75° N.
Strike about E-W.

S. S.

28215

300 paces from shore of Basswood
Greenstone-schist at end of portage
trail

The rocks along this trail, as is usually the case in the woods, are so covered that it is difficult to study relations. It would appear, however, from the sequence that we have here evidence of gradation between the Hornblende-schist and the greenstone schist?

The little lake in Sec 21-22 bordered by the same kind of rocks as are found in Basswood, viz: Hornblende-schist and granites. The schist take on more the character of greenstone schist than they do further north. Merriam studied carefully the west side of lake - so in consequence also of lack of time - did not examine very

Hr.

care fully.

28216

Granite from East Side of Hunt Dividing Lake.

Hb.S

28217

Hornblende-schist from South side of lake, just west of west end of channel connecting two lobes. From high cliff.

out

28218

White dense cherty schist from high cliff on South side of lake East of portage trail into Rice Lake.

Could make nothing of this today, because could get no relations with hornblende-schist.

July 18/98

Raw north from Pade lake in $\frac{1}{4}$ mi

For first 100 paces from lake find
Schistose greenstone,

Sl? 28219 then to 300 paces north is a more
schistose greenstone, resembling close-
ly the crinkled schist or slates in
Moose lake.

Sl? 28220 From 300 to 500 ft. which brings us
pretty nearly to the D. $\frac{1}{4}$ Dec 20, we
cross over practically the same rock
At about 50 paces N of this $\frac{1}{4}$ point
begin a denser schist with a white-
weathering, looking very much like
a tuff. This extends to 500 ft of the
Sl? 28221 $\frac{1}{4}$ point, where it is represented by
specimens 28221

From this point to the $\frac{1}{4}$ point of
the section the rocks are more like
green-schists. They vary but little
in character. Four specimens rep-
resent the types

h. s. 28222 900 ft. of $\frac{1}{4}$ point Dec 20.

h. s. 28223 1050 ft to 1250 ft. "

h. s. 28224 1400 ft to 1900 ft. "

At about the point where the $\frac{1}{4}$ point

of the Section is turned East and
 ran to corner, over same rock,
 represented by

D.
 28225 At 500 W of U.E. cr Sec 23

28226 " 200 " " " "

b.s.
28227 At the corner the rock appears more
 limestonoid than the rocks to the
 west

Between the corner and the E. $\frac{1}{2}$
 post the same fine grained green-
 stines exist. These are schistose in
 places, and particularly as we
 approach the lake. These very schis-
 tite phases resemble very closely
 the rocks 28219 and 28220.

When was in the field had no doubt
 that all these rocks belong with the
 green schist series. After the con-
 clusion of the work to the East, however,
 and doubt of this conclusion.

Am inclined to think now that the
 red broken line on the map marks
 a division between sedimentaries
 and igneous rocks although no
 sharp discrimination between the
 two is visible in the field.

It may be that the schists, i.e. the
rocks in the Southern half of Dec 23
and the Northern half of 26 correspond
with the slaty rocks in Moose Lake
and the tuffs in the Northern arm
of Pine Lake. To distinguish them
from other schists - shall call them
White-schists?

July 19

Spent in getting back to main
Camp.

July 20

Rested in afternoon.

July 20

Ran north from Wind Lake in
E. line Dec 13. I. 64 R. 10. over almost
solid ledge of half mile.

For first several hundred paces from
Lake find hillocks of greenstone-schist,
which with the north seems to grade
into Lumbden-schist? No actual
gradation was seen but there appears
to be a gradation in the character of
the ledges near together.

Greenstone-schist from hill about
750 ft of I.E. or Dec 13.

H. G.

28228

P.

28229

Very schistose gneiss at about
800 ft JSE cor Sec 13.

This rock contains leucocratic and
linear white masses and bands
that are parallel to the schistosity.
This material is probably cementing
substance uniting the different lam-
inae, i.e. we may have here a cemen-
tation schist.

H.S.

28230

H.S.

28231

The south side of the ridge in which
the E. 1/4 post Sec 13 stands is com-
posed of a coarse hornblende gneiss,
which in the top of the same ridge
becomes a hornblende schist.

H.S.

28232

At 250-275 ft of the 1/4 post took
specimen of hornblende schist from
ledge in swamp. Here the schist
is cut by granitic veins. Strike of
schistosity - E-W.

At 400 ft. of 1/4 post is great hill
of the typical Barraged granite
overlooking a swamp to the north.
Under this swamp the granite is
known to extend from the numerous
small now covered ledges that
peep from beneath its mossy-

B.
28229

Very chlorite greenstone at about
800 ft JSE cor Dec 13.

This rock contains lenticular and
linear white masses and bands
that are parallel to the chloritizing.
This material is probably cementing
substance uniting the different lam-
inae, i.e. we may have here a cemen-
tation schist.

M.
28230

The south side of the ridge in which
the E. 1/4 post Dec 13 stands is com-
posed of a coarse hornblende rock,
which in the top of the same ridge
becomes a hornblende-schist.

H.B.S.
28231

At 250-275 ft of the 1/4 post took
specimen of hornblende-schist from
ledge in swamp. Here the schist
is cut by granite veins. Strike of
chloritizing - E-W.

H.B.S.
28232

At 400 ft of 1/4 post is great hill
of the typical Barrow granite
overlooking a swamp to the north.
Under this swamp the granite is
known to extend from the numerous
small now covered ledges that
peep from beneath its mossy-

Surface.

From point 500 N. 75° E. Cor Sec
12. T. 64 - R. 10 went west and
south to the N. 1/4 part Sec 13 and then
S. to wind lake, which found at
1100 S. of this 1/4 part instead of at
2100 as indicated in plat.

The Humboldt schist is first met
with at 400 S. of N. 1/4 part Sec 13.

H.S.

28233

July 21st Moose Lake.

Went around shore of Moose Lake going East from Camp near U. S. Post Dec 29.

sl
28234

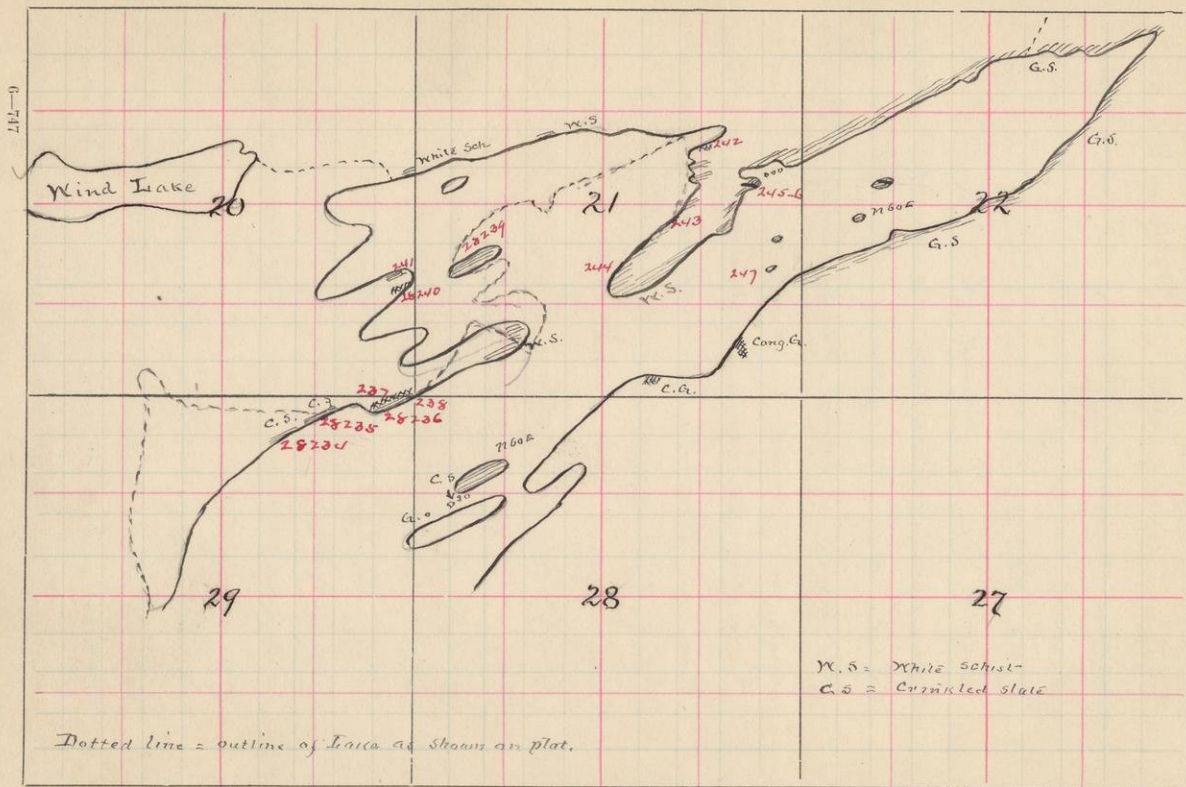
Near the U. line Dec 29 the shore consists of banded, crinkled, slaty rocks striking with the shore and dipping about vertically. The banding is quite even and the rock has the general aspect of a slate, but in fresh fractures it is seen blue impregnated with acid bands running parallel to the schistosity. A little further East it looks very like a green schist.

gno
28235

sl. from F. P.
28236

On the point near the U. S. Cor Dec 29 is another ledge of schist at the water's edge. Inland from this and continuous with it. So far as could determine is a massive rock speckled with red or purple blotches and indistinctly banded. This seems to be an igneous rock and the schist its peripheral portion. The two rocks constitute a ridge running along the point.

gno
28237



On the little island opposite the point the rock shows as a high cliff at the west end of the island. It weathers white and is very shaly. The schistosity dips 80° S and strikes about $N. 60^{\circ} E$ which is the prevailing strike of all the rocks around the lake, and at the same time is the direction of the long axis of the lake itself. The rock differs a little from the other slaty rocks a little further west in that the crinoids of the lower zone are regularly wavy.

At the East end of the island is the vertical green schist cut by a few quartz veins running parallel to the schistosity, and jointed by N-S joint cracks. At the corner between Secs. 20, 21 etc. the schist is more slaty than elsewhere. It here looks more fragmental than it does to the west.

On the little island in Sec 21 the same white weathering fissile schist occurs over most of the island, but at the center of the north side the rock is more slaty. It looks like a slaty

28238

28239

green-schist.

h. 41
28240 On point opposite island a massing
but jointed light colored greenstone
is exposed. It is fine grained and is
like some of the rocks north of Pine Lake.

h. 5
28241 A little further north on same point
it becomes slightly schistose.

The same white schist extends all
around the north side of the north
bay of the lake.

h. 42
28242 At the East side, however, rocks of
another character occur. At the
N.E. extremity we find a massing
amphibolite that passes into a schist
in shore.

h. 43
28243 On S.E. shore of bay is a high ridge
of rock that extends continuously to
the end of the point. At its Eastern end
this is a green-schist very like 28241.
Up on the ridge back of the schist the
rock looks quite a little more mar-
bling.

h. 44
28244 Toward the end of the point the rock
cleaves into smooth, light green
surfaces. In fresh fractures it is a
bluish-green schist.

The same rocks extend along the shore
to the line between Secs 21 and 22. On
the west side of a little bay first
west of this line it is cut by a dense,
Dark Diabase dyke

9.24
25245

25246 represents the predominant green-
schist.

There is no change of note in the char-
acter of the rocks at the East end of
the lake in either shore. The strike
of the schistosity is everywhere about
N. 60° E and where bounding can be
seen their strikes in the same di-
rection.

The Diabase dyke mentioned above
is again seen in the Easternmost is-
land in the lake.

92
25247

is green schist from the S.W. of the
group of four islands near the E $\frac{1}{4}$
post Sec 21.

The two ledges in the S.E. $\frac{1}{4}$ Sec 21
are obscurely conglomeratic.

July 22.

Went around Wind Lake.

Found granite on N.E. shore and on East side of N.E. bay.

On the South side of this bay is hornblende schist like that elsewhere found near the granite?

At the Easternmost meander corner of Sec. 14 & 20 the rock is quite massive and resembles a quartzite diabase and is cut by granite? A little further west it is the normal hornblende schist.

H.S.
28249

On the N.E. side of Long Island a small ledge of hornblende schist was observed in which the strike of the schistosity is $N. 75^{\circ} W$ and dip $75^{\circ}-80^{\circ} S$.

The same hornblende-schist occurs all along the South shore of the N.W. arm.

M.S.
28250

Specimen from westernmost ledge.

H.S.
28251

The little island near the N.W. point Sec. 19 consists of greenstone-schist with the strike of the schistosity $N. 70^{\circ} E$. South of the N. line Sec. 19 the hornblende schist appears to be replaced.

Granite

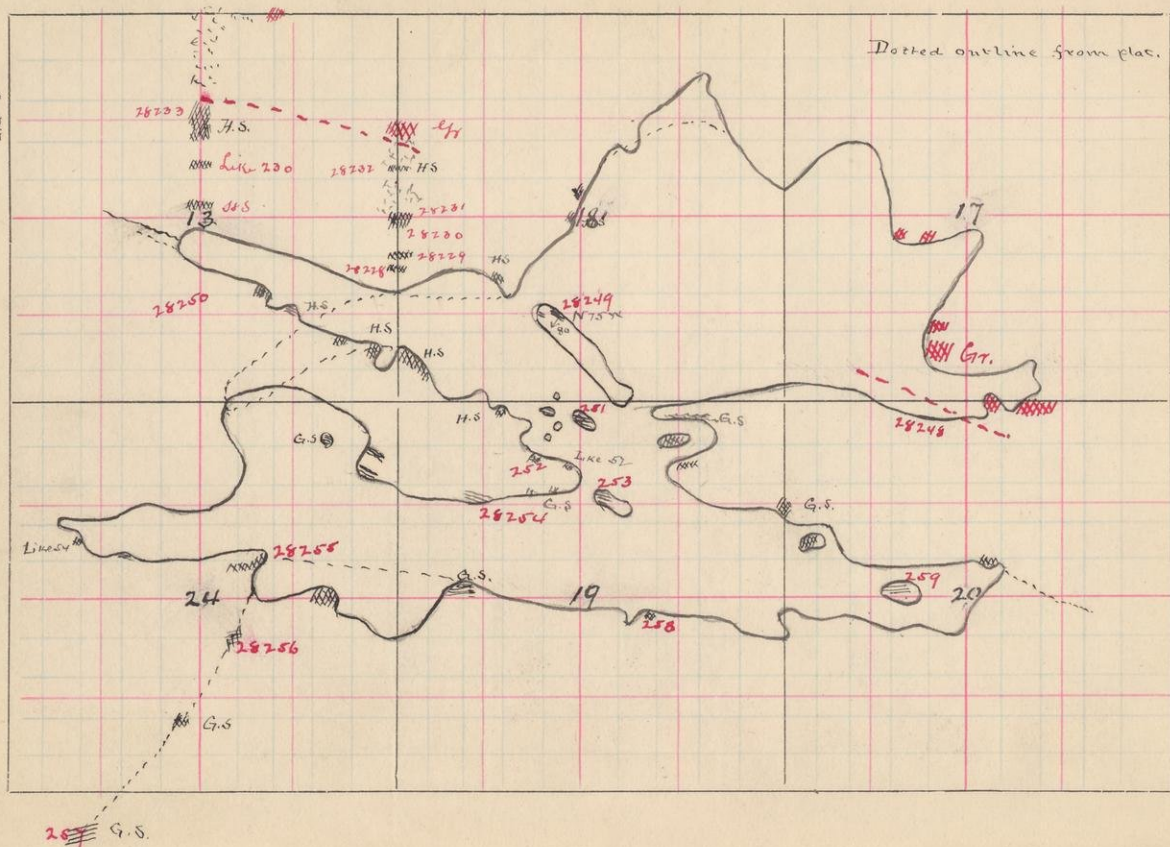
Dotted outline from plac.

6-747

७

T. 64

R. 9/10



ed by greenstone schists-rocks that
Winchell calls graywackes and
quartz.

41.
28252 Small Specimen of massive dense
greenstone from near end of point
separating U.W. from W. arm of
lake.

sl^(?)
28253 The same rock occurs on U.W. corner
of little island off this point. There
it is schistose and is indefinitely
banded on the weathered surface.
The strike of the band is N. 50° W.

gl[?]
28254 Greenstone-schist from U. shore of
W. bay about 500 paces from end of
point. It is speckled with little
chlorite particles, perhaps indicat-
ing the former presence of amygdaloids.
From large ledge on point at west
side of bay into which portage trail
from Pine Lake enters.

sl[?]
28255 Went in on portage trail to Pine
Lake, over greenstone-schist. Took
following specimens

gl⁵¹
28256 greenstone-schist from large knob
300-400 paces from Wind Lake end
of portage. The rock is spotted with

h.A. 40.
28257

little crystals of red feldspar.
Green-schist at 1400 from Wind
Lake. Dips of schistosity = N. 70° E.
On the South shore of the lake are
the rocks specially referred to by
Winchell as graywackes. These, it
seems to me cannot be Ophiolite
Gneisses.

17.
28258

is specimen from little E of Center
Sec 19. Light green dense schist.

52(?)
28259

The little island in the S.E. bay
is bordered on the North side by
high cliffs of a light grayish-green
schist striking about N. 80° E and
dipping 80° N. This is broken into
great rhomboidal blocks by three
sets of joints?

The first set is parallel to the schis-
tosity.

The second set dips with strike of
schistosity.

The third set makes an angle of 105°
with schistosity and dips high (80° to
the W.

U.B. The map given like in which
notes are plotted is quite different
from the township plat. The pres-
ent map was sketched from the
Census. It is rough, but from it lo-
cations of specimens can be trans-
ferred to Survey map.

July 25

Ran south from Moose Lake in
line between Secs. 31 and 32 T. 6N
R. 9.

The ridge bordering lake is gneissing
at 146 S. of E to post Sec 31 strike N.
side of ridge composed largely of banded
sedimentary rocks striking N. 40 W.
and dipping about vertically.

The rocks are interbedded in layers
forming a well defined and very
high ridge with an almost perpen-
dicular south facing escarpment
at about 400 S of the post.

c7
28260

The northernmost rock in the line is
a dense, splintery, non-vacillate con-
taining an occasional pebble of
quartz.

South of this is a conglomerate? It
differs very little from 28260 in fresh
fracture, but in the weathered sur-
face is rough and shaly? a distinct
ochreous. The bands vary in thick-
ness from a few inches to 20 or more
feet, and between them are argillites
and quartzites, and graywackes.

c
28261

sl
spilite

28262

Graywacke bed interbedded with con-

two

28263

SL

28264

Hb. two

28265

C

28266

glomerale².

Light gray fragmental

Sediment

Grit

Weathers surfaces of conglomerate².
all from top of hill.

The conglomerate shows the predominant pebbles with the exception of quartz. In addition to the pebbles seen at the specimen, there were a few dark-colored ones of jasper and a large number of red quartz pebbles.

At the bottom of the hill on its north side, at 440 S of 1/4 Post is a ledge of dense black rock containing numerous fragments of a porphyry, varying in size from a fraction of an inch to 1 in. in diameter.

C 28267

C

28268

A.F.P.

28269

QP

28270

A few paces further south is a small ledge of quartzite or fine grained porphyry and another ledge of the same rock that looks more like porphyry at 500 S.

South of this is a swamp and south of the swamp begins a succession of hills of greenstone.

The greenstone is quite massive and is interspersed here and there with ledges of white porphyry.

Looks as though the greenstone cut by porphyry is the iron-series of Vermillion and that the sedimentaries including the dense rock with porphyry pebbles are members of a serpentin series.

At 600 S of N.E. Cr Sec 6 and the same distance west is a high hill of greenstone and porphyry. The latter rock cuts the former and constitutes by far the greater part of the hill.

Q.P.
28271

Porphyry from N. side of hill.

at 740 S. from N. side is a cliff facing East. Here the porphyry is of a little different character. The porphyritic crystals are large and porous. These are often mottled red and white, or they consist of white centers with red peripheries.

Q.P.
28272

H.W. 1
28273

Near S. line Sec 6. The greenstone appears like spheroidal, and it is filled with radial spheroids, like the greenstone South of Jasper Lake.

Nearly all the in Dec 7 is massive and Diabasic, though some is slightly schistose. The ledge at 525 S. of U. line Dec 7 is coarse lambeuding Diabase. at 1100 S of U. line Dec 7 went west two paces then U. to Dec 31 and along line indicated black.

All through Decs 6 & 7 found granular Diabase that appears like spheroidal in some places.

H.
28274

Greenstone from near center Dec 7.

H.
28275

Greenstone 200 S of U line Dec. 7.

H.
28276

Greenstone from near U. line Dec 6

This is cut by porphyry, as is all the greenstone in the northern portion of this Dec.

As passed near base of sedimentaries where Eastern portion has been described, situated conspicuously the succession of rocks.

H.
28277

The south face of the hill is a dense, dark rock that breaks with the peculiar fracture of fine grained

greenstone. On weathered surface it resembles the spheroidal greenstone, though it may nevertheless be a fragmental.

28278 The Conglomerate is only a few paces north; but could not get to contact. It is of the same character as that to the East and strikes N. 60 W.

28279 North of the Conglomerate hill, near its base is a small ledge separated from the Conglomerate by a topographic break. It looks like schistose greenstone.

28280 At about 225 ft of the conglomerate is a little pit in Jasper.

Mr. 28281 Went west from this point and at 100 W. found well developed green-schist cut by porphyry.

Looks as though the Conglomerate hill represented a series of sedimentaries younger than the green-schists that has been folded in with these. According to this view we have here the west end of the fold which further East extends greatly and enclosed Snobank Lake.

