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Vermillion Lake and vicinity, Minnesota: [specimens] 10173-10363, 10001-10038, 8975-8999, 1000. No. 47 July, 1885

Merriam, W. N.

[s.l.]: [s.n.], July, 1885

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U. S. GEOLOGICAL SURVEY
FIELD SECTION BOOK

No. 47.
July, 1885.

Ver
Cermillion Lake and Vicinity, Minnesota
G. A. Merriam.

10173-10363, 10001-10038, 8975-8999
10000.

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 $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{2}$ inches will be allowed, but in all other cases *large sized specimens*, trimmed to a size of $3 \times 1 \times 1$ inches, must be selected, in accordance with $\frac{1}{2}$ 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.

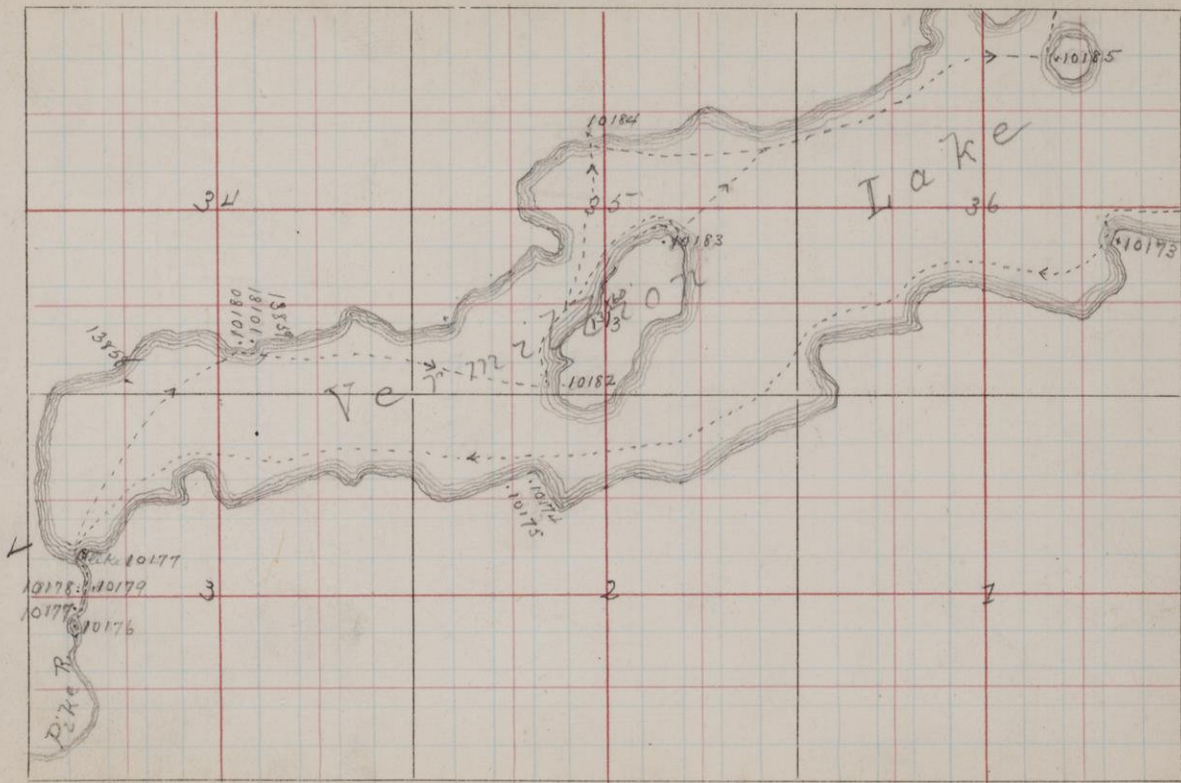
6. Forward this note book, as soon as filled, as registered mail matter, to R. D. IRVING, U. S. Geologist, Madison, Wis.

P. 24 State on River 200
47 " " " "
50 " " " "

Vermillion Lake
and
Vicinity

10173 to 10363 } Numbers as
10001 " 10038 } they occur in this
8975 " 8999* } book
10000

names written under numbers of specimens
are from micr. determination



T. 61 and 62 R. 16 M.

July 17 '85

1

10173

Starting west from the mouth of a River the first rock in place on the south shore of the bay is on a small point in the N.E. $\frac{1}{2}$ of the S.E. $\frac{1}{2}$, Sec 36 61-16 W. It is a schistose quartzite, color white. The schistose structure runs nearly east and west and is about vertical. The exposure contains perhaps 75 Sq. yds. Spec. No 10173

No more rock is seen absolutely in place until near the center of the N.E. $\frac{1}{2}$, Sec. 3-61-16 W. although the shore in places is covered with angular fragments of similar or nearly similar schist.

10174

At this last point is a small exposure (15 or 20 Sq. yds.) of a darker slate colored schist. The structure runs N. 85° W. and is vertical. Spec. No 10174

10175

About 100 paces west of 10174 an exposure of a finer light gray quartzite is found. The exposure is small and rounded similar to the above two. Spec. No 10175

10176

350 Yds. above the mouth Pike River

10177

makes a plunge of from 8 to 10 feet over

a banded quartzite. These bands vary in width from mere lines to an inch or so; and in color from a light to dark gray or slate.

Strike N. 80° W. Dip vertical.

The exposures are large at this place rising from 15 to 20 feet above the water and extending continuously for some 50 paces up and down stream from the falls.

Specimen No 10176 is taken from the head of the falls and parallel to the bedding. No 10177 about 50 paces below 10176 and transverse to bedding.

- 10178 150 Yds. below the falls on Pike River the rock changes to a very firm light gray quartzite. The mass of the rock is very fine grained; and in this fine matrix is embedded crystals of a translucent quartz.

The same rock shows at the mouth of the river on both sides, rising on the east side in quite large exposures. Just across the river from 10178 (on East side) & a few is an

10179

exposure of a fine grained dark colored slaty rock. The strike is as at the Falls. Dip vertical. The rock would appear to be a finer phase of these quartzites. The rock is banded and shows some coarser portions than shown by the hand specimen.

10180 A slightly darker and more schistose phase of these quartzites from S. 1/2 1/4 of S. E. 1/4 Sec. 34-62-16 74

10181 A few paces north of 10180 is seen a light gray very fine grained quartzite. Dip 85 to 90° N. Strike E. & N. Nicely banded with narrow light and dark gray bands.

10182 White quartzite from south end of large island in S. 1/2 Sec 35-62 16. Similar exposures are found at intervals along the entire west side of this island; also on the main land west of the south end of island.

10183 Quartzite from north end of above island.

10184

Spec. of quartzite from the S.E. $\frac{1}{4}$ of the N.W. $\frac{1}{4}$, 35-62-16 T. Has a somewhat schistose structure. The exposure is small.

10185

This rock is next found in place on the small island in the N.E. $\frac{1}{4}$, 36-62-16; and on the mainland to the northeast. The rock here is similar to that shown in a number of hand specimens already taken. This is the last point to the north where this characteristic, white, fine grained, quartzite is seen.

10186

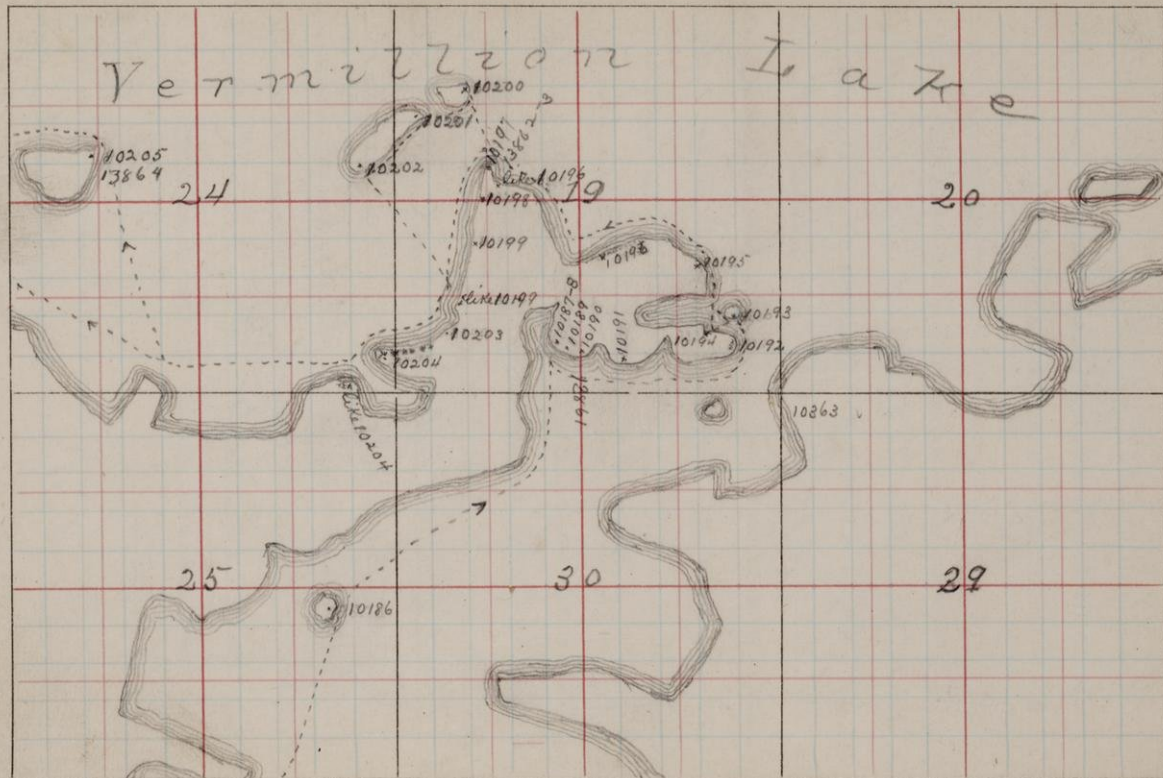
Until a small island in the S.E. $\frac{1}{4}$ Sec. 25-62-16 is reached the shores are low and swampy. On this island a fine grained greenish rock ^(quartzite) is exposed on the south side, in a low ledge, near the water.

10187

From S.W. corner of point in S.E. $\frac{1}{4}$ of S.W. $\frac{1}{4}$, 19-62-15 T.

10188

V



T. 62

R. 15 and 16 W.

The mass of the exposure is made up of the coarser rock (10187) and at one end apparently grades into a conglomerate. The finer rock shown in 10188 is seen in small patches and seams through the exposure but I could make out no definite relation between the two.

10189 A few paces beyond 10187 is a small exposure of rock very much like 10187

10190 A similar but somewhat coarser rock than 10187 and 10189 is found a few paces beyond 10189

All of the rock of these exposures on the weathered surface has the appearance of a coarse mortar
10190 is quite schistose

10191 On the point next east of 10190 the same coarse quartzite makes up the most of the point. Three or four thin layers of a finer black slaty rock like 10188 is seen

Strike N. 80° E. Dip 75° to 80° S.

10192 At the east end of point in S.E. $\frac{1}{2}$ of S.E. $\frac{1}{4}$ Sec. 19-62-16 the exposure is made up for the most part of a finer grained rock although layers of the coarser rock are still seen. In places the exposure is of fine ringed quartzite and it grades from this into rock similar to 10191. The dip is nearly vertical a little north if any way.

10193 From small island a few yds. north of east end of above point. The rock is very nicely banded with coarse and fine material as seen in the hand specimen. Dip 90°. The coarse and fine material are in about equal proportions.

10194 A very fine black slate from north side of point S.E. of S.E. $\frac{1}{4}$ Sec. 19-62-15

10195 A fine black slate from north side of point in the N. $\frac{1}{2}$ of S.E. $\frac{1}{4}$ 19-62-15. The slate follows along the N.E. side

7
of this point for several hundred feet. It has a well developed cleavage. Dip 90°. Strike nearly east and west.

10196 Quartzite along the N.W. side of above point. It extends nearly the whole length of this side. A few ^{narrow} bands of black slate are seen. Glacial Markings. S. 12' N.

10197 Quartzite, north end of point in N. 7 1/2 Sec. 19-62-15. The same rock is found again at the base of this small point.

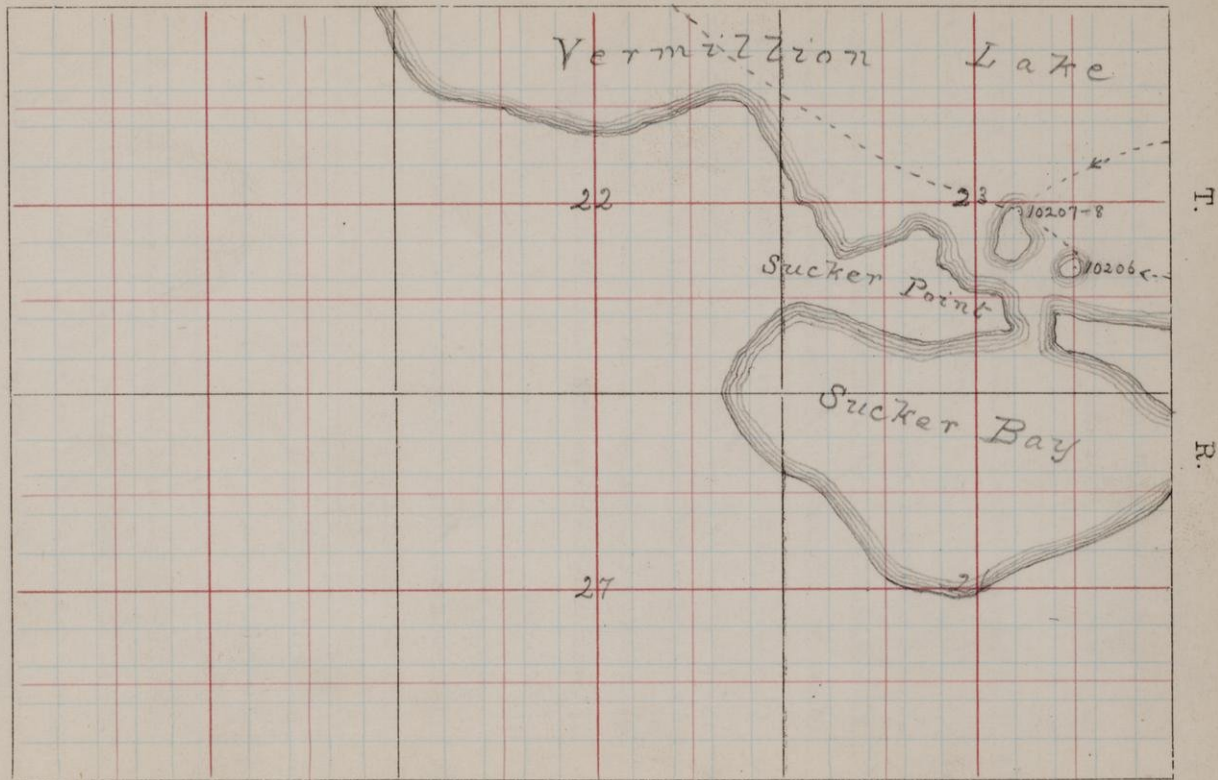
10198 A few yds. south of 10197. Strike about east and west.

10199 A firm grey quartzite near the center of the west side of point. N. 7 1/2 of S. 7 1/4 Sec 19-62-15.

10200 Quartzite from small island in the N. 7 1/4 of N. 7 1/4 Sec. 19-62-15.

10201 From N.E. end of large island between Secs. 19 and 24. 62-16 N.

- 10202 From S. end of same island
A conglomerate; shows portion of slate
fragment
- 10203 Coarse weathering quartzite from
S. $2\frac{1}{2}$ of S. $2\frac{1}{2}$ 19-62-15th All along
this point the rock is exposed con-
tinuously. Most of it is similar to
10203 and 10204 although a thin layer
of slate (2 or 3 inches) was noticed in one
place. All of this rock weathers
very rough and is one of the most
massive seen in this vicinity.
Dip as shown by the slate layer is
90°
- 10204 From west end of point Near S. E.
corner Sec 24-62-16th.
- 10205 From island in S. $W. \frac{1}{2}$ of N. $W. \frac{1}{2}$ Sec
24-62-16
- 10206 West from the point in the S. E. $\frac{1}{2}$
Sec. 24-62-16 no more rock in place
is seen until on the small island
in the S. E. $\frac{1}{4}$ Sec. 23. The shores
are however lined with boulders



the entire distance

On this island the rock in general appearance is similar to most of that in Sec. 19. In places it carries a few small pebbles. The weathered surface presents a peculiar irregularly ridged appearance.

10207

On an island a short distance

10208

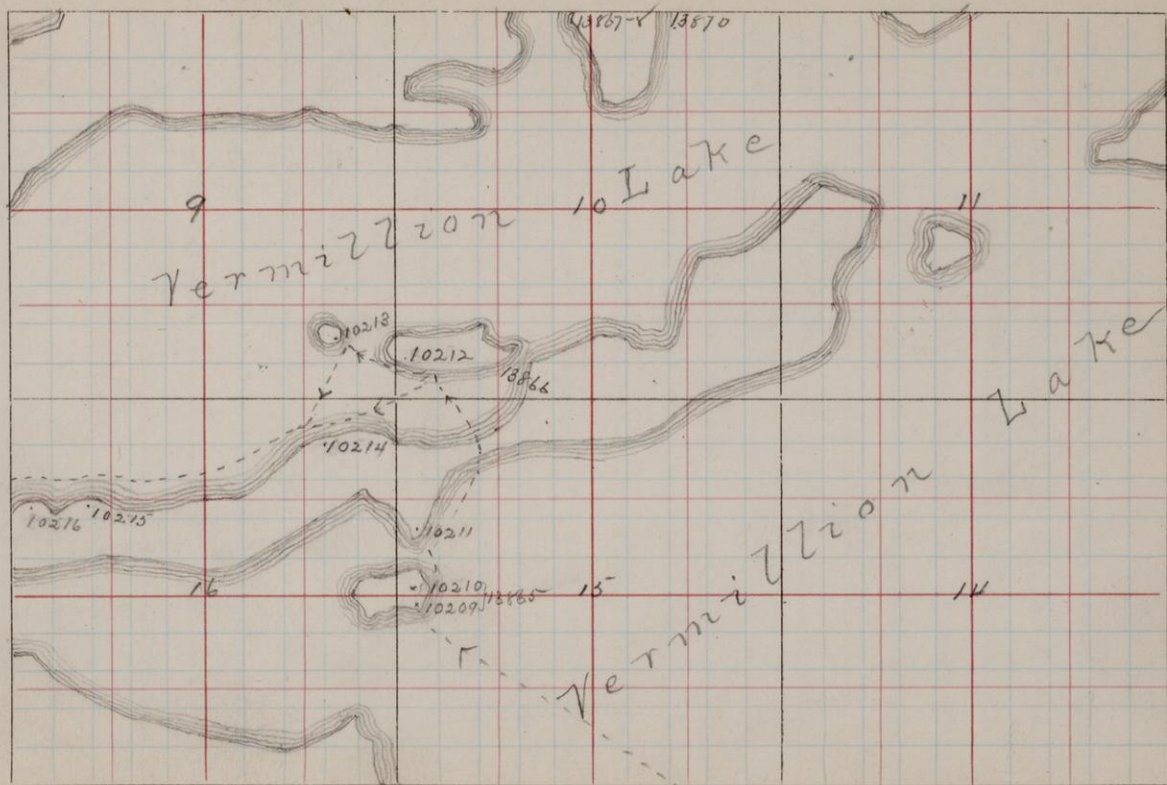
N. H. of 10206. Similar to 10206 although carrying no pebbles that I could see. In one place the bedding lines show very plainly on the surface of the exposure and are contorted and faulted in every direction. Dip 90° . Glacial markings S. 12° or 15° N.

No rock is again seen in place until on the island near the west $\frac{1}{2}$ post Sec 15-62-16.

10209

Otz. Cor.
Decomposed

The rock of this island differs from the specimens taken to the eastward only in carrying more iron oxide and in being more decomposed. Specimen taken from south side of



T.

R.

island

10210

Alg. por.
(decomposed)

A greenstone(?) from near center of island. Again to the north of this the rock is like 10209.

10211

Quartz schist(?) from end of point just north of above island. On the south side of this exposure the rock is quite decomposed and shattered; the north side however is much firmer.

10212

A schist from island in the S. H. $\frac{1}{4}$ Sec. 10-62-16 N. This rock varies from the schist shown in the hand specimen to a slate cleaving at a slight blow into slabs not thicker than a sheet of paper. It was not possible to get a specimen of this slate.

10213

Talcose slate or schist from small island a short distance west

of 10212 A little fresher than 8849¹¹

10214 A dark grey shale, mottled with red oxide of iron, from the N.E. $\frac{1}{4}$ of the N.E. $\frac{1}{4}$ Sec. 16-62-16

The rock splits so easily that it is difficult to get a good specimen. It follows along the point for several hundred feet.

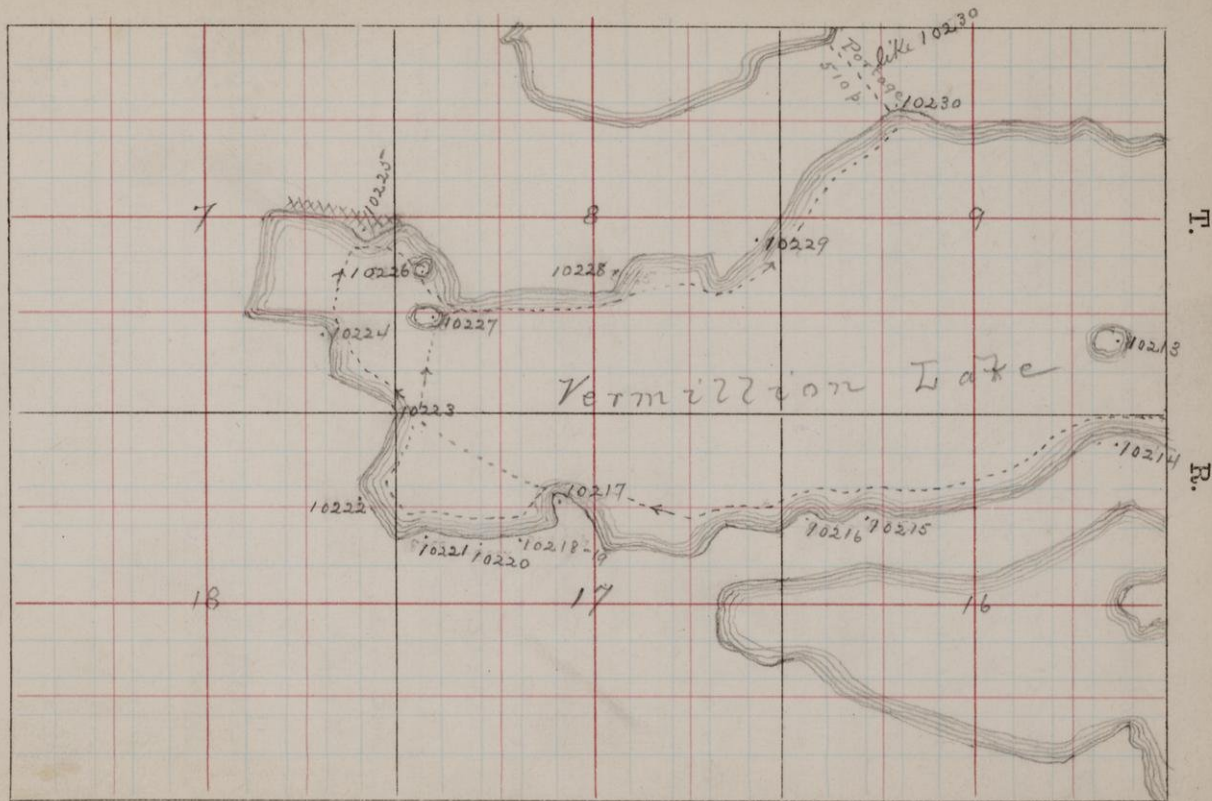
10215 Talco schist from small point in the S.W. $\frac{1}{4}$ of N.W. $\frac{1}{4}$ Sec 16-62-16. Breaks into thin slabs. Structure vertical.

10216 Similar to 10215, from small point next west of 10215. All these specimens are mottled with iron oxide.

8851
10217 End of point in N.W. $\frac{1}{4}$ Sec 17-62-16 N. Like the last two specimens.

✓ su scists

15 010-120221



✓ 10218 ^{Sch. felicit} Salcose slates and shales from
 10219 { the east and west shore in the
 10220 { N.W. $\frac{1}{4}$ Sec. 17-62-16 These rocks
 10221 { vary a little in color and amount
 of iron oxide that they carry; otherwise
 they appear almost exactly alike

✓ 10222 A more quartzite like phase of
 Sch. felicit these rocks, from the N.E. $\frac{1}{4}$ of the
 N.E. $\frac{1}{4}$ of Sec. 18-62-16 A few
 hundred feet north of 10221

✓ 10223 Quartzite(?) from end of point $\frac{1}{4}$
 mile north of 10222

10224 Small specimens (3) from small round
 ed ledge in S.E. $\frac{1}{4}$ of S.E. $\frac{1}{4}$ Sec. 7-62-
 16 Could not get large Spec.

✓ 10225 A greenstone from the N.E. $\frac{1}{4}$ of the
 Sch. felicit S.E. $\frac{1}{4}$ of Sec. 7-62-16. This rock
 (compare 10210!) extends all along this shore of the
 bay and shows again about $\frac{1}{2}$
 a mile to the east It seems
 to be a layer as it follows about
 the right strike

- 10226 Slaty quartzite from island in the N.W. $\frac{1}{4}$ of S.W. $\frac{1}{4}$ Sec. 8-62-16
- 10227 From larger island just south of 10226 A light colored rock mottled with iron oxide
- 10228 From N.W. $\frac{1}{4}$ of S.E. $\frac{1}{4}$ Sec 8-62-16 Compare N.W. Sec. 10225
- 10229 Light grey slaty quartzite from the N.E. $\frac{1}{4}$ of the S.E. $\frac{1}{4}$ Sec. 8-62-16 Dip about vertical
- 10230 Green schist from S. end of portage in the N.W. $\frac{1}{4}$ Sec. 9. Carries numerous crystals of pyrite. The same rock is seen in angular fragments all along the portage trail and near the center breaks out again into a ledge. The trail (510 paces) runs over a single wide ridge (the backbone of the point) made up of this schist

T.

R.



- ✓10231 Green schist from the S.W. $\frac{1}{4}$ of the
Green sch. S.W. $\frac{1}{4}$ Sec. 4-62-16 The exposure
is small Schistose structure
vertical
- 10232 Greenschist from the N.W. $\frac{1}{4}$ of the
S.W. $\frac{1}{2}$ Sec. 4-62-16 Darker and
more schistose than 10231
- 10233 Schist from small island in
the N.E. $\frac{1}{4}$ of the S.E. $\frac{1}{4}$ Sec. 5-62-16
- 10234 Light grey schist mottled with
iron oxide S.E. $\frac{1}{2}$ of N.E. $\frac{1}{4}$ Sec.
5-62-16
- ✓10235 Schists from end of point near
10236 the center of the S. $\frac{1}{2}$ Sec 5-62-16
- 10237 About 200 paces west of 10234, on
10238 a small point in the N.W. $\frac{1}{4}$ of
the S.E. $\frac{1}{2}$ Sec 5-62-16
On the south side of the ex-
posure the rock is a grey
schist speckled with black spots
To the north and lying in
contact is a fine quartzite

(10238) The strike is N. 80° E.

A small dike about 8" wide is seen just under the surface of the water.

Glacial markings S. 10 W.

10239

A light green schist is exposed a few yds. north of 8374-5 across a small bay. Dip high to south.

10240

Schist from the S. N. $\frac{1}{2}$ of the N.E. $\frac{1}{4}$, Sec 5-62-16. These schists are exposed all along the west end of this point; in places they are quite schistose and again more like a quartzite. They carry considerable white quartz in thin veins and lens shaped masses.

10241

A fine gray schist near the N.E. corner Sec. 5. A short distance north of this is another exposure of exactly similar rock.



✓10242 From small point in the ¹⁶
S.E. $\frac{1}{4}$ of the S.E. $\frac{1}{2}$ Sec 32-63-16

10243 End of point in S.E. $\frac{1}{4}$ Sec.
32-63-16

✓10244 Small island a short distance
west of point in the S.E. $\frac{1}{4}$ Sec
32-63-16

10245 Schist from island N. $\frac{1}{4}$ post
Sec 5-62-16 Mottled with
iron oxide

10246 A Schist from the S.E. $\frac{1}{4}$ of the N.E. $\frac{1}{4}$
Sec. 6-62-16 A short distance
to the southeast is another exposure
similar to the last except
that it is firmer in places

10247 A very schistose rock from
the S.E. $\frac{1}{4}$ of the S.W. $\frac{1}{4}$ Sec. 6-62-16

✓10248 } $\frac{1}{4}$ mile west of 10247; a fine gray rock
10249 } filled with small spots of iron
oxide

✓ 10250 } Porphyry - about 200 paces S. N.
10251 } of 10249 Eight or ten wide on
Qtz. Por. or. north side of small point
granitic por. just south of this a few feet the
Schist again shows

✓ 10252 Greenstone at meander corner
All. gabbro between Secs. 6 and 7. A few
feet S. N. of 10252 a rock like 10250-1-
again shows Could not
make out how these Greenstones
run but they would seem to be
either parallel to each other and
with the strike or else cut each
other at nearly right angles

✓ 10253 Another greenstone near the
Highly all. bottom of the bay in the N. W.
Hb. Greenstone corner Sec. 7-62-16

10254 From the S. E $\frac{1}{4}$ of the S. E $\frac{1}{4}$
Sec. 1-62-17

10255 Grey schist from end of larga
point in the N. N. $\frac{1}{4}$ of S. E $\frac{1}{4}$ Sec 1
62-17
Glacial markings S. 20° N.

The small island a few yards to the S.E. is rock similar to 10255 as is also the N.W. side of this point

10256 Same as 10255 From end of point in in the S.E. $\frac{1}{4}$ of S.W. $\frac{1}{4}$ Sec. 1-62-17

10257 From island near the N.W. post Sec. 12-62-17 A gray quartzite (?)

10258 Schist from small island in the N.W. $\frac{1}{4}$ of the N.E. $\frac{1}{4}$ Sec. 11-62-17

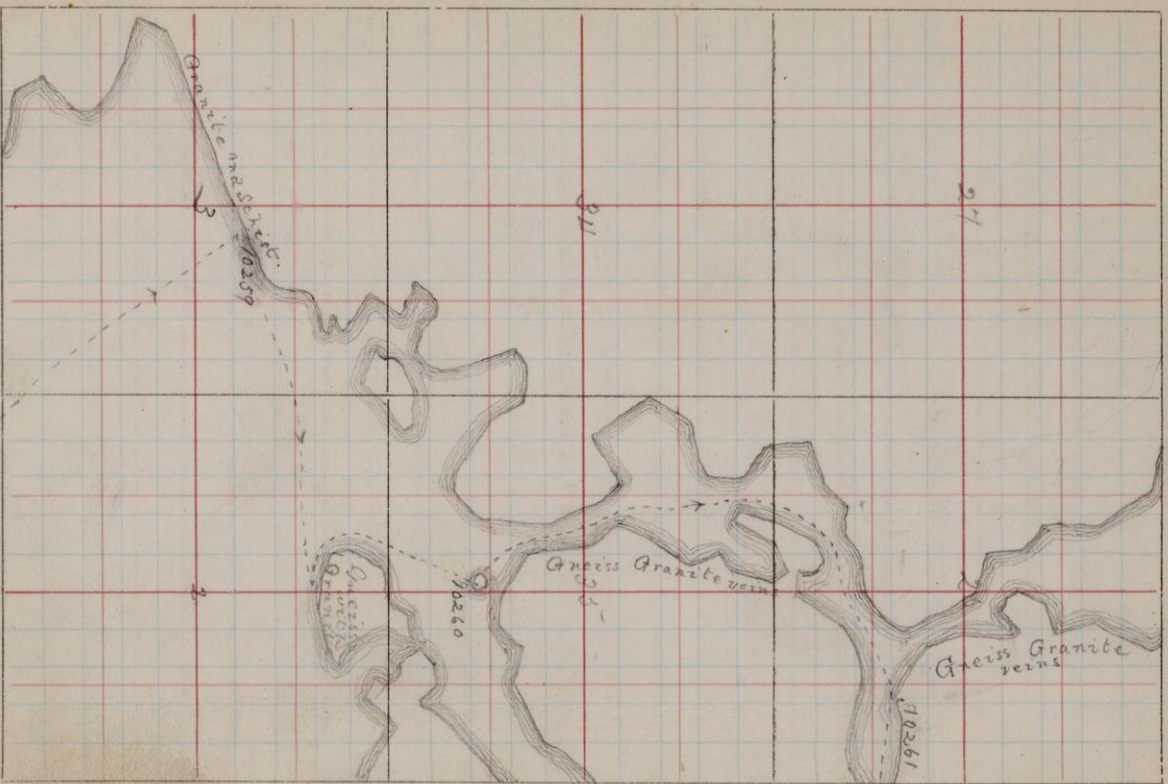
10259 Granite from the S.W. $\frac{1}{4}$ of the N.E. $\frac{1}{4}$ Sec. 3-62-17

Hb. granite

All along this shore the granite and black gneiss (banded) is exposed in large masses. The granite is mostly gray though some smaller veins of a reddish color are seen. The granite and gneiss are banded.

T.

R.



19

and mixed in all possible shapes

10260 Gneiss or schist with granite veins from small island in the S.E. $\frac{1}{4}$ of the S. $26\frac{1}{2}$ Sec. 35-63-17

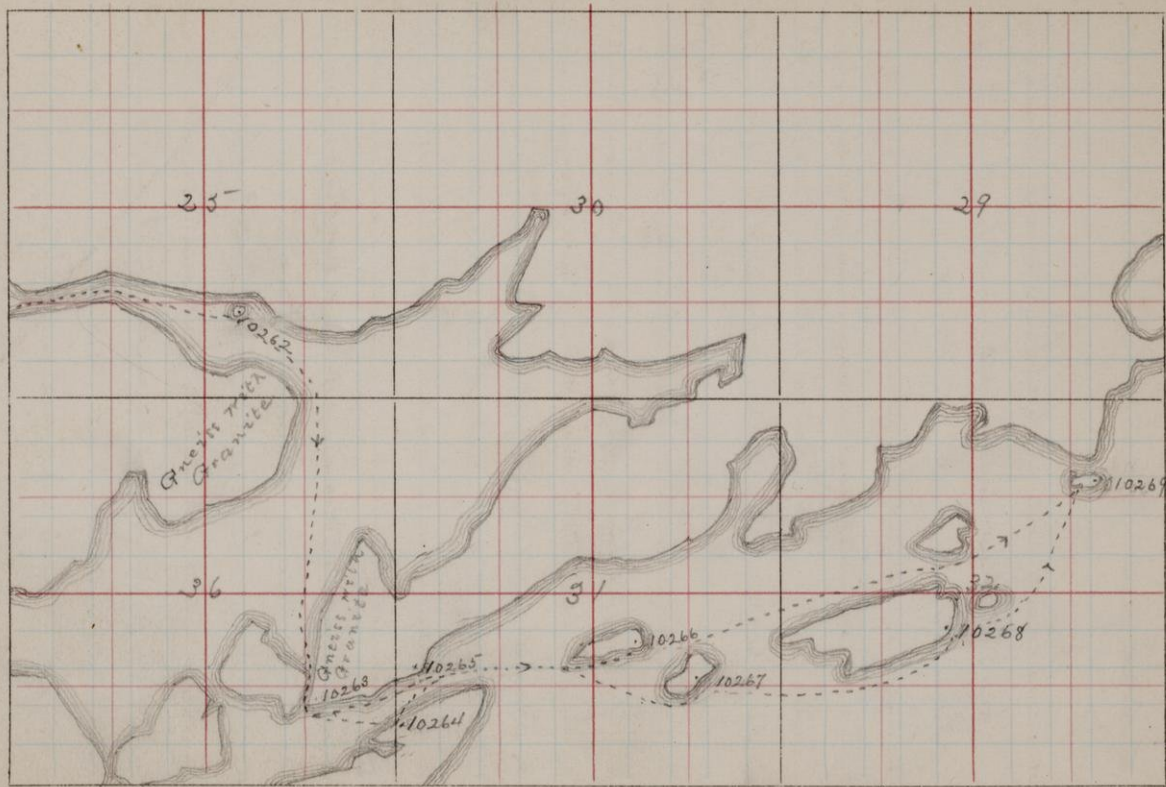
10261 From the gneiss in N.E. $\frac{1}{4}$ of S.E. $\frac{1}{4}$ Sec. 26-63-17 Showing vein of granitic material
Mica Sch.

10262 From small island in the S. $26\frac{1}{2}$ of the S.E. $\frac{1}{4}$ Sec. 25-63-17

10263 S.E. $\frac{1}{4}$ of the S.E. $\frac{1}{4}$ Sec 36-63-17
The rock here does not carry so much granitic material in fact most of the exposures are made up of the rock shown in the hand specimen

10264 Specimen of schist from old gold mine near meander corner on north side island S. $26\frac{1}{2}$ corner Sec. 31-63-16

10265 From point on mainland in the N. $26\frac{1}{2}$ of the S. $26\frac{1}{2}$ Sec. 31-63-16
Mica Sch.



T.

R.

✓ 10266

Green sch.

Greenish schist from small island near center Sec. 31-63-16

✗ 10267

From small island near center S. E. $\frac{1}{2}$ Sec. 31-63-16

✓ 10268

Green sch.

Schist from east end of larger island in the S. E. Sec. 32-63-16

10269

Schist or gneiss from small island in the N. E. $\frac{1}{2}$ of the N. E. $\frac{1}{4}$ Sec. 32-63-16

The exposure is cut by granitic veins but they are smaller and not so numerous as farther north

✓ 10270

Green sch.

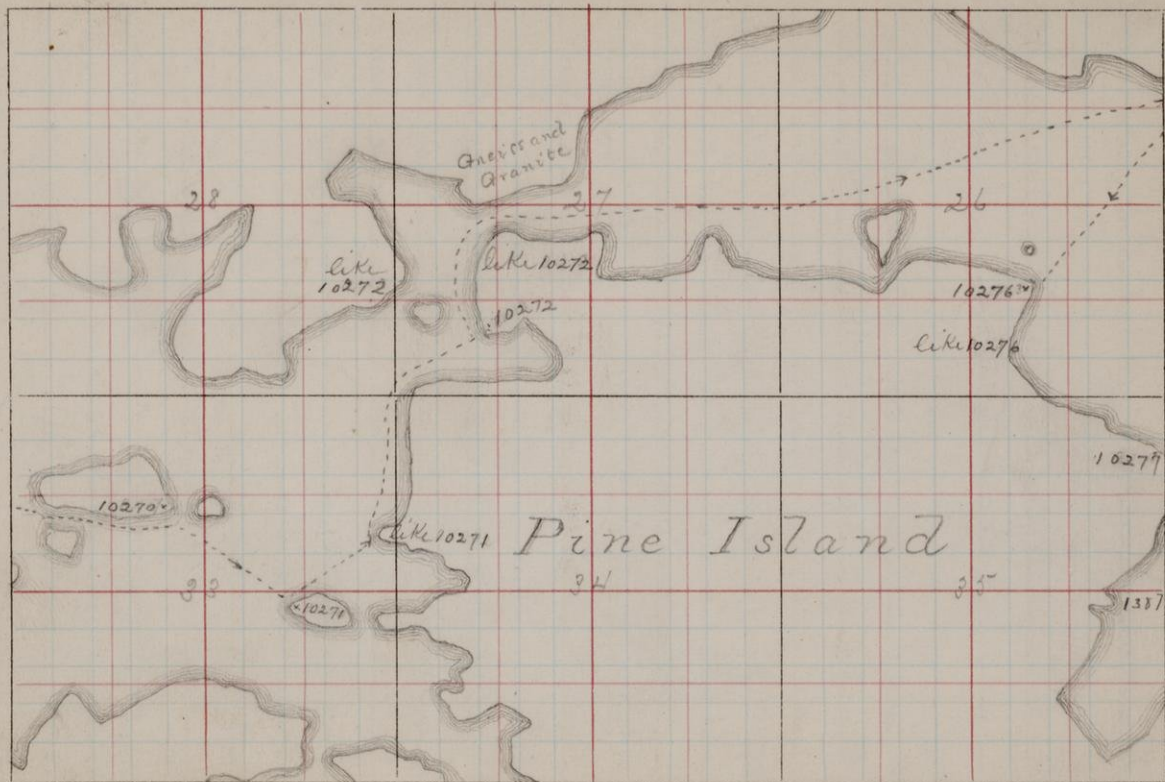
From east end of large island near the center of the N. E. $\frac{1}{2}$ Sec. 33-63-16. A fine grained greenish schist carrying considerable white quartz

✓ 10271

Like 10270 From west end of island in the N. $\frac{1}{2}$ S. E. $\frac{1}{4}$ of Sec. 33-63-16

✓ 10272

The gneiss with granitic veins shows again in large exposure



T.

R.

on the point in the S. $\frac{1}{4}$ of
Sec. 27-63-16 Also across the
lake on the island and point
to the west At the first
point the exposure is about one-
half granite

This gneiss and granite shows at
intervals from this point to the
mouth of Trout Lake river although
no more specimens were taken until
near this river

V10273 Granite from small island in the
R. *Granite* S. $\frac{1}{4}$ of N. $\frac{1}{4}$ of Sec. 19-63-15

Most of the rock of this island is
granite only a little of the darker
gneiss being seen (Map p. 22)

V10274 Gneiss with granitic veins from point
R. *Granite* near center of the N. E $\frac{1}{4}$ of Sec. 7-63-15
(See map opposite p. 22)

10275 Gneiss from the S. $\frac{1}{4}$ of the S. $\frac{1}{4}$ of
Sec 19-63-15 (Map opp. p. 22)

Numerous exposures of this peculiar
veined rock occur along the shores
of Trout Lake as far north as we

T.

R.

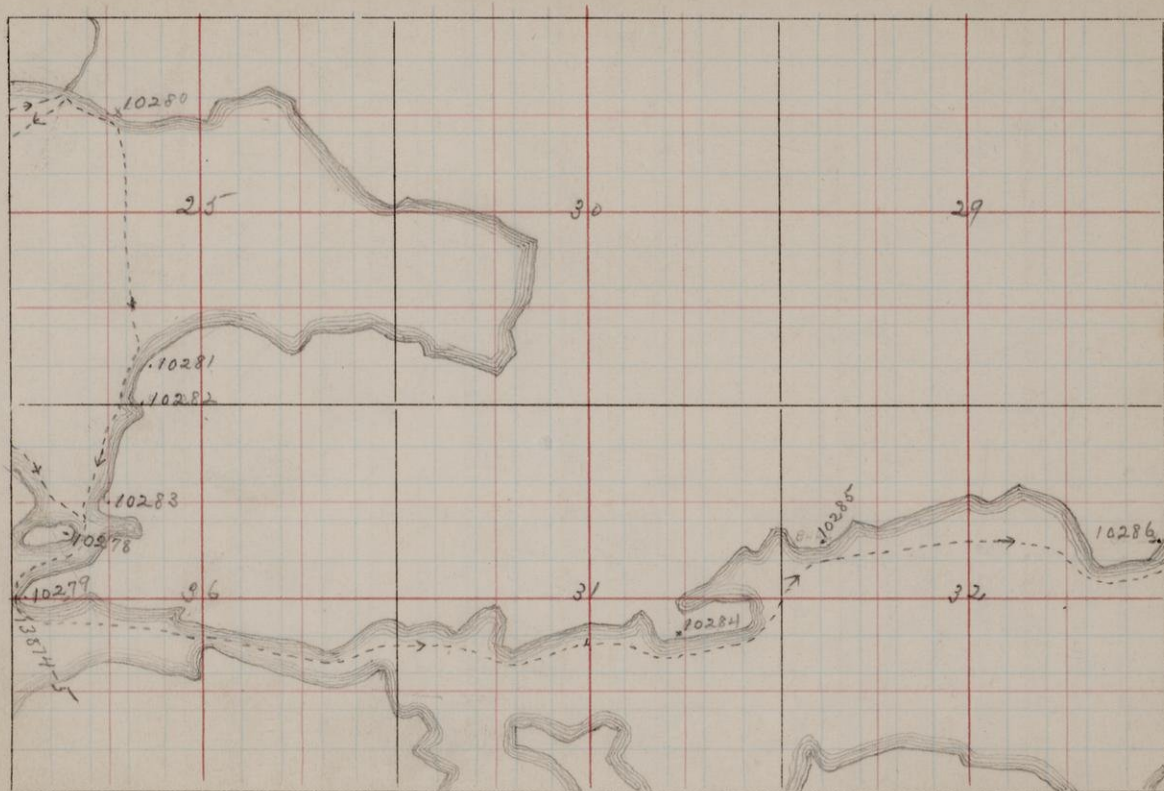


went (N.E. $\frac{1}{4}$ Sec 7)

- 10276 Gneiss from the N.W. $\frac{1}{2}$ of the S.E. $\frac{1}{2}$ of Sec. 26-63-16 Large exposures of this rock occur along the east end of this point (See map opp. p. 21)
- ✓ 10277 A greenstone from the N.W. $\frac{1}{2}$ of the N.W. $\frac{1}{2}$ Sec. 36-63-16
All. dyonite or diorite
- 10278 A greenish schist from east end of island in the S.W. $\frac{1}{2}$ of the N.W. $\frac{1}{2}$ Sec. 36-63-16 At this point these peculiar greenish schists and slates found farther to the west show for the first on this side of the channel
- ✓ 10279 A very schistose rock from west end of long point near W. $\frac{1}{2}$ foot Sec. 36-63-16
Green Schist. Highly albit. Hemstone
- 10280 Near mouth of Trout River N.W. $\frac{1}{2}$ Sec. 25-63-16
- 10281 The green schist from the S.E. $\frac{1}{2}$ of the S.W. $\frac{1}{2}$ 25-63-16 The first seen of this schist on the east side of this channel
Mica Sch.

63
T.

R. 16 and 15-



- ✓ 10282 Like 10281; near meander corner between
~~All mica~~ schist Secs. 35 and 36-63-16
- ✓ 10283 End of point near the center of Sec. 36
 63-16
- 10284 From point in the S.E. $\frac{1}{4}$ Sec 31-63-15
- 10285 Schist from the S.N. $\frac{1}{2}$ of the N.N. $\frac{1}{2}$ of
 Sec. 32-63-15
- ✓ 10286 Greenstone from near meander corner
~~Syncline or~~ between Secs. 32 and 33-63-15 = 10277
~~dec. diorite~~
- 10287 Slate from small island near
 the center of Sec 33-63-15
 Dip 90° (See map next p.)
- ✓ 10288 Schist from small island in
~~Green schist~~ the N.N. $\frac{1}{4}$ of the S.N. $\frac{1}{4}$ Sec. 32
 63-15 (See map next page)
- 10289 Mainland N.E. $\frac{1}{4}$ of S.E. $\frac{1}{4}$ Sec 33-63-15
- 10290 Mainland S.E. $\frac{1}{4}$ of S.E. $\frac{1}{4}$ Sec 33-63
 15 (See map next page)



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- 10291 Schist from end of point in the N. E. $\frac{1}{4}$ of N. E. $\frac{1}{4}$ Sec 4-62-15
- 10292 Schist from S. N. $\frac{1}{4}$ of the N. E. $\frac{1}{4}$ of Sec. 4-62-15 The exposure is banded the bands varying from quite a coarse quartzite to almost a slate the coarser kind being by far the most prominent
Strike N. 83° E Dip 90°
- 10293 A coarse weathering schist from end of small point near the center of the S. N. $\frac{1}{4}$ of the N. E. $\frac{1}{4}$ of Sec 4-62-15
- 10294 A schist from the N. E. $\frac{1}{4}$ of the S. N. $\frac{1}{4}$ of Sec. 4-62-15
- 10295 From the west end of island near the center Sec. 4-62-15
- 10296 West end of point near center
Sch. Cor. of the S. E. $\frac{1}{4}$ Sec. 4-62-15
- 10297 Schist from end of above point
Green Sch. about 150 yds. south of 10296



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- 10298 A short distance west of meander corner between Secs. 3 and 4 - 62-15
(Recon map opp p. 24)
- 10299 Small island N. 1/4 of the N. 1/4 Sec.
10-62-15
- 10300 Mainland end of point in the
N. E. 1/4 Sec. 10-62-15
- 10301 Island in the N. E. 1/4 of the S. E. 1/4
Sec 10-62-15
- 10302 Schist from the N. 1/4 1/4 of the N. 1/4
1/4 of Sec 11-62-15
- 10303 N. 1/4 1/2 of N. 1/4 1/4, 11-62-15 1/4 mile
East of 8439
- 10304 S. 1/4 1/4 of the N. E. 1/4 of Sec 11-62-15
- 10305 East end of point in the N. 1/4 1/4
of the N. 1/4 1/4 of Sec. 12-62-15
- 10306 Island near the N. 1/4 post Sec.
12-62-15

10307 From island a few hundred yards east of 10306

10308 From the north side Ely Island N.E. $\frac{1}{4}$ of S.E. $\frac{1}{4}$ Sec. 17-62-15

✓ 10309 A couple hundred yds. south of 10308
Dec. Sch. Qtz. porphyry

✓ 10310 From a conglomerate near the center of the island in the N.E. $\frac{1}{4}$ of the S.E. $\frac{1}{4}$ Sec. 17-62-15
Por. con.
The pebbles were small and only those of jasper showed to amount to much. The largest piece I saw was only 4 or 5 inches in length.

✓ 10311 Taken from the S.E. $\frac{1}{4}$ of the S.E. $\frac{1}{4}$ Sec. 17-62-15 70312
Like 10310 more schistose
10312
a few hundred feet south of 10311

10313 Taken from the south side of the island For a number of hundred yards from the south side at this point
10314

the island is composed of
slates similar to 8450 and 8451
(See map opp. p. for the last
7 specimens)

10315 A schist from the N.E. point of
island near the center of Sec. 11
62-15

10316 From the S.E. corner of same island

10317 From small island to the S.E. of
above island, in the S.E. 1/4, Sec 11-62-15

10318 A black easily cleavable slate from
west end of point near center of
Sec. 12-62-15

10319 A coarser grey rock a couple hundred
feet S. of 10318 N. of 10319 and in
contact comes a very fine black slate
The two kinds are thoroughly
mixed near the contact

10320 Slate and the coarser rock from
near contact

Like 10319
fragments

10321

Near the center of 12-62-15- The rock weathers white, similar to the conglomerates farther east, and carries a few pebbles. The small island just west of 10321 is of similar rock.

10322

From end of point in the S.E. of S. 24. of Sec. 12-62-15. A few yds. south the same rock again shows.

10323

A large dike of greenstone, running N.W. and S.E., 150 to 200 feet wide.
Hb rock or
gneiss
compare 10286
etc.

10324

Within several yards of the greenstone a very black slate shows in a band about 50 feet wide.

10325

Conglomerate from point on S. side Sec. 8. The entire point is formed of conglomerate as well as the small point just to the south. The pebbles appear to be of slate and a quartz rock. The surface weathers to a white.

coarse mortar like appearance

- ✓ ^{Like 10319} 10326 ^{frag(s)} Taken in order from N. to S.
 through the N.E. of the N.W. of
 10327 13-62-15 They are all a
 10328 light colored to grey schist
- 10329 From a small island in the
 S.E. $\frac{1}{4}$ of the N.W. $\frac{1}{4}$ of Sec 13-62-15
 a light green schist
- 10330 From end of point in the S.E. $\frac{1}{4}$ of
 the N.W. $\frac{1}{4}$ Sec 13-62-15
- ✓ 10331 White schist from the N.W. $\frac{1}{4}$ of the
^{Like 10311}
^{10319 etc.} S.E. $\frac{1}{4}$ Sec 13-62-15
- ✓ 10332 White very schistose rock from the
^{Like 10311}
^{but highly}
^{changed with}
^{caliche} west end of the point in the S.W. $\frac{1}{4}$
 Sec 13-62-15
- 10333 Shaly conglomerate The rock is
 similar to many of the conglom-
 erates lying along the south side
 of Vermillion. The weathered surface
 has a braccioid appearance; but
 a fresh surface only rarely shows



a conglomeratic structure. If it were not for occasional pebbles of gneiss it would be difficult to tell that these rocks were conglomerates.

10334 White schist from near the S.W. corner Sec. 13-62-15

10335 From end of point in the S. $\frac{1}{2}$ of the S.E. $\frac{1}{4}$ Sec 14-62-15

10336 From an island in the S.E. $\frac{1}{4}$ Sec 14-62-15

10337 From an island in the S.E. $\frac{1}{4}$ of Sec 14-62-15

10338 Schistose rock from the west end of large island in the S.W. $\frac{1}{4}$ Sec 14-62-15

10339 A lean slaty iron ore from the N.E. $\frac{1}{4}$ of the N.E. $\frac{1}{4}$ Sec 22-62-15
 Banded blk. fer. sch. The exposure is large; and the rock well banded and very slaty

10340 Schistose quartz-porphyr(?) from small island in the N.W. $\frac{1}{4}$ of the S.W. $\frac{1}{4}$ Sec 22-62-15-

10341 } A white and dark banded rock

10342 } from the N.W. of the S.W. of Sec 22

10343 } 62-15- The quartz-bands break

with a granular surface but where weathered look like a chalcedony. Besides the bands of white-quartz there are others of a darker or brownish red color. Most of the iron on a fresh surface appears in the form of pyrite. The banding is much contorted.

10344 Conglomerate from a small island about 100 yds. south of above exposure

10345 Conglomerate similar to 10344 from island in the S.W. $\frac{1}{4}$ of the S.W. $\frac{1}{4}$ Sec 22-62-15-

" 10346 Dike in 10345 - about 12" to 15" wide
all: *granite*

10347 From point near meander corner between
W & pr. Secs. 22 & 27-62-15 Stuntz Bay

- 10348 Very fine black slate from west side Stuntz Bay S. H. $\frac{1}{4}$ Sec 21 62-15
- 10349 Conglomerate from the S.H. corner of island in E. $\frac{1}{2}$ Sec 21-62-15
 Conglom. The pebbles vary in size from mere grains up to boulders a foot or more in diameter and make up fully $\frac{1}{2}$ of the mass of the rock. They are of three kinds viz. a Jasper, a black slaty iron rock and a quartz-porphyr.
- 10350 A finer rock carrying but few pebbles from the same island but several hundred yds. north of 10349
 Por. Con.
- 10351 Dike in 10349 These dikes are from an inch or less to several feet in width and run in various directions through the conglomerate 5 or 6 branches were noted in a space of as many Sq. yds.
- 10352 A conglomerate from the west end of island in the S.E. of the N.E. 20-62-15

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10353

10354

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10358

10359-60

10360

10361

10362

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10364

10365

- 10353 A Black banded lean iron rock from the north end of point in the S.E. $\frac{1}{4}$ Sec. 20-62-15 The same rock shows at intervals for the first 100 paces south
- 10354 75 paces south of 10353
- 10355 125 paces south of 10353; a light-colored conglomerate similar to those found a mile or so to the east
- 10356 125 paces south of 10355 the same rock shows for about 100 paces Between 10355 and 10356 a narrow belt of banded iron was crossed
- 10357 100 paces south 10356 This rock continues for the next 75 paces
- 10358 75 paces south of 10357
- 10359 For 200 or 300 paces south of 10358 the rock remains the same being a succession of bandings of fine slate and a fine and coarse quartzite Near the south side of these rocks

two distinct folds can be traced
At places the surface markings
show the slates to have been much
broken and crowded together by the
tilting of the layers; this shattering
even going so far as to produce a
brecciated appearance

Besides the above appearance the
layers are much faulted, dovetailed,
and squeezed together in various shapes

Farther south and a short distance
east of the base of this point the
trend of the layers suddenly changes
from the uniform N. of E. strike around
to a S. E. direction and holding
this direction for a considerable
distance

Specimens 10357-60 are taken about
250 paces south of 10358

10361 Near base of point south of a
swamp lying between 10360 and
10361

10362 Near the S. W. corner Sec 20-62-15
Interbanded with a fine black slate

10363 Near the N.W. corner Sec 29-62-15-

Cross sections near Tower

Beginning on the center line of Sec 32-62-15 (near Tower) six sections were made north and south at intervals of one half a mile working eastward

- 10001 At the center of section 32 a schistose conglomerate is exposed for a few paces only. The pebbles are a black iron slate and quartz porphyry; small patches of a graphitic material are also seen
- 10002 40 p. S. and 40 p. west of the center of Sec 32 is a small exposure of quartz-schist
- 10003 250 paces north of the center of Sec 32 a contorted chloritic schist is exposed for 90 paces. The rock carries large quartz nests. On the north side of the exposure the quartz makes up the bulk of the exposure. The quartz has a reddish color and shows a granular fracture; on the weathered surface however it has a chalcedonic
- 10004

appearance Spec 10004
 (See further Dr. Inings notes)
 No exposures for the next 40 paces

10005 390 paces north of the center post -
 a light colored schist shown in
 10005 is exposed for 40 paces
 No more exposures for 80 paces

10006 510 paces north of the center of Sec 32
 a white and black-banded iron
 rock is exposed for 55 paces

10007 To the north and in contact with
 10006 comes a greenish schist 40
 paces wide and carrying large
 masses of the banded iron on the
 north side. For the next 60 paces
 the banded iron shows again the
 bands being much contorted and
 broken the rock in places being
 brecciated

The next exposure (860 paces north of the
 center of Sec 32) is of a white and black
 banded iron with some red jasper
 910 paces north (center Sec. 32) the jasper
 shows again for a few feet. These

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Jasper

An Sch.

Jasper

An Sch.

Jasper

- two exposures are a continuation of the high ridge to the west (See R.D. Brown's notes) In contact with the jasper on the north is a green schist 30 feet wide (10008) then in contact with this schist comes another belt of jasper. For the next 30 paces the schist and jasper alternate in small bands interlocking in the manner shown on the opposite page as nearly as could be made out from the surface exposed.
- 10009 Specimen of this jasper

Section along the east line of Sec 33-62-15 Distances measured north from east $\frac{1}{4}$ post

- 25 paces north a banded jasper shows for 5 paces when a green schist 10010 shows for 25 p. The schist is much contorted. 5 paces north of the schist the jasper shows again; for the first few paces the white and black banded iron shows (10011) but this soon gives place to the red jasper
- 10010
- 10011

The jasper shows for 25 paces or up to the 95th pace from the $\frac{1}{2}$ post -

Up to the 160th pace no more rock in place is seen, the line leading over a ridge, at that place however the ridge breaks down showing a small exposure of jasper. The fragments on this ridge and the exposures at the Lee mine a short distance east lead me to think that the whole ridge is of jasper.

199 paces N. banded jasper shows in a small ledge and from here is exposed at intervals along the line and also short distances both to the east and west of the line up to the 275th pace.

10012 530 north a greenish grey schist is exposed for 20 paces.

610 paces north a small exposure only a few feet wide of a jasper.

10013 770 paces north and 30 or 40 paces west of the line is an exposure of schist 20 or 30 paces wide.

- 10014 949 paces north a schistose porphyry is exposed for 3 or 4 feet on the south slope of a ridge. Crossing this ridge the line runs through a cedar swamp for 900 paces and then crosses a Norway ridge. No rock in place being seen until after passing the east $\frac{1}{4}$ post of Sec 29 (Distances are now from this $\frac{1}{4}$ post)
- 10015 160 paces north a fine black slate is exposed for 10 paces. The dip is about vertical and the surface bandings run $E. 22^{\circ} N.$ Solar. The same slate is exposed again 200 paces north.
- 10016 595 paces north a similar slate, with coarser conglomeratic bands, is exposed. The bands of pebbles also the other bandings run here $45^{\circ} S. of E.$ Dip vertical. The exposure at this place is 30 or 40 feet wide. A short distance to the east is another exposure similar to the last; the bandings here also running S. E.

Section along the N. and S. $\frac{1}{4}$ line
 Sec. 21-62-13⁻
 (Distances from Lake shore)

✓ 10017 215 paces south the banded slate
 and quartzite is exposed for 30 paces
 300 paces south the same rock is
 seen for 25 paces; and again 359
 paces south for 125 paces almost
 continuously

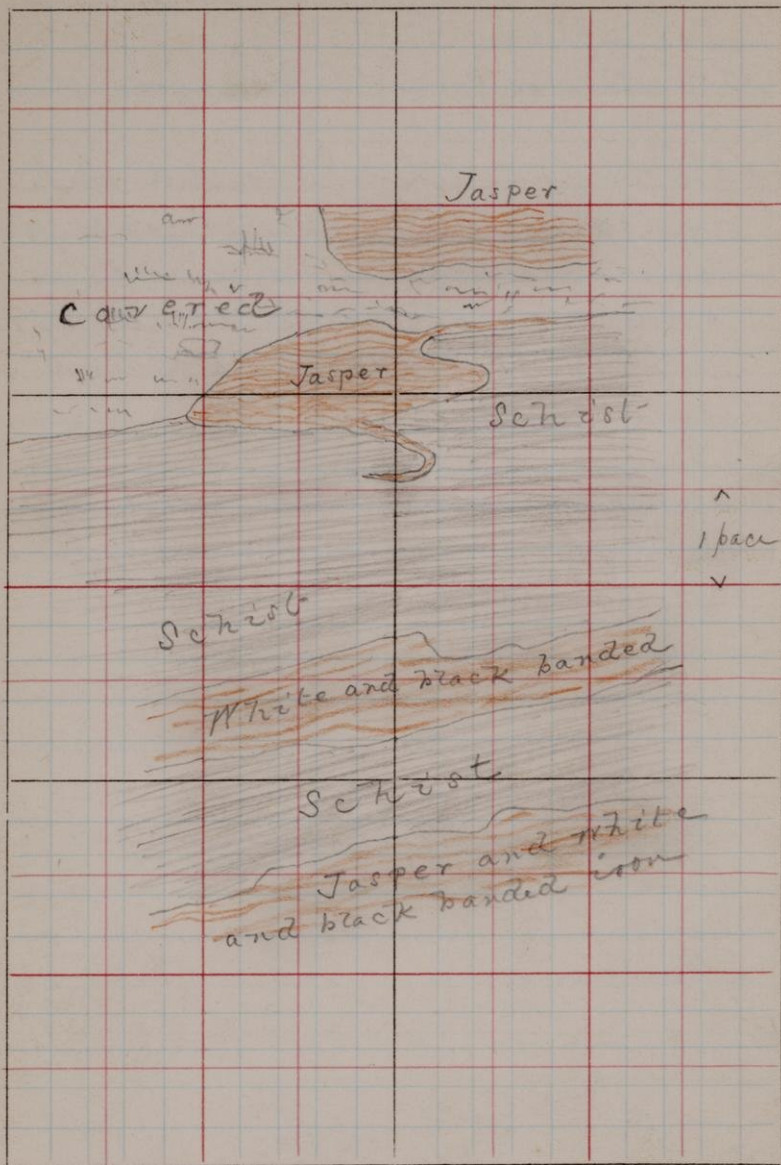
✓ 10018 666 paces south on the north side
 of a high ridge a quartz porphyry is
 exposed for a few feet only

724 p. south a high bluff of red banded
 jasper is crossed for 75 paces

There are no more exposures along this
 line 1585 paces south a large
 swamp is struck running to
 Pass Rivers

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Section on the line between
Secs. 28 and 27
(Distances from lake shore)

436 paces south a black and white
banded iron shows for 5 paces

10019 788 paces south the banded iron and
jasper is seen for 25 paces when
a schist comes in in contact with
the jasper and penetrated by or pene-
trating the jasper in a most irreg-
ular manner. The diagram on
the opposite page shows a portion of
the surface at this place

10020 Specimen of the schist
This alternation continues for 70
paces several bands of various
widths, both of the schist and
jasper being crossed

1214 paces to top of the hill north of
the Power mine. No exposures
were found on the line although
jasper was noted a short distance
to the east about 1100 paces from
the lake

1310 paces the large open pit of the Tower mine was struck. The pit is about 200 paces long by 75 wide (estimated) running N. of E.

10021 1470 paces south on the north side of Ry. a small showing of schist only a few feet wide was crossed.

Section on the N. and S. 1/2, Tine
Sec. 27-62-15

10022 At the Ry. track 160 paces south of the Stone mine pit a greenish schist is exposed interbanded and mixed with a jasper.

The Stone mine is about 125 to 100 paces south of the center Sec 27. All distances are taken from the open pit at this mine.

10023 240 paces north a small exposure of schist about 15 ft. wide is crossed.

370 paces north a small exposure is seen the south half of schist and lying in contact a jasper with

an irregular edge running into the schist. The gasper is only 8 to 10 feet wide when 500 feet of a breccia composed of this schist and gasper is seen.

452 paces north a large mass of 10024 banded gasper (50 paces wide) shows

700 paces north is a small exposure of quartzite only a few feet wide

10025 is exposed 800 paces north for about 20 feet. North of this comes a schistose rock but it is apparently a quartz porphyry; it runs to the lake. (See specimen from south side Stuntz Bay)

From Stone mine to edge of bay 1075 paces

Section along the line between
Secs. 26 and 27 - 62-15

We turned east along the section line from Stuntz Bay going $\frac{1}{2}$ mile as nearly as possible; but could

not find the section corner
Distances are measured south
from this section line

At the point we turned south there
are large exposures of a black and
white banded iron with an occa-
sional showing of red jasper

10026 67 paces south 10026 is exposed with
a belt of black banded material

10027 (10027) about 18" wide running
with the strike

255 paces south another belt of jasper
45 paces wide is crossed. On the
south edge of this exposure a belt
of schist about 6' wide is seen and
to the south of this jasper. The line
of junction especially on the south
where best seen is very irregular

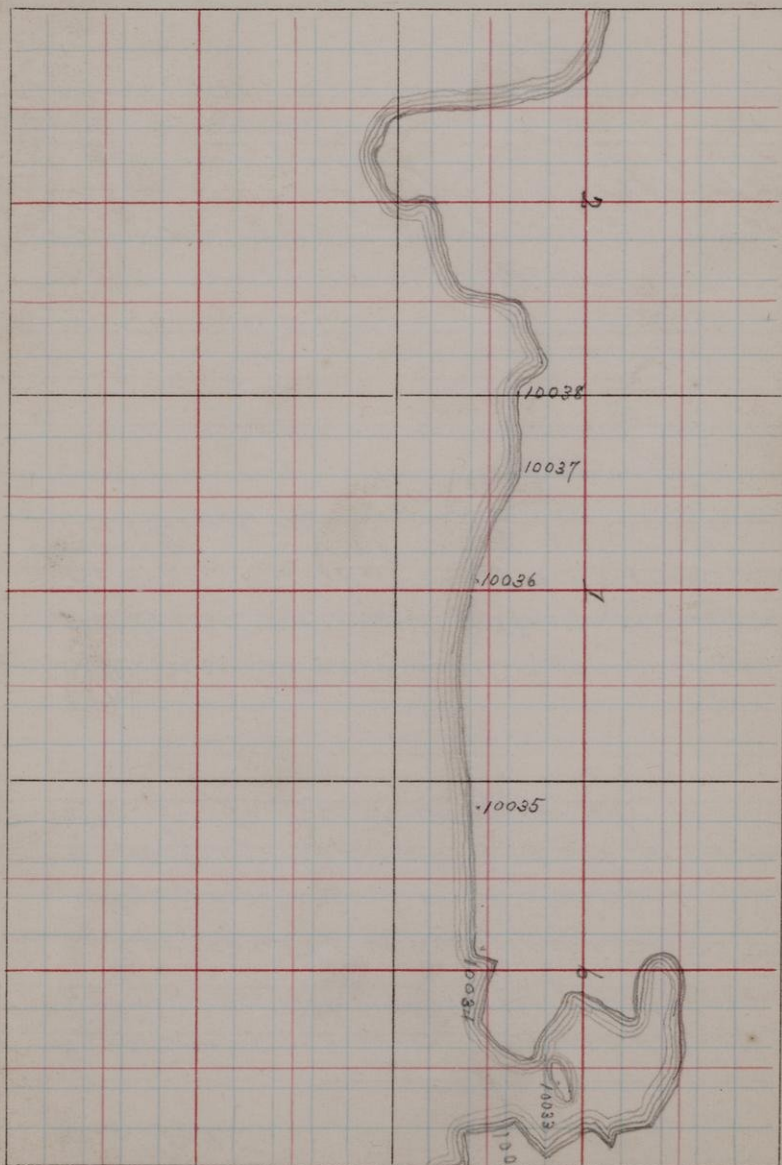
10028 470 paces south a schist with a
lens shaped mass of jasper included
within it

866 paces the line passes just west

of a small pond 100 yds. or so in diameter

No more exposures are seen until at Jasper Bluff about 1900 to 2000 paces south where there is a large ridge (the highest in the vicinity) of Jasper. South of this is a large tamarack swamp.

The results obtained from these sections are not satisfactory; nor do I think they can be made so without a large scale contour map.



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- ✓10030 Fine black slate from the south side of Pine Island S.W. of the S.W. of Sec 5-62-15
- ✓10031 A coarser rock (quartzite?) with a narrow band carrying what appears to be pebbles (10032) The band is only 2 or 3 feet wide and no more rock like it is seen
- ✓10032
- ✓10033 From a small island near the center of the E. $\frac{1}{2}$ Sec. 6-62-15
- ✓10034 From a band of banded slate and quartzite Sec. 6-65-15
- ✓10035 Slate near the S.W. corner Sec. 6-65-15
- ✓10036 Near center of S. $\frac{1}{2}$ Sec 1-62-16
- ✓10037 From the N.W. $\frac{1}{4}$ of the S.W. $\frac{1}{4}$ Secs. 1-62-16
- ✓10038 Near the meander corner between Secs. 1 and 2-62-16

Trip from Tower south along the
Ry. to the gabbro (Smith)

- 8975 From an exposure on the east side
Ry track 2460 yds. from the crossing
near the depot. A moderately
coarse grained, greenish, massive
rock weathering to a greenish white
color
- 8976 2760 yds. south of the crossing an
exposure 40 yds. long of a green,
fine grained, schistose rock
containing numerous quartz veins
Some portions more massive than
others. Strike about E. N. E.
Dipping N. N.
- 8977 3070 yds. south, and exposure 60 yds.
long of a greenish grey, somewhat
coarse grained massive rock
- 8978 From a narrow schistose band in
this exposure
- 8979 200 yards south of last exposure is an
exposure, on east side Ry, about 20 yds
long and 10 ft high. The rock is

a grey, fine grained schist
Strike E. N. E. Dip to the N. W.

8980 A fine gray slaty rock 5020 yds
South of crossing Cut 110 yds long
Strike E. & W. Dip North.

8981 130 yds. S. of 8980 an exposure 60 yds.
long of a dark grey rather coarse
schistose rock The exposure is
banded the bands running about
W. N. W. and dipping N. N. E. about 15°
to the N.

Weathers white with a sandy appear-
on the surface

8982 From the Ry. cut 310 yds. from the last
A dark grey, fine grained, schistose
rock Banded east and west
Dip 85° to North Exposure 15 yds long

8983 6000 yds. Exposure of a firm, purplish grey
schist banded and similar to the
last

8984 6880 yds, A dark grey schistose
rock containing considerable
H. & Schist

quartz and numerous small dark
needle like crystals

- 8985 7930 Yds. south A fine grained, light
gray, schistose quartzite dipping at
an angle of 45° to the north and lying
against a coarse massive quartzite
about 15 yds wide (8986) South of
this coarse band the rock is similar
to 8985 but not banded

8987 Schist 100 yds. south of 8986
Dip about 45° E. of N. Exposure 20
yds. wide
*Micaceous
Hb. schist
(Agassiz's
Halter
solid)*

8988 13750 Yds. south of Tower an exposure,
of mica schist, about 60 yds long.
Thinly banded with light and dark
bands Strike about east and
west. Dip to the N.
*Biotite-schist
or gneiss-
with some
Hb.*

8989 16280 South A exposure of gneiss.
about 100 yds. east of Ry
*Biotite
gneiss-
or schist*

8990 1470 Yds. south of the Embarras
River A granite
Hb. granite

- 8991 Granite on the Embarras east-
side Ry.
- 8992 Granite from an exposure in
Ry. cut 8000 yds from the Embarras
Riv. Top of Mesabi Range
- 8993 Exposure on east side Ry (8892 yds
from the Embarras) in gravel pit
Mucaceous
quartz-
schist.
A dark slaty quartzite Banded
the bands running about east
and west Dip vertical 300 yds. S of
the Granite
- 8994 11680 yds. from the river in Ry. cut
Much broken down
- 8995 Banded iron from the same place
- 8996 as 8994 Small exposure
- 8997 Cut 12000 yds south of the River
a banded iron rock, weathering
to a bright yellowish red
- 8998 Very black prony slate from
a Ry. cut 13220 yds. from the
River Exposure is much
up Banded iron similar

to 8990 is also seen here

8999 Similar to 8998 100 yds south
of 8998

10000 Gabbro from the Ref. Cut - 15250
yds south of Embarras River

^N The

