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Stearns County, Morrison County, and Todd County, Minnesota: [specimens] 5098-5146. No. 15 1883-08

Hall, C. W.

[s.l.]: [s.n.], 1883-08

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Hall 3

U. S. GEOLOGICAL SURVEY

FIELD NOTE BOOK

No. 13

August 1883

Stearns, Morrison & Todd Co. Minn.

5098

D. W. Hall

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

INSTRUCTIONS.

1. Devote at least two pages of this note book 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. 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 smaller spaces as 100 paces, each of the spaces between the red lines as 500 paces, and four of these large spaces as one mile, or 2,000 paces. Usually the southeast corner will be placed at the first red 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 down one space, 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, after which give in order 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 exposure as possible. Very often the notes for one section will cover more than one page in which case pass to the next right hand page, *repeating the map on each left hand page* as long as the notes, with regard to one section, continue.

3. Collect a specimen from each separate ledge of rock, or whenever 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 the note that it is of a rock identical with specimen so-and-so. Under the same conditions small sized samples will be allowed, but in all other cases *large sized trimmed specimens*, with chips for slicing, must be selected in accordance with § 3, chapter IV, p. 44, Regulations of the U. S. Geological Survey. All specimens are to have numbers painted on them, in white on a black background, in camp.

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, etc., etc.

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

#15

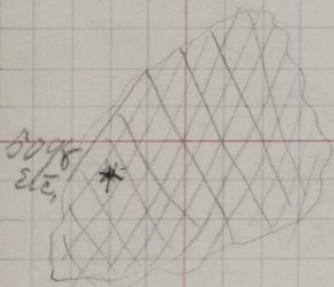
Sharns, Morrison, Todd, Cos Men

C. W. Hall

August 1883.

Sec. 18 T. 124 R. 28

Woodland



5098

425 N.; 1700 W.

This exposure is a cliff some 25 feet above the surrounding woodland; it is rounded on the top and considerably weathered in parts.

The ledge is not so much jointed as on many we have visited. Some quarrying which has been done here shows large blocks can be taken out.

At this point dikes are seen; one some 15 ft wide, running $N 65^{\circ} E$ of very fine, sharply brittle, mediumly textured dark rock. Another 4 inches wide running $N 70^{\circ} E$.

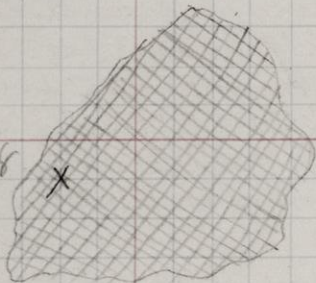
This exposure of quarry + dikes lies about 425 paces from the West line of the 14 Sec + 300 paces from the South line. Quarrying has been done at several places on the 14 Sec, but this seems to be most favorable.

This location upon the South side is abrupt + has been quarried. The north side slopes off towards $N 20^{\circ} E$ at an inclination of 10° (with several layers "peeling off").

At one point not far from the broader dike but separated from it by a covered surface is a fine "Vine Stuff" which is very finely jointed. Main joints running $N 20^{\circ} W$ from 1 inch to 1 foot apart. Another set showed a direction $NW + S.E.$. I added one set of the leading joints over the whole 14 Sec. had this general direction and they were nearly perpendicular.

Sec. 18 T. 124 R. 28

Woodland

5098
273

5098;

425 N; 1700 W.

Some of the points of rock on this 1/4 Section reach a height probably of 75 feet above the local average — about 100 feet above the Snake River which runs thro' the northern 1/2 Sec.

The trees on for the most part small to shrubby only in a few ravines or hollows is the soil accumulated sufficiently to yield a large growth. But to the East & North the trees are larger.

This Specimen (5098) consists of a coarse crystallization of feldspar, hornblende & quartz. Feldspar predominates. In the upper part of the quarry — how it is below one cannot tell for it has been quarried only in the upper layers as yet — it is of a reddish tint which seems to arise from the Fe_2O_3 collected in the cleavage planes and fractures. Occasionally a large white crystal is observed which, besides being free from flaws & cleavage planes opened, is of a milky appearance.

The hornblende is of a broken nature, some individuals quite large, others quite small & it seems to be irregularly distributed.

Quartz occurs somewhat sparingly compared with the other two minerals named & even compared with its amount in other granites sampled. It is in granules & not in crystals.

Sec.

18

T.

124

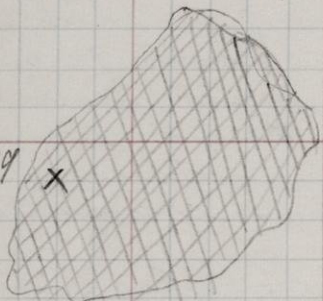
R.

28

Woodland

5099

X



5099; 425 ft; 1700 W

This is the coarse half gray rock of the same locality at 5098. On account of the granifying fresh material was easily secured. It seems from macroscopic appearance to be a genuine hornblende granite.

It is not so coarse as the preceding which is apparently the enclosing rock.

The contact could not be seen yet the latter seems to be the larger mass.

The 4 inch dike which has been already mentioned passes thro' this no. 5099.

Mica seems nearly as abundant as hornblende — both are in goodly proportions.

Feldspar shows some lighter, nearly white crystals; there with occasional greenish ones are much larger than the average mass. Quartz seems to be present in granular masses, some of considerable size. The grains are clear.

This seems to be a very firm clear rock, good for working, of attractive color and very free from FeS_2 and capable of taking a fine polish.

Sec.

18

T.

124

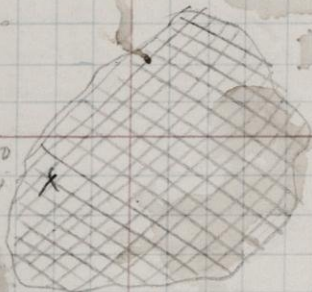
R.

28

5410

5101

x



5700

425 N; 1700 W

This is the dike rock of the same exposure from which the preceding were taken. From the narrower dike - the 4 inch - which was very much shattered and very fine in texture.

The 10 foot dike yielded the samples bearing this number. The rock is of medium texture. No accessories were to be seen by the naked eye.

5101;

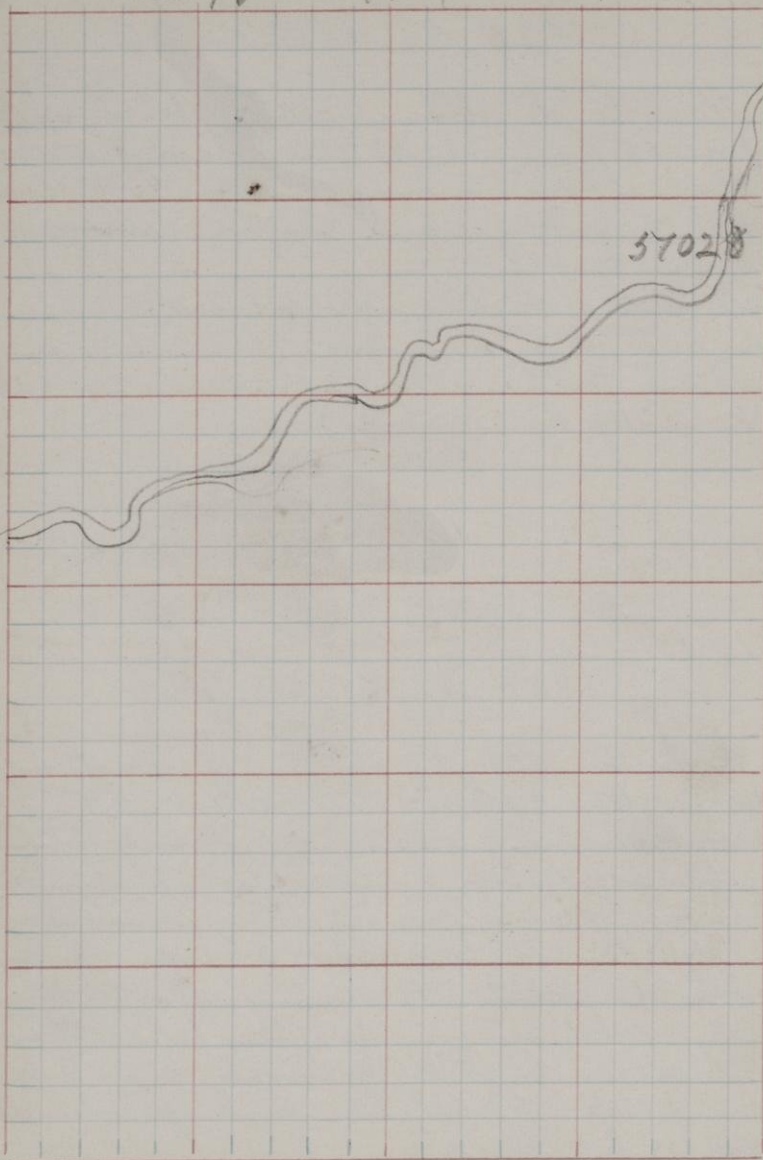
425 N; 1700 W.

Is the streak or rim of material between the coarse 5098 + 5099. It does not seem to belong to either of them except as color associates it with the former.

It is 12 or 15' feet wide, shows many vertical joints running N 20° W and a hard uniform surface for weathering. Feldspar in fine granules is the most part. Hornblende and quartz also appear to be present.

Sec. 18 T. 124 R. 24

57028



5102;

1900 N; 100 W.

This exposure lies at the plat indicates 100 paces South + as many paces East of the N E corner - part of the section.

Its position is between the highway and the river. The top rises some 20 or more feet above the water mark.

Many joints appear upon the surface the principal one with the direction S of the Sun - N 20° - 25° W.

There is a dipping to the northeast but the inclination in this direction is not so distinctly by bedding as in some other exposures in the townships.

The rock itself is a fine grained light-colored granite with small grains of quartz and but little mica.

In some places in the ledge there appears to be a porphyritic structure, which indeed shows itself in almost every part of the exposure by a development of large milk-white crystals of feldspar. A slight greenish tint shows apparently a product of alteration.

Sec. 17 T. 124 R. 28

Prairie

Prairie

~~XXXX~~

5103.

1

1

1

5103;

1120 ft; 800 W.

This Exposure lies in the form of the Beckus
The Exposure stretches East and West
Some 200 paces but partly covered
with trees but at no place is it high
About 8 feet was the highest point ob-
served & this was the at the west end,

The rock is quite free from joints
those observed & so taken for the lead-
ing one showed the direction N 20°-25° W.

A bedding inclining at a low angle from
a horizontal towards the northeast was
observed in the Eastern part of the outcrop.

The whole surface altho in a good deal
been burned over two or three times and
the surface was not a fair representa-
tion of the rock below,

The rock is a light colored hornblende gneiss
its of fine texture than most exposures thus
far seen. Quartz is in fine pieces and not
abundant so far as can be seen with the
naked eye. Some feldspar crystals are
large & white like the preceding number;
hornblende and mica in nearly equal
proportions.

The stone is said to quarry very well indeed,

Sec. 34 T. 126 R. 33



5104

300 ft; 200 W.

This rock lies under the foundation of Clark's Mill in Melrose village. It is in the river beneath & below the dam so far as it protrudes from under the foundation.

The height above the water below the dam is six or eight feet.

The length of the rock above ground must be — above ground 20 paces; width 10 paces; the height from bottom of the water — a nearly perpendicular face is about 14 feet.

Mr Clark said that rock had been found by the Cooper Shop some 100 feet from the mill foundation.

In the village near half a mile from the mill to the west rock was struck in sinking a well which could not be escaped in digging a hole 12-14 feet in diameter.

The rock under the mill is a red granite; that one half mile distant was dark colored provided the samples shown were from that locality — No samples were taken.

The fact that there is a ledge under the mill seems to be still uncertain.

Sec. 15 T. 126 R. 34

h 104
h 106
h 105
h 105

Village

5105; 1925 N.; 1790 W.

This outcrop is in a field and within 100 feet of the Manitowish railway track in the village of Sauk Centre. It lies 75' from the North line + 210' from the West line of the Section.

The rock projects just above ground at its highest point; at the others excavations have been made for quarrying. The rock surface when exposed slopes nearly north at an angle of some 8° .

Glacial striae were observed coursing S. 45° E. which for this country seems to be an unusual direction for this State (See 9th An. Rep., 1880, Geol. Chart, Hist. Survey of Minn. Upham's Report of Progress p. 383)

One set of joints N. 65° E.; another N. 25° W. did not seem to have perfect continuity. This stone is preferred for quarrying because of the aid these shank give in splitting the rock.

This rock is massive, the outcrop extends 75' from NW. + SE, as shown by the several exposures made in quarrying. How far beyond this limit to the S.E. or towards the West cannot easily be determined by appearances but we were as-

Sec. 15 T. 126 R. 34

b706
b706
b706

Village

5705-

1925 N. ; 1790 W

Sworn by the owner of the field that it is struck in plowing in several places within an area of 100 acres + at various places in the vicinity it is reached in sinking wells cellars + other excavations.

No dikes were observed at this locality.

On a fresh fracture this sample shows in places an unusual quantity of FeS_2 or some other pyritic mineral. It is distributed in granules rather than crystals thro' the rock. Even where they cannot be seen their presence is indicated by the abundant iron rust discolored every joint and seam produced by decomposition + oxidation whenever there was exposure.

The other minerals recognized are feldspar and an amphibolic representative in sufficient proportion to give a dark green color to the rock. It is evidently hornblende as the color on thin edges + the angle of cleavage + the quite perfect cleavage itself indicated.

The feldspar is in very fine grains. Quartz was not observed at this exposure.

Sec. 15[~] T. 126 R. 54

107
55106
55105
55105
55105

Village

5106; 1925 N; 1790 W.

This number lies immediately north of the number just described. It, like that, comes to the surface two or three localities between the N.W. edge of # 5105 just located & the N line of the section at 100 paces from the Sec. corner.

The inclination of the rock is towards N.W. at 6° to 10° dip.

The largest exposure is 40 paces long & 20 paces wide; the other exposure - near the fence is 26 long & 6 wide.

The principal joints run N 60° E dipping N 45° . Some other joints are present but not so continuous.

The rock is a gneiss, rich in feldspar. Great irregularity is noticeable in the texture; in some places it is very coarse in others quite fine. A "streaming" can be seen in some places on the surface showing the wavy lines of alternating feldspar rich and feldspar poor material.

The mica is not black & shining like that in the granitic rocks at St. Cloud but is of a greenish tint in most places.

Quartz is abundant - occasionally coarse.

Sec. 15 T. 126 R. 34

2107
2106
2105

Village

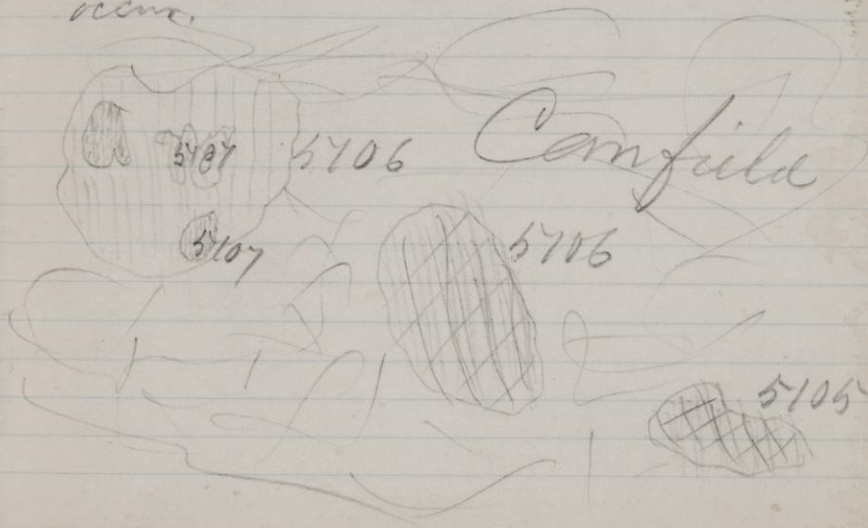
5107

1925 N.; 1790 W.

This is an inclusion in #5106.
The laminations stand nearly perpendicularly
+ show direction of $\pm 60^\circ$ S with some con-
tinuities.

While this no. is an inclusion in 5106
in irregular masses from the size of a
man's fist, to others 8 or 12 feet in length
it itself contains inclusions of 5106
in irregular. It could not be determined
whether these latter were merely arms
reaching across from outside to the other
thru this foreign material.

These inclusions - of 5107 - are far
more regular in their direction of the
laminae than the masses in which they
occur.



Sec. 15 T. 126 R. 34

5107
5106
5105

Village

5105, 5106, 5107

1925 N; 1790, etc. W.

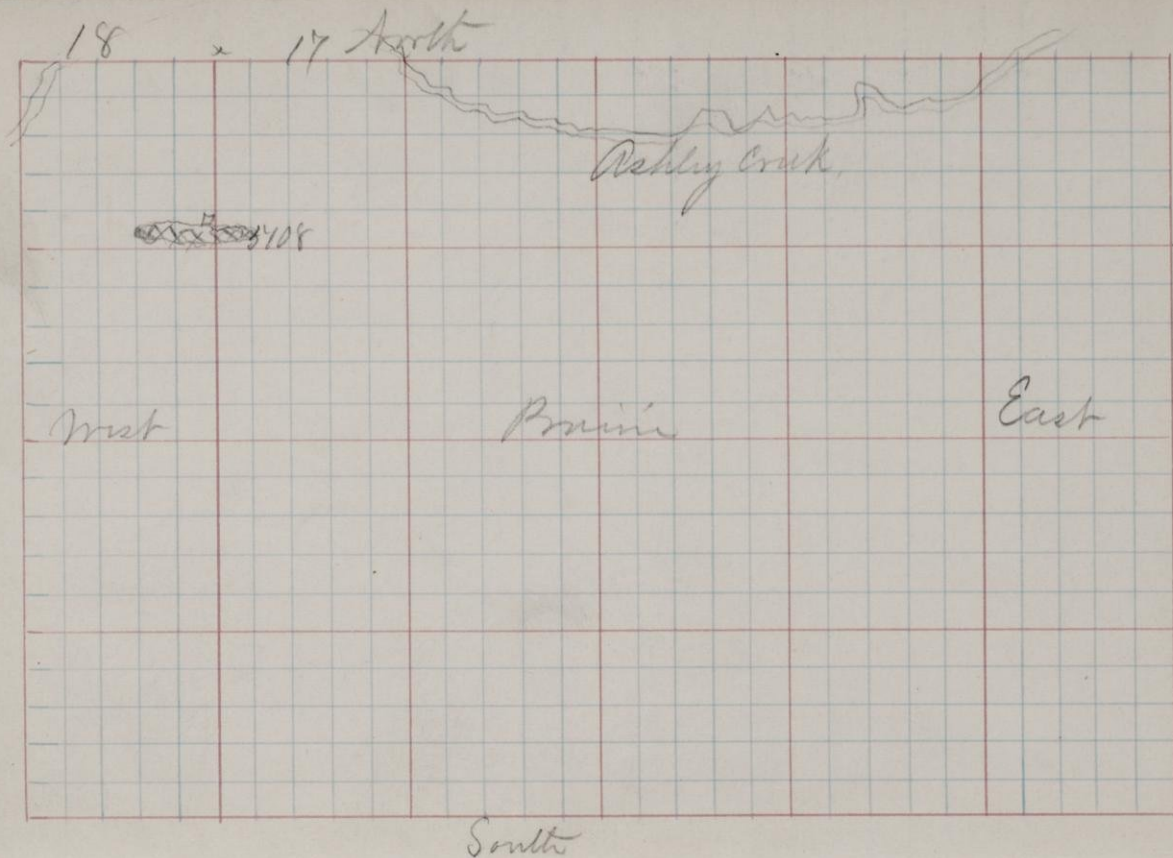
The rough sketch on the preceding page gives the compensation positions. All the ground for a considerable area is no doubt underlain at no great depths.

In the gneiss itself, i.e., in 5106, so far as any dip could be worked out of the contorted laminae it was southerly from 65° to 80° .

(This in one or two places it was South Easting 70° .)

In some places the Strands of Coarse are worn in such a manner that they give a horizontal or parallel surface and exhibit feldspar crystals + granules of quartz of very large size.

Sec. 17+18 T. 126 R. 86

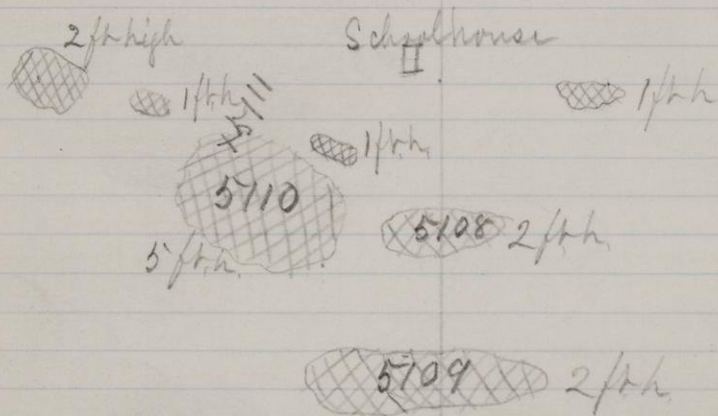


5708; - 5711 incl.
1525 ft; 2000 ft.

The second numbers gathered at this locality lie on both sides of the Section line between 17 + 18 and just north of the 14 Sec. line below the 7th + 8th sections.

There are six or eight outcrops at this exposure within the distance of 300 paces East + West and 100 paces north + South. They are arranged along in front of the School house and no other exposures are known within miles of this spot. The East end is about 75 paces east of a north + South fence which fence is near the Section line.

The positions are thus shown:

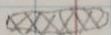


Scale; 100 paces 1 inch

Sec. 17 1/2 T. 126 R. 35-

rock

18



5408 etc,

17

Buini

5108, etc

1525 ft; 2000 W.

14

Some of the outcrops rise more than 5 or 6 feet above the prairie. Their tops are rough & jagged (tho' evidently at one time smooth), and are weathered along joints and seams. Masses seen to have been taken out and carried away, likely during the glacial period since the edges are worn smooth & the cavities rounded out.

Joints are everywhere and run in one direction conspicuously. Owing to the low position of the outcrops and their rounded & worn surfaces no inclination could be stated satisfactorily.

Along to the north, one half mile away extends a moraine stretching NW & SE. It seems to be 30 or 40 feet high and an outlier from others which can be seen further towards the north and west. Along the South the St P M & M Ry runs only 1/4 mile distant.

Joints on one of the masses showed a direction $N 20^{\circ} W$. No bedding joints could with certainty be determined tho' all indications pointed to a Seelye dipping northwesterly.

Sec.

17 T.

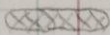
126

R.

35

North

Ashley Cr

 5708

Barn

5708

1525 N; 2000 W.

The samples bearing this no were taken from the exposure under the fence & 1st in front of the School house.

It appears to be a mixture of feldspar & a light green mineral which so far as color, hardness &c, are concerned may be Epidote or garnet, - very likely the former.

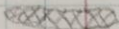
In some places this mineral constitutes a large proportion of the mass, as upon the north side of this outcrop, while in other places it almost entirely disappears.

The green seems to resist weathering equally well with the feldspar as the surface when free from lichens abundantly shows. The lichen growing here is of almost the same shade of color as the mineral beneath it, so it is extremely difficult to tell at a short distance away whether we have a rock rich in Epidote (?) or one covered with lichen.

Sec. 174 T. 126 R. 35

brook

Ashley Cr.



5709

5709;

1525-N; 200W.

From the outcrop just South of the preceding. It is somewhat larger - extending under the surface apparently for some distance at a very slight depth.

The rock seems to be an intimate mixture of quartz & feldspar with scattering grains of black mica and only slight traces of the green mineral so abundant in the other specimen.

The color is light brown, though it is due to ferric oxide in the feldspar granules.

The rock weathers very smoothly showing on the polished surface occasional crystals of white feldspar - much more clearly than on a fresh fracture.

The polishing of the surface may be due to the blown sand since there are no facets for many miles to prevent the sand grains & fine dust from being drifted in considerable quantities at seasons when not protected by the growth of grass.

Sec. 14 T. 126 R. 35

North

Ashley Cr.

5410

5710

1525 N; 50 W,

This is from the largest outcrop in the group & the samples were taken from the north side where the rock stands some 8 feet high.

The rock is darker in color - brownish with less of the green mineral than was noticed in 5708 directly east of it.

This rock like #5708 shows no grains of quartz - or but very minute ones. It seems to be a mixture of feldspar and the light green mineral.

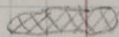
The feldspar is brownish red in color like #5704 but the quartz of that no. is replaced in this by the green mineral which frequently appears segregated in nodules the size of ones fist, when but little if any feldspar is seen. No good sample of such a nodule could be secured - only pieces when the green predominates I could be secured broken off.

In this sample there is an accession of a dark lead gray color recurring mingled with the feldspar & epidote (?). It seems soft against the knife point and cuts like talc.

It is quite abundant in some places. On two or three specimens a bright black perfectly clearable mineral was seen. Looked like Galena. Quantity too small to be determined.

North

Ashley Cr.



5711

Sec.

18

T.

126

R.

36-

5711;

15-25 N; 100 W.

This is same piece of mostly pure
feldspar broken from about midway
East + West of the north side of our
crop containing 5710.

The piece came from what ap-
peared to be a vein composed of very
coarsely crystalline rock material
such as was seen in the gneiss at
Sank Center.

Towards the surface the crystals
were whitened ~~white~~ and yielded a
powder on the fingers when rubbed.
Showing kaolinization.

Sec. 10 T. 126 R. 29

Mr Lamberts
the place from which 5112
can be most conveniently
reached —



Woodbury

5712

600 N. 750 W

The exposure lies in the timber and with the exception of here and there an uplift is entirely covered around.

These outcrops scattered here & there indicate an extent of several hundred paces in either direction.

The ridge on which these outcrops have its most prominent extension northwest and southwest the outline of others — one to the northwest for instance appears above the trees.

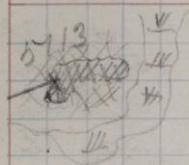
The rock is a dark gray granitic one, protected by the overgrowing forest from erosion & consequently weathered to a considerable depth.

Geldspar is abundant; but little idea could be formed as to its species except from inference based upon association.

Hornblende had suffered much from disintegration. There was an appearance of the breaking up of this mineral and the formation of mica at its expense.

The mica has a brown tinge which on the most weathered parts gives the glistening of golden yellow.

Sec. 6 T. 125 R. 28



Woodland

5713

1250 N; 1800 W.

This exposure forms a ridge covered with small timber having a height of 30 or more feet and a length of 40 rods from the point at which the samples were taken toward the northwest and then east to a swamp. The whole tract covers at least 30 acres in extent.

There are in the vicinity quite a number of boulders which have every appearance of having been torn from this locality.

owing to the covered condition named it was exceedingly difficult to secure satisfactory samples, - nor could a determination of the dip strike jointing or bedding well be made.

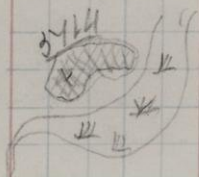
The samples were all weathered more or less.

The rock has a light brown color rather pleasant but without glossiness. It may vary in color with depth. The color comes from the feldspar; but some of the feldspar is white or nearly so.

Quartz is abundant clustered in places to make large masses, - an inch or so across.

Hornblende + mica Equally distributed; not abundant. In some pieces one thinks he sees a gneissic structure but the rock is too covered to determine. No accessories were identified.

Sec. 6 T. 125 R. 28



Woodland

5714

1250 N; 1800 W.

This is the coarse rock from the same locality as the preceding.

It seems to occur in bands running through the latter varying in width from 3 inches to 2 feet (so far as noted).

When they are extended over any extent of surface as they sometimes are owing to their position with reference to the worn edges these streaks of 5714 give the appearance of large masses of the coarse rock.

The feldspar is in some cases in crystals 2 or more inches in length, of a light reddish brown or flesh color.

Quartz is intermingled & occurs in great abundance but the granules are not so large in proportion as the feldspar.

When hornblende is to be seen it is in small & doubtfully determined granules.

Micro scales are of considerable size and considerably weathered.

No accessory minerals were observed either in this or the preceding.

Sec. 6 T. 123 R. 24

Woodland

5115

5715

975 N; 250 W

This exposure is about 50 paces long
 N E and S W by 20 or 30 paces wide
 It extends into the soil N E + N without
 any depression of the surface while on
 the other sides it slopes off giving a
 face 8 or 10 feet high when some quar-
 rying has been done.

The samples were taken on East Side.

The rock showed a close resemblance
 in color and constituents to N.
 5713 which occurs a little below
 north and west on this same section
 but its texture seems somewhat
 finer.

A dark mineral seems to occur
 in bands running thro' the mass,
 usually narrow but of varying width.
 This appears to be mica a mineral
 which is distributed thro' the rock in
 greater proportion than the hornblende.

Feldspar is red - clear & quite perfectly.
 Quartz abundant & in clear glassy granules.

5715A This occurs in contact with the
 above. Its color is much lighter
 The grain & proportions in the mineral could
 not well be made out on acct of ground condition

Sec.

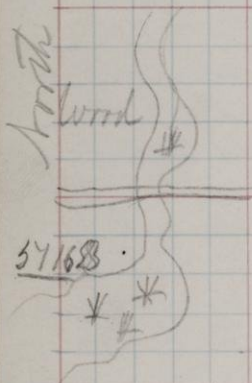
5

T.

125

R.

28



Wood

□

5116;

850 r; 1900 w

This spot is now a slough which once had the dignity of being a lake one would judge

The exposure stands among some small scrubby oaks which on the north extend down to the water,

The rock rises some 10 feet above the water in a rough irregular mass & in form of an angular ridge. The extent of the exposure is not over 10 paces long by 6 to 8 wide.

It fronts towards the Southeast,

The rock is coarsely Crystalline - a combination of feldspar and mica or a decomposed hornblende, it is difficult to tell which.

The rock seems to be very much like 5115 A in its general characteristics.

Sec. 21 T. 125 R. 28

5721

5717

5716

5715

5714

5724

5720

Unsampled

57

5717 etc 1550 N 700 W

This exposure or rather the beginning of an exposure lies about 40 paces South of the north line of the 14 of 14 section in which it lies.

The extent of this first of a series of outcrops is 125 paces long. Each about 175 paces broad. Many more paces of extent can be seen boulderlike the soil at a very slight depth from the dried condition of the grass bordering the uncrowned.

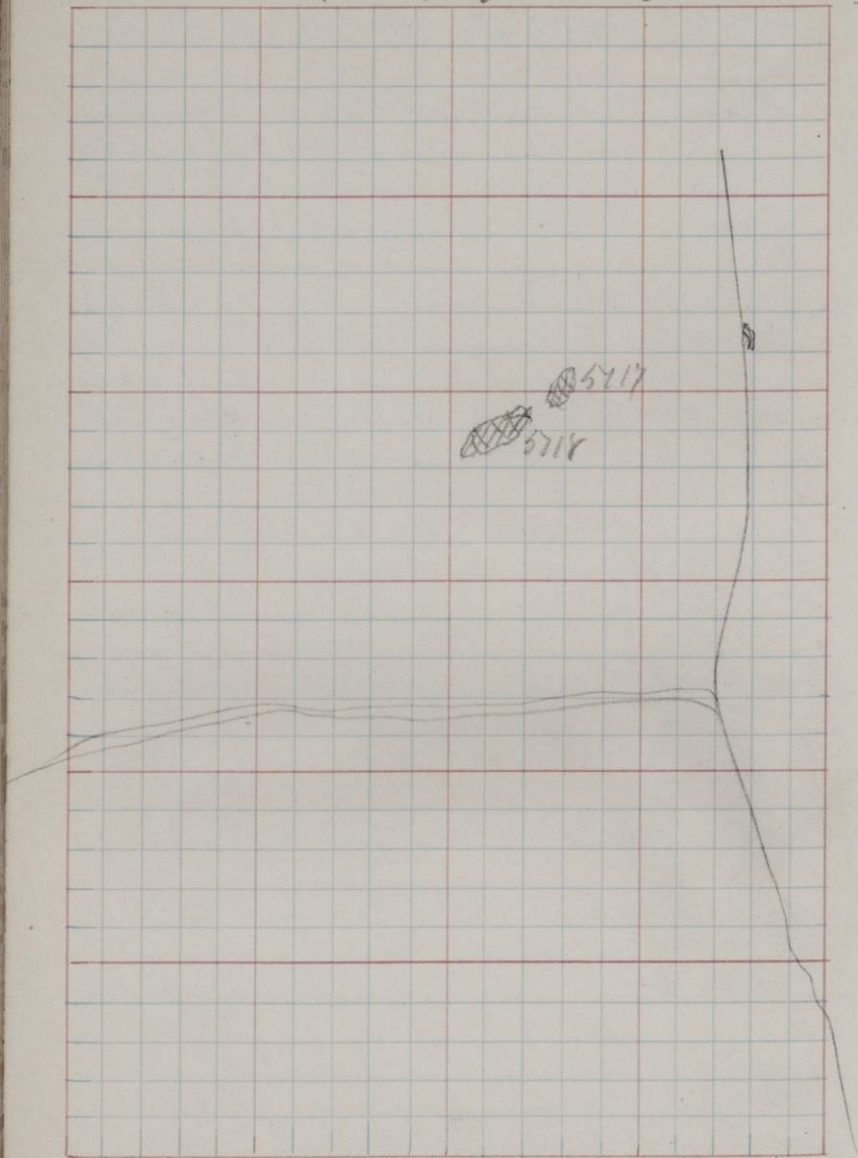
The highest part of the exposure is about 20 ft above the sandy plain to the north and east. The rock is smooth; it is very fine from joints and seams; inclines 2° to 4° to the north varying from N W to E according to the side of the ridge on which it stands.

This exposure is about 150 paces South and 400 to west of another in the river.

Joints extend in several directions; - the leading series, indeed the only ones which can be called a series, - does not vary more than 6° or 8° from a north and South direction.

A river some 2 inches wide runs across the surface towards N 60° W.

Sec. 21 T. 125 R. 28



5717

1550 N, 700 W.

The rock is a hornblende, granitic one of a light, pleasant color, however having been quarried no fresh specimens could be secured. It is rather coarse the feldspar being the prominent mineral and of a slightly bluish tinge.

Hornblende & mica appear to occur in about equal proportions with mica apparently associated in the nests of hornblende—as this latter mineral seems to occur in such segregations.

Quartz in fine granules quite clear but not particularly numerous same to be present.

No accessories were observed.

5718.

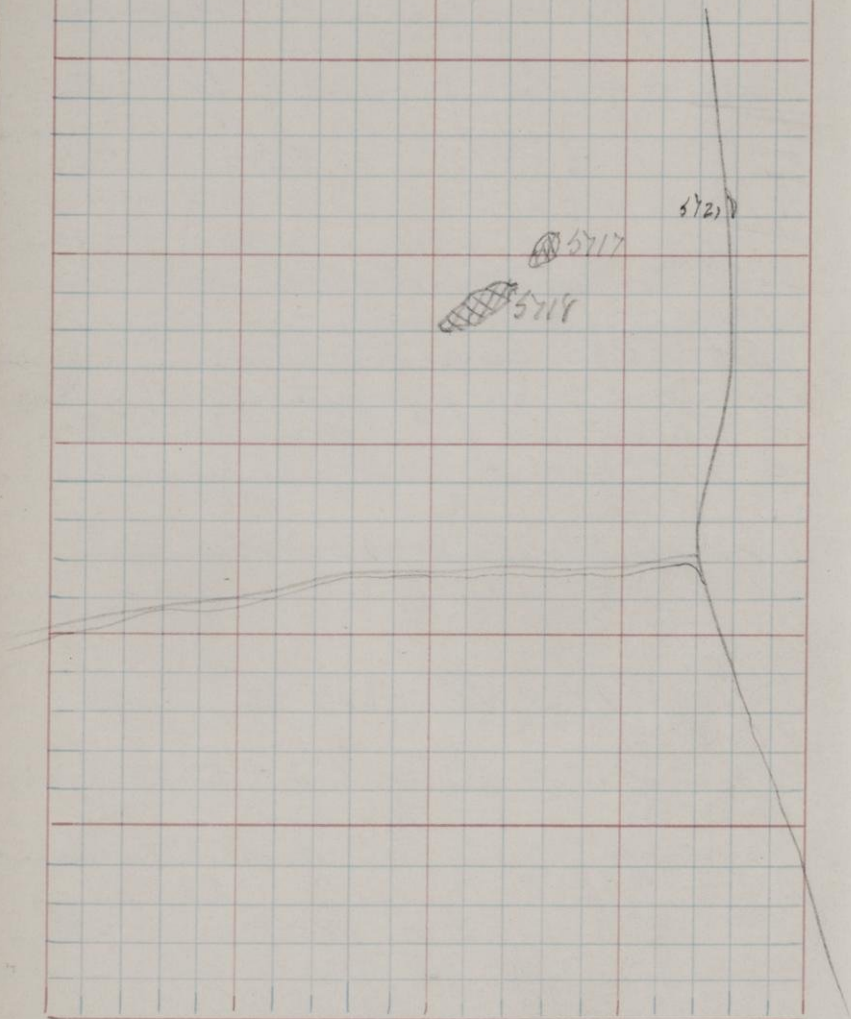
1425 N, 800 W

Pacing 200 paces towards the west and 50 or South Mr Sartells (J. B.) ledge of gray Syenitic granite is reached. It extends, chiefly around, 200 paces west and slightly southward. This outcrop shows the same general surface features as the preceding but

Sec. 21 T. 125 R. 28

5717
5718

5721



5118 cont.

1425 N 800 W

it is less exposed. In color it resembles closely the Sank Rapids stone as also does it in texture.

Quartz feldspar and mica seem to be present with a fair proportion of hornblende.

5118 A

Show dark bands of some mineral which covers the surface of close fine joints freshly opened.

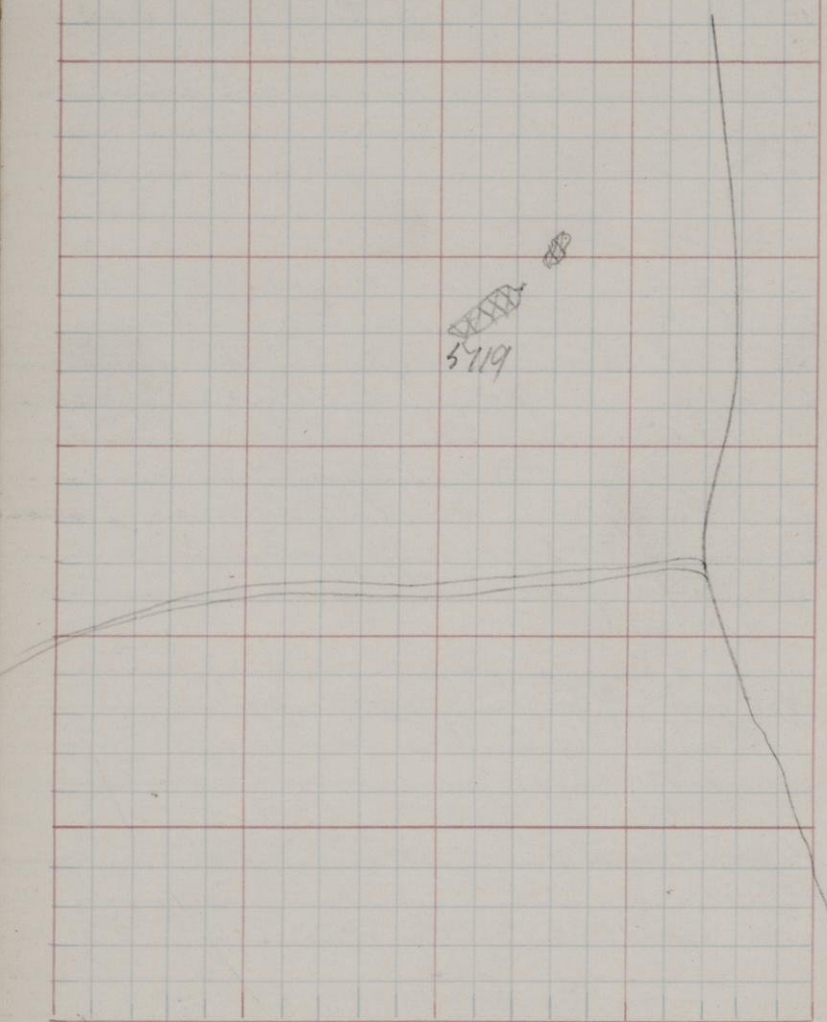
It does not seem to follow any particular but joints equally in all directions disclose it when they are opened.

This is probably a decomposition product of some sort.

Aside from this coating of the seams this number bears very resemblance to the preceding no. 5118 and out of which these samples were selected on account of the coating of the seams.

Sec. 21 T. 125 R. 28

5719



5119

1350 ft; 900 W

Occupies no inconsiderable portion of this extensive ledge and evidently changes at a depth into 5118.

And the change does not depend upon depth alone as the rocks now lie; for at several localities the fresh 5118 is higher and nearer the surface than this which is intimated to be a weathered rock.

It bears every indication of weathering for at Groves Quarry on Sec 28 and Wadley on Sec. 18 1/2 4, 28 this rock or what appears to be like it is quarried in preference to the other & apparently for the same reason it works so much easier and truer to the line and more stone can be raised in a day.

The dirty spots looking as if a wash from the soil had been lodged between the granules appear to be in places where insupated under a strong glass to be product of decay. A greenish tint suggests another substance than K_2O at some of the spots.

Some feldspar crystals have a purple hue; some are yellowish green. Many are quite large with perfect cleavage showing inclusions of quartz (?) on the cleaved planes.

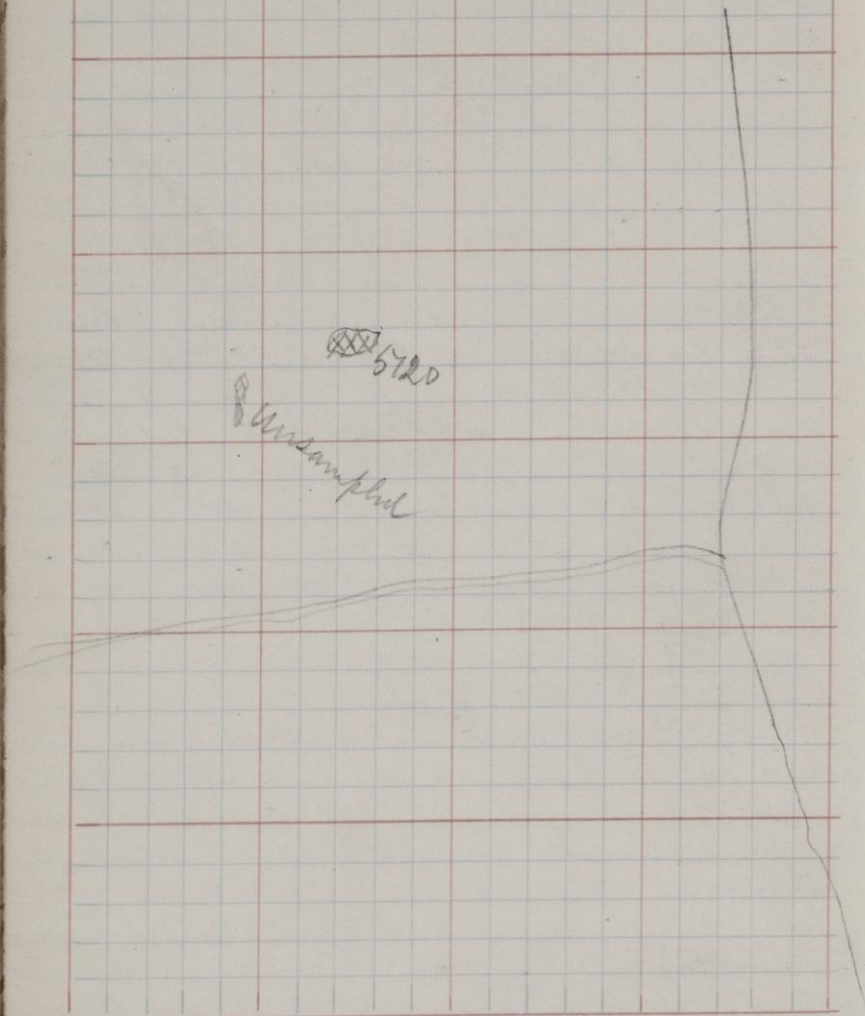
Sec.

T.

R.

5720

Unsampled



5720

1250 N 1250 W

This Exposure is on the land of the St. P. M. & M. Ry. It lies 150 paces east of the west line of 2000 ft north of the south line of the 1/4 of 1/4 Section.

It consists of two considerable masses rising some 8 or 10 feet above the surface around. They extend 80 paces east & west each some 30 paces long. The country is open around them save a few bushes.

The rock shows no particular direction or strike, - for it like all other exposures we see in Stearns Co. consists of knobs of harder or less worn rock coming near the surface of the drift deposit everywhere present.

Some joints which were minor than direction N 35° E; others - and widely by principal ones - N + S or nearly so, and these sum to shatter the rock completely; - so much so that it is almost impossible to dress specimens to proper shape. These joints or rifts are very close together. Over the surface of the Ridge they show at distances apart varying from one-half inch to even more than a foot.

This specimen has a reddish color and is rich in quartz.

Sec.

T.

R.

5/21/8

D

57121

1600 ft 200w

This is the rock in the bed of the Miss.
river.

This seems to be identical with No.
5717 and for that reason it was taken
as showing fresher specimens than that

The rock is very low even at this
low stage of the water. It does not
rise over 15 inches from the water sur-
face while a large ledge in the middle
of the river was under - the place
disclosed by a pile of pine logs which
had become stranded upon it.

The exposure on the west side by
the water edge is about 30 paces
long, and is but slightly interrupted

Hornblende and feldspar are the
leading constituents of this sample.

I believe this is one of the very
toughest rocks I ever tried to
dress as the many hammer blows
on its surface seem to testify.

Sec. 17 T. 125 R. 28

Primer



5122

5722

1250 N; 50 W.

This rock occurs on the extensive stock farm of A. P. Clarke of St. Cloud, 50 paces west of Sec line + 250 is north of the 92 Sec line.

The exposure rises out of a marsh some 15 ft high, at two or three points or knobs between which growing upon the rocks are a few oak trees & shrubs. Total length 225 paces N E + S W + width 150. Surface smooth, rock not deeply weathered, quarrying has been done on the S W end.

Surface is not badly jointed and is said to quarry well — taking not more than one half the blows for splitting off that ordinary granite does.

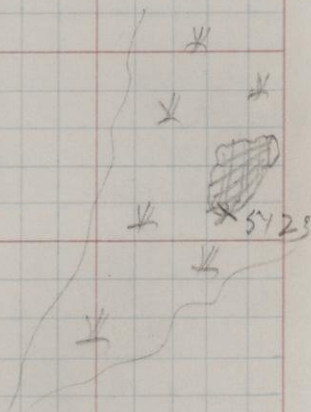
No appearance of dip except rounded appearance of the surface due to glaciation.

In one part joints run N 45° W + N 40° E. Elsewhere they were observed N 60° E + N 20° W a common direction.

The rock is a red granite — hornblende with grains somewhat above medium coarseness. It is quite hard and brittle + seems difficult to dress. Not breaking with certainty in any direction altho quarrying seems easy.

Sec. 17 T. 125 R. 28

Prairie



5723

1250 ft; 50 W.

This is an inclusion in the preceding # 5722.

It is much finer grained than the mass and is of a darker color.

There were several of these masses the one sampled being several feet in diameter.

The exposure shows different tints of color in different parts e.g. towards the Southwest it has a color about half way between the sample 5722 and that in the bed of the river No. 5721, while to the northeast and near the limit of the exposure the rock has a deeper color (red) than elsewhere.

Sec. 21 T. 125 R. 28

5121

5117

5118

5119

5124

5120

Wassumpfer

Wassumpfer

Malab river

5124

1250 N; 1000 W.

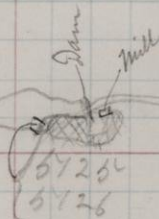
This sample is substantially a duplicate of # 5120.

It differs however from that number in being less shatterd for large blocks of considerable size can be quarried and it has a finer better look generally. It seems to be a little darker somewhat finer textured & with a little less quartz.

Only 30 or 40 paces away is the dark gray; but the sod between the two spots conceals the contact between the two so that no trace of it is visible and no relation between the two can be more than guessed at.

Another outcrop 150 paces west & 200 paces south of 5120 of the same color and shatterd condition and apparently of the same mineral constitution was visited but no samples were taken. The spot is low and of only 12 or 15 paces length.

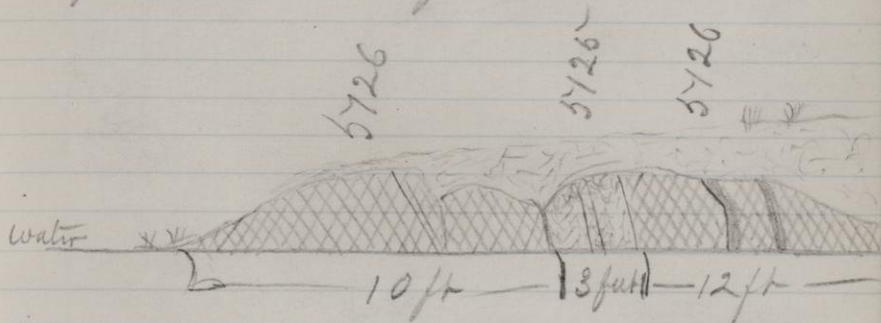
Sec. 21 T. 125 R. 28



5725

575 N. 900 W

This and the number following are found on the South side of the Millpond about 1/2 mile west of the mouth of the Katab river. The outcrop when they were taken is 85 paces above the dam. It stands only two feet above the water when the pond is full. Notice is it a wide exposure; this figure gives an idea of the relations of the two numbers;

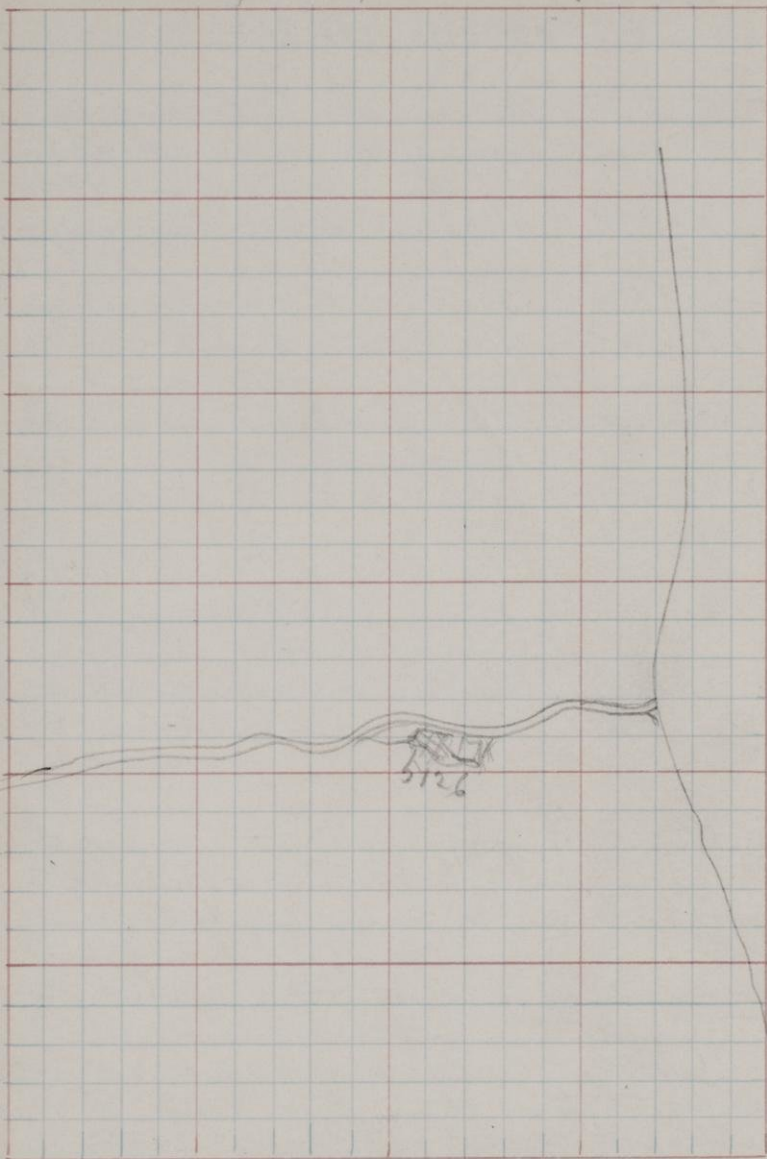


Thus the "gray granite" or a rock strikingly similar to it occurs as a sort of band or vein in the mass which is very like the red granitic rock which constitutes so important a mass of the exposure on the hill i.e. nos. 5720 and 5724. This spot suggests that these two kinds of rock — rock types apparently — are much

Sec. 21

T. 125

R. 28



5725

575' N 90° W

more related than a look at them at wide distances apart would lead one to suspect. From the occurrence of these two rocks on various sections in St Cloud e.g. 29 + nos 5060 + 5061 or the rocks at Sauk Rapids, the rock in the main quarry corresponding to this dash 5725 and that by the river approaching the 5726,

The gray is 5725. The band or zone which it constitutes is 3 feet wide. The direction is to 40° - 45° E + the dip is 80° S.E.

The rock is a mixture of feldspar mica + hornblende; quartz was not identified.

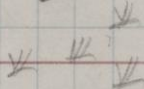
5726 This is the red rock enclosing the preceding gray and extending out of sight beneath the soil both right & left. This same rock is under the foundations of the mill dam and beneath the mill. It appears also in the bank South East of the mill between it & the road.

There seems to be but little difference after all to the naked eye between 5725 + 5726. The feldspar in one is red in the other almost purple. Quartz in one in small few grains; in the other abundant. Hornblende in both mica in neither. Pyrite in both but more abundant in the red.

Sec. 12 T. 125 R. 29

Forest

5127



5127

200 N; 250 W

This occurs on the land of Mr. Sealed?³
 The exposure is over 100 paces long and nearly
 as wide. The ridge extending $\pm 20^\circ \text{E}$
 from its southernmost point rises from
 the first part of its course (50 paces)
 to a hill 25 or 30 feet high. It rises rather
 abruptly on the sides - S.E. & N.W.

The land to the S & E is marshy
 on the north & west it rises into a
 heavily timbered ridge

Owing to its curved condition the
 jointing could not well be determined
 Some with a little uncertainty as to length
 of Seam were $\pm 80^\circ \text{E}$; $\pm 10^\circ \text{N}$ with
 apparently perpendicular position.

The rock is rather coarse; weathered;
 now friable; not porphyritic; composed
 chiefly of feldspar and mica.

There is something interesting found
 in this rock, it seems to me.

The whole section seems to be
 wooded. Except where marshes and
 lakes cover the surface.

Sec. 13

T.

125

R.

29

 $\frac{1}{2}$
 $\frac{1}{2}$

 $\frac{1}{2}$
 $\frac{1}{2}$

512



1

 $\frac{1}{2}$
 $\frac{1}{2}$


5129

 $\frac{1}{2}$
 $\frac{1}{2}$

5130

5128

1800 N; 350 W.

Passing from 5127 S. 25° W. 300 paces a hill was reached 30 feet high and 100 paces long. Its direction is NE and SW and is quite abrupt on the East and West.

Heavy timber lies on the northerly + southerly faces and a tamarac swamp towards the east + a marsh on the west.

No determinations of direction of joints or bedding could be determined.

The rock weathers off in scales as does especially the preceding, 5127, the surface peeling off in concentric layers like that on so many ledges in St Cloud township.

This is a coarse mixture of feldspar and mica; whether the latter is a decomposition product or not cannot well be determined with the naked eye but seems from the freshness of the rock improbable.

The feldspar of a lighter bluish color seems to occur in fine crystals + granules while the mica appears in larger black shining scales.

Sec. 13 T. 125 R. 29

Forest



5729



5729

1600 N; 550 W

And 20 rods further still in the same direction S 25° W. on the land of Peter Blom is a mass of rock mostly covered with wood and brush - in one or two places 30 or more feet high - stretching with one or two depressions, which bring the top rather low, to the edge of a tar-marine Swamp.

The direction as a whole seems to be N. 25° E but the interruptions vary it somewhat. The length of the exposure is 200 paces and its width 150 ft.

Some quarrying has been done here, on both north and south sides but no good fresh fine material was reached.

A long-continued weathering over a surface protected protruded from roots and soil has changed the rock to a considerable depth.

In outward appearance this rock is identical with 5727 - perhaps not quite as well preserved and with a more pronounced bronze tinge observable in some of the mica scales.

Sec. 13 T. 125 R. 29

Forest

5130

5130

1150 N; 900 W.

Continuing in a southwesterly direction towards Camp for about 500 paces we reached a mass of rock 20 feet high in two mounds - the length over both being 75 paces + widths 50 ft. The land belongs to Peter Blomer.

The whole area was covered with a heavy growth of timber + brush save where a mass of rock stood out in vertical or highly inclined positions.

On the SE face the rock stands in large blocks rectangular in shape in two layers; the pieces weigh from 1 to 6 tons.

The joint on this Southeast face runs N 60° E and dips 80° westward. Another joint seems to be about right angle to this.

The rock is much fresher than 5129 but not so fresh as 5128. The constituents appear to be the same but a fissile condition is apparent in pieces near the surface which disappears within.

Sec. 12 T. 125 R. 29

Horst

85731

Horst

5131

1275' N; 950' W

A mass 45 feet long + 25 ft wide and from 6 to 8 feet high. The spot is common with trees and it lies within a heavily timbered section and near a small creek.

The ground for a considerable distance is covered with quite large blocks of this rock. No quarrying has been done this considerable stone has been broken from the boulders in the vicinity for cellars on the prairie.

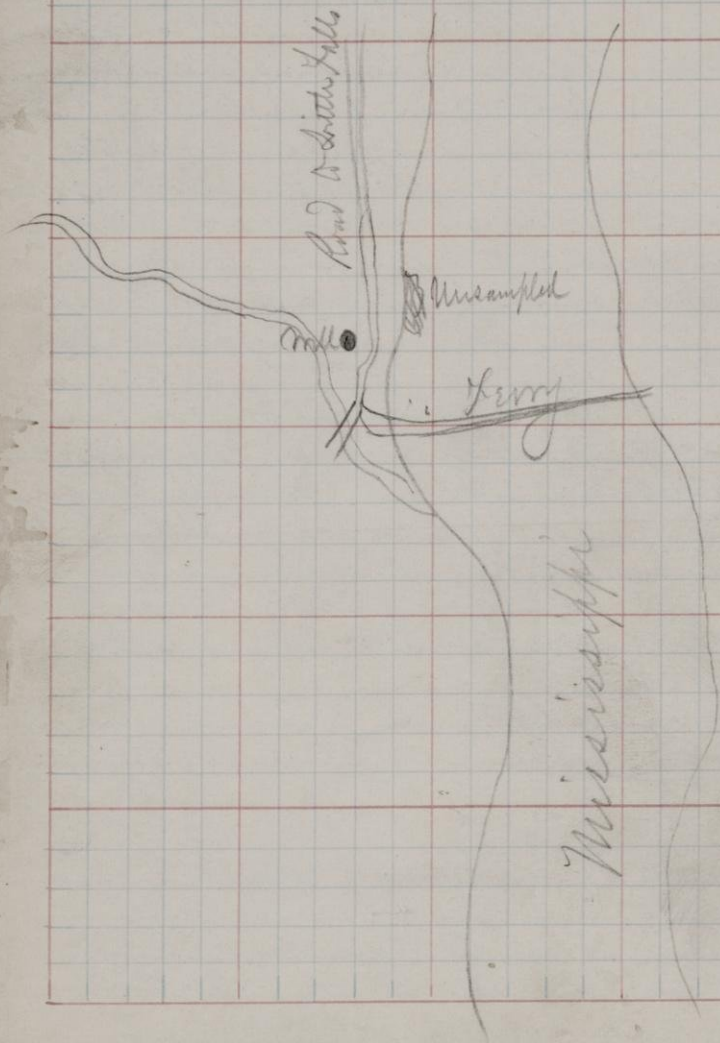
No a spot which has never been broken the material obtained is quite fresh.

The samples contains so far as can be seen with the naked eye, - feldspar likely tridinic - with a greenish tinge, mica in a far smaller % than in the preceding nos. and every evidence of the presence of augite or hornblende probably the former in small granules or crystals.

The rock is much finer grained than that heretofore sampled in this vicinity.

{ This rock in Spauld township 5127 5131 inclusive seems to have the general characters of no. 5113 in Breckway and 5016 in Wakefield Can this belt be followed further either Northeast or Southwest? }

Sec. 8 T. 127 R. 29



5732

This is a schist taken from a well sunk by Calvin A. Tuttle. The well was begun on ground 23 ft above medium stage of water in the river.

After digging 20 feet - first a bluish clay which gradually became lighter colored, every foot falling a little & a light colored soft material was reached which was 5 ft thick. This was replaced by the schist for 25 feet when the work stopped.

The well was dug in the summer of 1881.

The schist was greenish steel gray very fine & possessed a greasy feel. It could be easily loosened with a pick & broke up into three fine scales. The texture & structure were just about the same from top to bottom. The rock seems different from the conglomeratic pyritiferous decomposed schist of the river some

5734, Continued.

the same as does the schist below. This is a lighter-colored rock than what occurs at the bank of the river some 200 paces north and 100 paces of the S.E. corner of W¹/₄ Sec. 28. It seems to be free from the pyrites either clear & fresh or decomposed while at the river bank both conditions of this mineral were observed.

5732

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The well was dug in the summer of 1881.

The Schist was greenish. Still gray very fine & possessed a grassy feel. It could be easily loosened with a pick & broke up into three fine scales. The texture & friability were just about the same from top to bottom. The rock seems different from the Conglomeratic, pyritiferous decomposed mass in the bank of the river some 10 rods away.

5733. Is the quartz which occurs in the Schist. It is quite fresh & milky in appearance. Some of the masses were quite large, others small. The quartz is badly shattered breaking without difficulty even at times in the fingers.

5734 This is the material mentioned as overlying the Schist with a thickness of 5 feet. Its color is white with fine blotches of rust suggesting of decomposed pyritic crystals. It contains "5733" in small & sharply angular masses.

Sec. 4 T. 128 R. 30

Rolling Prairie with
much timber + Scrub growth.



5735

250 ft; 500 W,

This exposure lies in the bottom of Swan river from the bridge crossing this stream just about in the center of the S.E. 80 of the Section, down the stream for about 80 paces.

The direction of strike is $N 30^{\circ} E$ and the dip, $N 30^{\circ} W$, is about 8° . The rock is very much shattered; it literally stands on edge in the stream; fine pieces are the rule and large ones only occasionally can be secured.

The total exposure width of the exposure cannot be over 50 feet - chiefly on the north side of the stream, which here runs quite rapidly falling some 4 feet in the 80 paces from the bridge to the foot of the exposure.

250 paces further up the stream this same rock again appears in the bed beneath the water - no samples were taken. It would be difficult to take samples in either place at high water.

A wavy banding of the rock is seen dipping from 33° to a considerable higher degree dipping towards the south. This is apparently the true bedding of the rock and unites this exposure in this character to those sections beautifully seen at Little Falls on the west side of the river and at Thomson near the A.P. depot.

The rock is very soft & fissile & so shattered that no slates ^{fairly} _{in size} could be quarried from it.

Sec.

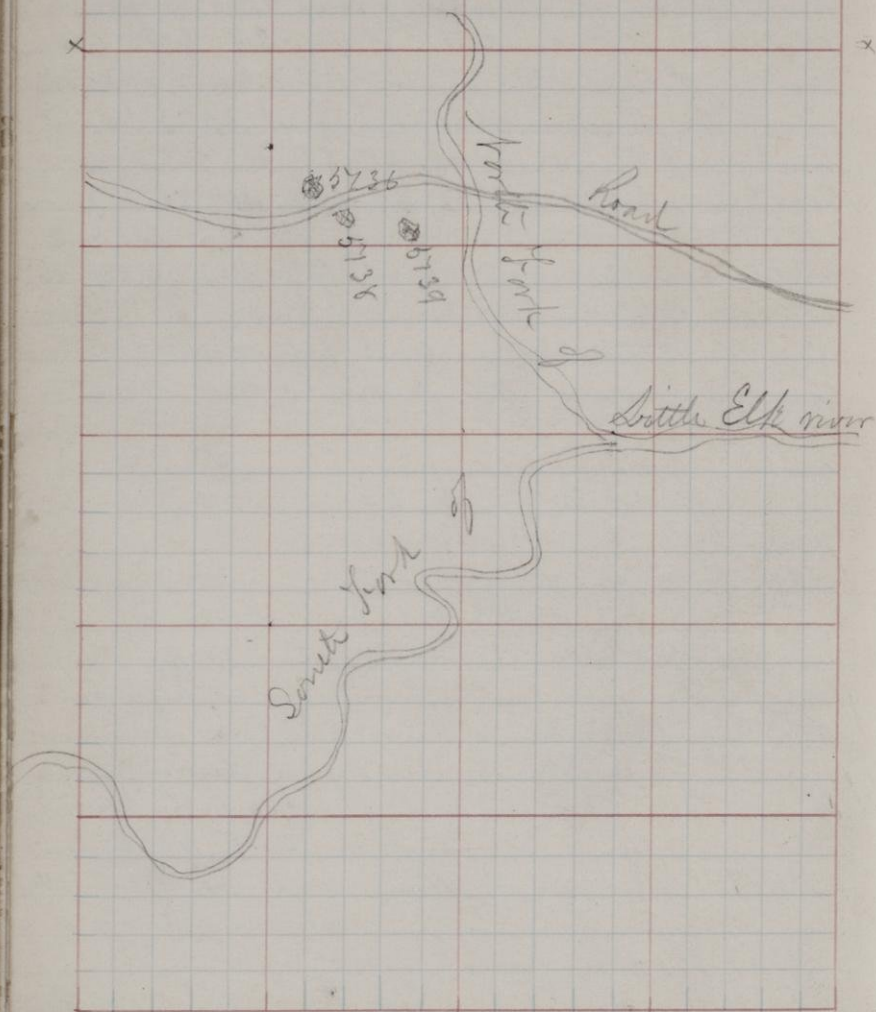
7

T.

130

R.

30



5736 26

1650 ft; 1400 W

The locality for these several following numbers lies between the north and south branches or forks of Elk river about 450 paces by the road from when it crosses the N. fork. The outcrops several in number stretch along for a considerable distance both sides of the road. Surface is heavily timbered.

The outcrops show a strike of the cleavage planes $N 30^{\circ} E$ with a general direction of $SE + NW$. Both series of outcrops. The surface is glaciated + considerably worn but so covered + so weathered that no strata were observed and measured.

The rock is peculiar. It is a schist. While on the surface it is filled with small holes, when the rock is broken the small spherical cavities are partly filled with an iron-rust, some of them entirely so. When the iron rust is partially washed out the cavities have a porous appearance like some bog iron ore. In some places this rust is of a cherry-red color in others a lemon yellow. Seldom can these blotches be seen at a greater depth from the surface than one half inch; then there is a brightening of the rock and soon in quite fresh particles occurs a black sparkling

Sec.

T.

R.

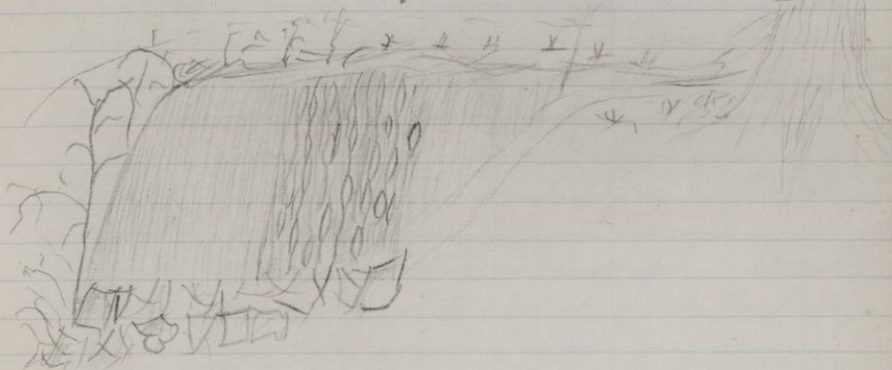
5736

5136 etc. 1650 N, 1400 W

mineral which has a steel blue & sometimes a purple color. These crystals are small and are found in every part of the rock - but not evenly distributed

The rock is uncom. Strata of a talc rich (?) Schist run vertically or nearly so while lenticular masses of a mm. Silicious or feldspathic character are enclosed. These masses are seldom more than three (3) or four (4) inches in length but a few were seen 6 to 8 in. long.

Pine



The rock seems to whiten on exposure to the air. No quartz granules were seen but fine cleavage surfaces could be seen sparkling in the sun or on fresh fractures. Some of them remind me of calcite.

Mr Warren Upham reports pyrites at

Sec.

T.

R.

5726
5736A

5736

1650 N; 1400 W

this place (11th Rep. Geol. & Nat. Hist. Sur.
Miner.) as occurring in Crystals but the
closest inspection with a lens at the several
outcrops visited failed to reveal this mineral;
and the suspicion is strong ~~that~~ while the
weathering and the rust bear indications of
the presence of pyrites that these appearances,
the flecking of the surface and the presence
underneath of a rust, result from the de-
composition of the black steel blue min-
eral described.

Rock has been taken to the amount of several
cords from the spot where 5736 was broken,
20 paces west of the road by the foot of a
large pine and near the highest of land.

The closest examination at all the
places visited has failed to show any traces
of bedding other than the cleavage. So this
rock differs in this respect from that at
Bedoux bridge #5735 & at Little Falls,

5736 A

Is the weathered rock from this
same spot where 5736 was taken. It
occurs necessarily in small pieces
since the weathering has reached no great
depth. The general appearance of this mod-
ification has already been described.

Sec. 

T.

130

R.

30

5136

5136A

5137

5138

5139

Road

Mud Lake

Little Elk river

South Fork

5737.

1650 N; 1400 W

Represents some of the light colored nests within the mass of #5736. They have a pinkish tint and appear to carry both quartz and feldspar.

5738

1550 N; 1300 W

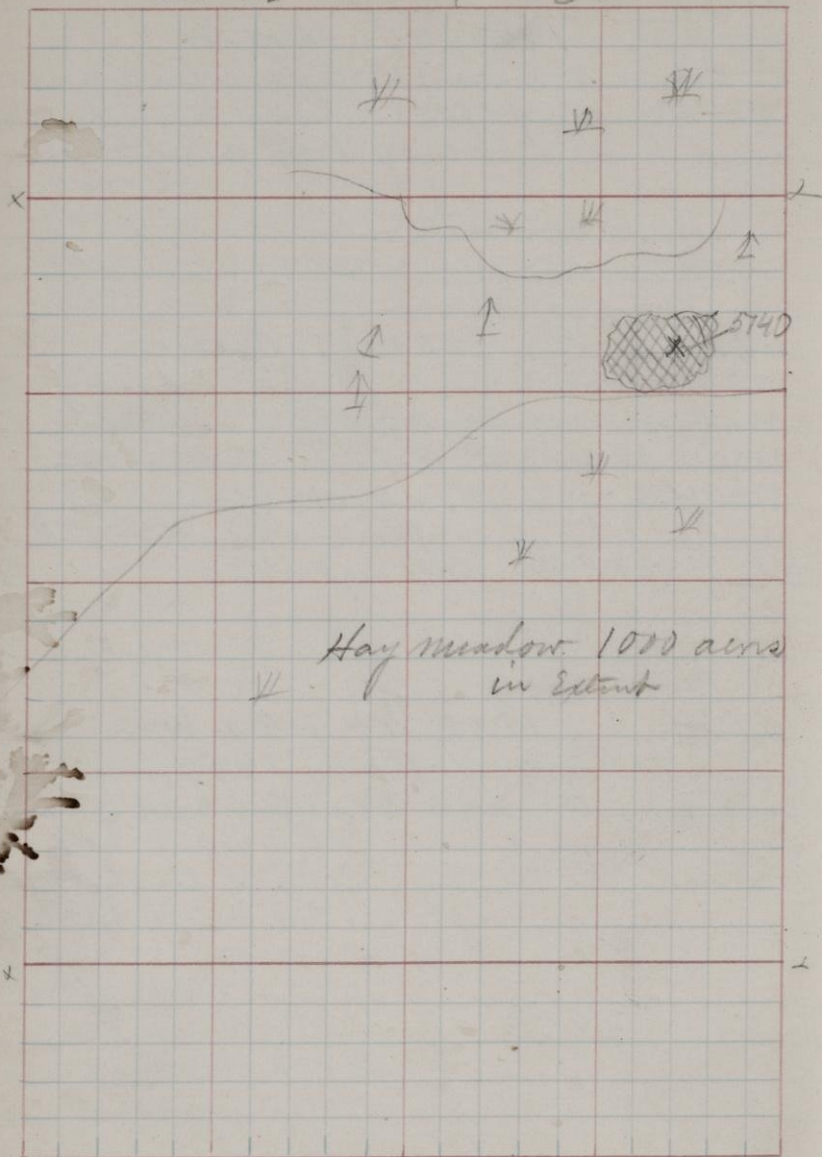
Was taken 20 paces East of the road and about 50 paces Southeast of 5736. It is lighter colored. Contains the steel blue grains and otherwise is very much like the first number taken from this locality - #5736.

5739

1530 N 1150 W

Is the rock taken 145 paces nearly East from the No. 5738. The rock is finer rather dark colored and when broken across the cleavage is exceedingly tough.

Sec. 13 T. 129 R. 30



5740

1600 N; 300 W.

This is a large area covered for the most part with trees & shrubs growing on thin soil with here and there an exposure of rock scattered over some 20 acres.

The mass rises from 10 to 20 feet above the hay meadow and is 200 paces wide and full 250 or longer from east to west. The surface has been glaciated and worn smooth but is uneven. Higher points are frequent between which are hollows 3 or 4 feet deep filled with soil. When the rock does occur many old quarrymen have thought it nothing more than a field of boulders.

The rock is hard and dark colored. When freshly broken the fracture shows hornblende to be the leading mineral.

It is highly cleavable & shows shining dark green surfaces. The feldspar is for the most part of a greenish tint browned probably from the hornblende associated with it. But this must not be confounded with the bright lighter green color seen in some grains apparently decomposing. There is some mineral decomposing which here & there shows a dirty carbonaceous spot with protuberances from its walls looking like stannic

Sec. 13 T. 129 R. 30

Marsh

X 3740 FA

Hay meadow 1000 acres
in Eltint

5740

1600 ft; 300 W,

Calcite crystals. Near the surface is a clear milky white mineral that cuts with the knife and looks as if it were decomposed feldspar (Kashin) and in some respects appears like calcite. This is not seen to any extent deeper in the rock.

Mica is scattered thro' the mass here and there in fair sized crystals or clusters of plates not confined to any particular direction. This mineral is seen in some hand specimens more frequently than in others i.e. it is not evenly distributed thro' the rock.

Som pyrites was seen in two or three grains.

5740 A

This is the weathered surface of the rock. The hornblende seems to resist weathering longer than the feldspar. This latter mineral decomposes into a white Kashin-like residue filling the cavities between the dingy green grains of the hornblende. This white gradually disappears leaving a cavernous surface of the hornblende alone.

5740 looks the most like a specimen collected by Professor Pickham on the East side of near ~~Portage~~ ^{Hub} Point of any rock I have seen in Minn.
Still the Hub Point rock contained no mica!

Sec.

T.

R.

Marsh



5742

Hay meadow 1000
acres in extent

III

III

III

III

III

III

III

5141

1600 N 200 W

This was taken from the East end
of the exposure 100 paces or more from
5140.

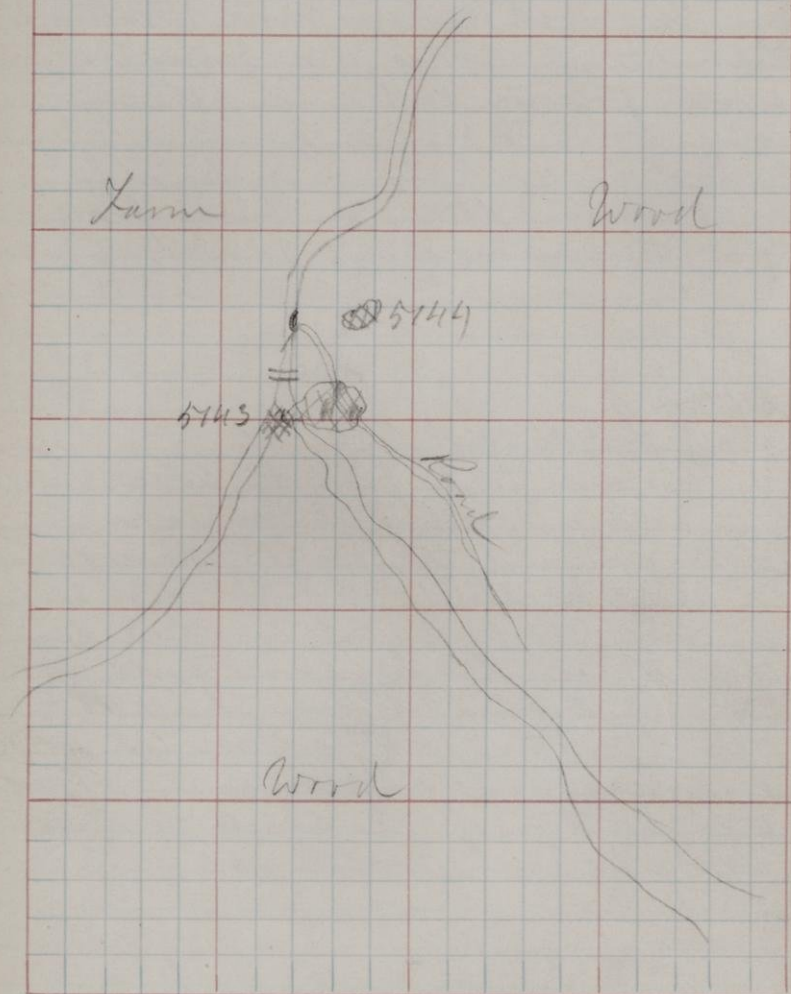
The rock is here more weathered
than then and is of a finer texture
but the foliated part, mica, I strongly
suspect it to be, is quite a propor-
tion of the rock - more however in
appearance than in bulk for the
very thinness of the scales.

5142

1500 N 350 W

This was taken from the South side
of the exposure where the mica or some
other mineral taking its place occurs
in plates or shists of parallel scales
covering surfaces as large as stone
thumb nail. In some parts of the
exposure several of these shists take
one direction & thus give the rock
a gneissoid appearance. But
this position of the shists is not
every where noticeable.

Sec. 34 T. 133 R. 32



5743

Hb. Ak
aggregata

49

1000 N 1350 W

This is the rock in Long Prairie river at the mouth of the Fish Trap brook about 5 miles from Motley.

The river at this point is about 50 paces wide & has a rapid current - this is said to be the first rapid above its confluence with the Crowwing at Motley.

The rock is low - no doubt entirely covered in moderately high water save on larger boulders which stand between the two streams. The outcrop on the west side of the river is 50 paces long, interrupted but apparently continuous.

The joints are N 10° to 15° E - the stream flowing a little east of north the exposure is at right angles to their course. The rock is of a green color, perhaps the paleness of some parts arises from the presence of decomposed hornblende - chlorite - and there is a peculiar sub-metallic luster very likely from the feldspar which suggests an interesting rock for microscopic study. The rock is all unusually fresh on coarse grains.

5744 1250 N; 1150 W

Was taken from an exposure 125 paces east of the river & 250 paces from the fork of the stream. Its direction is N 40 E from that fork mentioned.

Sec. 34 T. 133 R. 32

Larm

Wood

5744

5743

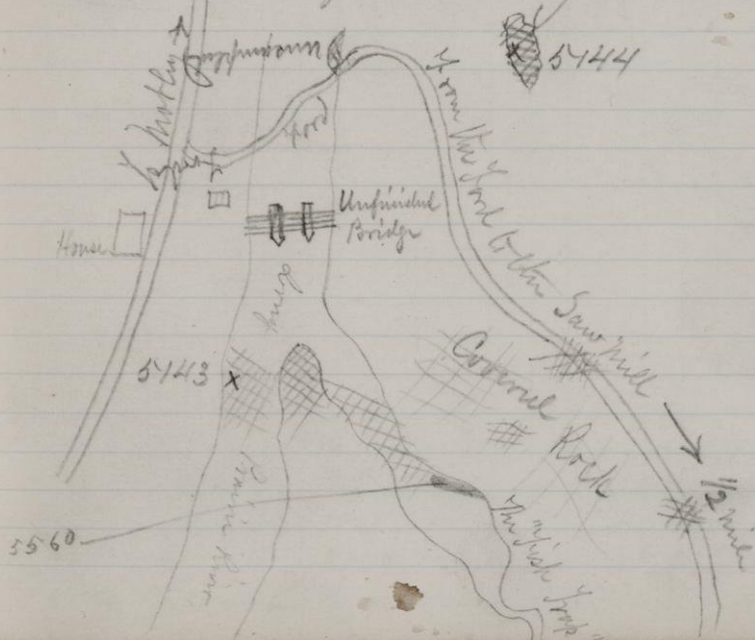
Wood

5744 1250 N; 1130 W

This exposure is 100 paces long + 50 wide extending N 50° E. No doubt it extends much further in all directions under the soil + also that this exposure is continuous with 5743.

The sample is an coarsely crystalline badly shattered + is badly weathered. On exposure the feldspar weathers white - within it retains its dark green almost metallic appearance. A green foliated mineral appears here in considerable quantity along and near the seams. A greasy feel is noticeable along the seams. (Bake Sheppard Chert?)

No good specimens could be broken. Several spots occur here + there where the rock comes to the surface showing its wide extent.



Sec. 15 T. 131 R. 35

4 anti

5746
5746
5746A

5745

1320 N; 250 W.

The Exposure is 120 paces long by 50 wide
is situated 320 paces fr S line of $1/4$ Sec + 250 ft
East of East Sec. line.

The rock stands 8 or 10 feet high from the
plain in which it lies; it presents a broken
surface with fractures running in all di-
rections; it bleaches in weathering.

The ledge is covered to a considerable extent
with small oaks + grass; but little quarrying
has yet been done.

Joints; N. 20° W. are the principal;
bedding do. dipping 20° towards N 20° E.
besides minor joints + interruptions.

The rock shows no dikes, but several veins
were observed. One of which was sampled.

The rock seems to be a gneiss with some
light green mineral like Epidote (?) as
an important constituent. Much horn-
blende is present - some of it quite decom-
posed + a peculiar light brown chlor mineral
is sometimes seen as an accessory.

5746 Taken from the East side where
the rock appeared considerably broken
+ the texture somewhat coarser than
5745

5746 A A sample with pieces of one of the
Several small veins (this one $1/4$ wide).

