

I.

1. The area in question is almost completely masked by drift & detrital matter. Exposures of rock in place occur so far as I have been able to discover only at the following places.

Black hornblende rock on the S. side of the N.W. Angle Inlet nearly opposite the Reference Monument.

at Buckle's Isd. <sup>intensive</sup> Red granite in contact with grey gneiss to the North.

Flag Island also consists of grey & red granite with the exception of a small area of much altered slate rock on the Eastern Shore.

The large Island lying immediately East of Flag Island consists, so far as I have been able to examine it, of green slaty rocks, much altered, very compact.

The point about two miles Southward from Flag Island shows exposures of pink granite, <sup>as far as distance</sup> & South of this on the shore grey gneiss appears.

A hill of red granite also exists on the Meridian Cultery 6 miles South from the N.W. Angle.

All these localities are in the Northern part of the area & are fully described in my detailed report of last season's work.

The red granite is intensive & belongs to an important mass of that rock which is found to cut indifferently through the Laurentian & Huronian Formations.

The green slate rocks mentioned above cover an inconsiderable portion of the <sup>area</sup> & belong to an area of much altered rocks of Huronian age fully described in my report already referred to.

~~It is probable that the Northern part of the area in question is underlain at no great depth~~



Exposures of rock in place are rare & occur only in its northern part, which is probably underlain at no great depth by rocks of Laurentian Age. Small areas of Huronian appear along the Eastern edge & intrusions of granite cutting rocks of Laurentian & Huronian Age indifferently also occurs. The various localities are fully described in <sup>subjoined</sup> my report of <sup>the</sup> <sup>East</sup> <sup>Severn</sup> work.

~~by rocks of Laurentian age.~~

The Southern part of the area is deeply covered by drift deposits of Sand & Gravel, & I am inclined to believe from reasons stated in my report <sup>already referred</sup> that Laurentian of Upper Silurian age exists below the surface, & overlaps the older rocks already mentioned. No indications of minerals of economic value were observed in any part of the area.

2. The flora resembles that characteristic of the Laurentian Region from this part of the Lower St Lawrence & differs from that found in the Prairie Regions to the West. a few Western & Southern forms however occur in association with those of Eastern & Northern aspect.

The greater part of the region is covered by forests of coniferous trees & from the Swamps character of the soil the <sup>(North American)</sup> Tamarack is the most abundant. Cedar (*Thuja occidentalis*) occurs in forms of limited extent. ~~also the~~ Red Pine, Banksian or Scotch Pine, & White Pine (*Pinus Resinosa*, *P. Banksiana* & *P. strobus*) ~~also occur~~ also occur on the drier ground but not in large groves.

The ordinary varieties of Spruces are also represented of deciduous trees Poplars of several species are perhaps the most abundant (*Populus Balsamifera*, *P. tremuloides*, *P. grandidentata* & ?) Willows of many species form thickets in the Swamps & along the edges of the timber Elm, oak, birch, ash-leaved maple (*Negundo auroides*) & also occur sparingly. None of these trees attain a very large <sup>size</sup> growth though fair sized poplars, oaks, & Red Pines sometimes occur. Many of the drier areas bearing the best timber have been burned over.



The shore of this part of the Lake is usually fringed by grassy muskies, & large areas of the interior are occupied by similar muskies with scattered clumps of Tamerack. These swamps in the vicinity of the angle are made to furnish a supply of natural hay for the stock kept there, ~~the hay~~ <sup>which</sup> though rather coarse in texture is nutritious. The "Roseau grass" (*Phragmites communis*) is also found covering areas <sup>of</sup> ~~any~~ <sup>in</sup> ~~extent~~ <sup>of</sup> extent. I had thought it might be made available for the manufacture of paper <sup>the common varieties of</sup> ~~of the~~ but it does not appear to contain sufficient fibre ~~at all~~ <sup>for paper</sup>. Rushes occupy the deeper parts of the swamps & are much used by the Indians for mat & basket making. Wild Rice (*Zizania aquatica*) does not occur abundantly in any part of the area in question which I have examined, but in the Northern part of the Lake constitutes an important part of the food of the Indians. Its growth might I think be induced in many of the swamps of the lake if it was considered of sufficient importance.

open grassy swamps

Surrounding  
to be

The <sup>portion of this</sup> area is small, & the soil where I have had the opportunity of examining it sandy & with little vegetable matter. ~~It is however found~~ <sup>capable</sup> ~~of growing~~ <sup>(See map)</sup> Indian corn is cultivated in small patches by the natives & I am told early yields to come to perfection. Wheat has also been raised at the N.W. angle as an experiment & was found to succeed well. Potatoes yield excellent crops & all the ordinary vegetables & cereals would doubtless succeed <sup>with careful farming</sup> ~~well~~ were the inducement for their cultivation sufficient. A large area of the swamps land & much of the bottom of the lake could be reclaimed by lowering the outlet at Rat-Portage 15 feet which would not be a work of great difficulty.

The island known as Kit-a-gaw-ween is a garden island has been cultivated by the Indians from time immemorial. I was not able to visit the island but from a distance it appears to be level & to support a good growth of timber.



III. 1. The section of country bounded as described  
 may be divided into two portions. First  
 that lying immediately W. of Lake of the  
 Woods & extending westward to the prairie  
 region. Second Prairie land bordering the  
 Red River. The first is characterized by  
 a great development <sup>of drift deposits of</sup> sand & gravel  
~~deposits~~ referable to the glacial epoch, &  
 Rock in place only appears in isolated  
 hills & consists of gneiss granite &c. of  
 Laurentian age. Limestones of Silurian  
 age largely developed around St. Winnipeg  
 & southward in Minnesota must ~~pass~~  
<sup>overlap</sup> ~~border~~ the edge of the Laurentian &  
 underlie a great part of the area but do  
 not appear to be exposed in any place.

The prairie land bordering the Red River  
 is composed of alluvial deposit <sup>superficial</sup>  
 to the glacial drift & indicating the position  
 of a former great lake.

2. A great part of this region is identical in  
 general character with that already described as  
 lying E. of the Meridian of the N.W. angle.  
~~The~~ The flora of the eastern portion is also  
 similar but in proceeding westward the  
 coniferous trees are to a great extent replaced  
 by poplar, elm, oak, &c. & the flooded areas  
 formerly occupied by barometer forest now  
 become more usually grassy. Scarcely  
 a large proportion of this country is too  
 marshy for agricultural purposes. The drier  
 ridges now bear in some places timber



of good size. Chiefly red pine. Large elms & oaks fringe the river banks in many places. The soil is usually too sandy to be considered of <sup>first rate</sup> ~~good~~ quality especially when compared with the deep rich prairie loam of the west. It is however warm & easily worked & with proper cultivation would bring crops rapidly to maturity. Areas which have been formerly covered by small lakes show richer land & a large proportion of the country could be artificially drained should land become sufficiently valuable to justify the necessary expenditure.

The prairie land bordering the Red River is composed of alluvial deposit - superficial to the glacial drift & indicating the position of a former great Lake. When crossed by the 49<sup>th</sup> parallel it has a breadth about 13 miles. About 50 miles northward where the Dawson Road crosses it the breadth has increased to 26 miles in an E. & W. direction. The part immediately bordering the Red River is heavily timbered & for some miles eastward the prairie continues dry. East of this <sup>belt</sup> ~~strip~~ between it & the ridge which ~~bounds the prairie land eastward~~ is a region characterized by numerous swamps. The swampy area where the 49<sup>th</sup> parallel passes is 3 1/2 miles wide & when cut by the Dawson road must be about twice the breadth. The swamps yield fine natural hay & are all capable of being reclaimed when the spread of settlement renders it desirable. ~~The whole~~ This area of prairie

The western part of this region ~~appears~~ ~~to be~~ bordering on the Prairie land & ~~the west~~ appears to be the most valuable. ~~The edge of the wooded district as it slopes westward to the prairie becomes useless swampy & assumes the character of oak & poplar "openings"~~

Constituting the border of the wooded district



Land East of the Red River is admirably suited for settlement. The soil is of the best quality. The supply of wood from the <sup>forests</sup> woods to the East practically inexhaustible, & the whole region is within easy reach of the Red River, Dawson Rd & navigable part of the Roseau R. ~~Should the Railway pass along the Eastern edge of the prairie this region will, <sup>probably</sup> be more rapidly settled up than any other part of the prairie.~~

(*Pinus resinosa*)

The chief present value of the wooded region East of the prairie would seem <sup>to be</sup> as a reserve of fuel, & timber for construction, for the prairie land & settlements bordering the Red River. A large quantity of valuable <sup>Red</sup> pine lumber has been cut during the last few years on dry ridges near the Pine River which runs into Roseau Lake from the North & similar pine-bearing highlands will probably be found in other parts of the area. The timber cut on Pine River was floated into Roseau Lake & thence by the <sup>W</sup>Roseau R to Red River. This <sup>river</sup> or other means of transport may be used for the conveyance of fire-wood to the Red River Country should the demand become require it.

It therefore passed along a portion of its course through American territory.

Many of the muskies near the highland would yield peat, which though not sufficiently compact ~~it~~ for use in the state in which it is found might be manufactured by one of the processes now in use elsewhere & shipped to the Red River Country for fuel in boats, should water communication be opened up.

In conclusion I may state that a great part of the value of the country lies both



East-West of the Meridian of the  
N.W. Angle consists in its yield of skins.  
Beaver & Muskrat are especially abundant  
but nearly all the common fur bearing animals  
are represented.

The Lake of the Woods also contains abundance  
of fish. Among which as being most important  
may be mentioned. Sturgeon, Whitefish, Weelche  
or gold eye, pike or pickerel. Though no  
systematic fishery is carried on the Indians  
depend largely on the three first named  
varieties ~~of fish~~ for their subsistence.



McGILL UNIVERSITY  
ARCHIVES  
ACC. NO. 909B/24  
REF. 1

Copy.  
Answer to Capt  
Cameron's questions  
on Eastern country.  
April 18. 74 -

[Bundle at #13]



1

Capt. Anderson R.E.  
Chief Astronomer R.N.A.B. Commission.

Sir,

At your request I have the  
honour to submit the following notes on  
the canoe route from Lake of the Woods to  
Red River, by the Red & Roseau Rivers.  
I crossed the watershed of the route above  
mentioned in the latter part of August 1873  
The passage from the Lake of the Woods to Red  
with two men & a single three fathom  
bark canoe. The passage from the  
Lake of the Woods to ~~the~~ the waters  
of the Red River occupied 9 days. Much  
delay arising from timber obstructions  
in the rivers, the state of the portage on the  
high-land or the bad rapids on  
the lower part of the Roseau R.  
The route though long known to the Indians  
& used by the Chippeways & Sioux as a  
war-path between their ~~respective~~ respective  
countries, from time immemorial, has  
remained almost wholly unknown  
to the ~~whites~~ <sup>explorers</sup>. Prof. Baird & Mr S. J. Dawson  
had intended passing by this route to  
Red River in connection with the Assinibon  
& Saskatchewan exploring expedition in  
1857, but were turned back (as described



in the ~~river~~ ~~bar~~

) by a large force of Indians collected on Kit-a-gam-minis or Garden Island in Lake of the Woods. Heard in the same <sup>direction</sup> a following year attempted to ~~follow~~ <sup>follow</sup> the Roseau River Eastward from Red River but was ~~turned back~~ <sup>defeated</sup> by the <sup>impassable nature of the</sup> Roseau Swamps

On entering the mouth of Red River a sand bar is crossed the water on which is not apparently more than four or five feet deep. The lower <sup>portion</sup> ~~part~~ of the river ~~is~~ <sup>is</sup> for about  $\frac{1}{2}$  miles is both wide & deep narrow but deep, it then becomes quite wide & still remaining deep. For about  $\frac{1}{4}$  miles ~~it~~ is both wide & deep, & not very tortuous. ~~The~~ Near the mouth it passes through a grassy swamp & for some miles the shores continue swampy <sup>generally</sup> though covered with bushes & small timber.

Beyond this the river though still deep becomes narrow & tortuous, & not ~~at all~~ <sup>at all</sup> this character throughout its upper part. At the same time the current becomes much stronger, though without assuming anything of the character of a rapid. The banks for about  $2\frac{1}{2}$  miles in a general S. westerly course, ~~though much further~~ the windings of the stream; the banks are generally several feet above the level of the water & support a moderately good growth of aspen & Balsam poplar, with a <sup>some</sup> ~~few~~ oaks & a few ~~in the water~~ <sup>in the water</sup>. Most of this higher ground has however been turned over some years ago & the

which for several miles before reaching the lower is <sup>the</sup> ~~the~~ <sup>not</sup> ~~not~~ more than 10' wide

from the height of the narrow part of the river.



Greater part of the timber destroyed.

Beyond this, & to its source, the stream is fringed by grassy swamps bordered at a short distance by a thick growth of tamarac scarcely at all above the level of its water. The current however is still strong & the river though very narrow & tortuous remains ditch like & deep.

On approaching the beginning of the portage the tamarac forest retreats further from the stream, & the latter remains merely as a narrow rut among the reeds, which has been worn by the constant passage of canoes. The bottom <sup>of the swamp</sup> though covered by a few inches of water & decayed vegetable matter is hard & firm & consists of fine whitish argillaceous clay of such a nature as to be almost completely impermeable to water.

It has become necessary to track the canoe with ropes & for a few hundred yards the swamp became so shallow that it was found best to lighten the canoe & portage the stuff by hand.

On this century the tamarac portage swamps the tamarac <sup>trees</sup> become small & scattered, & soon remain only ~~as~~ <sup>as</sup> isolated groves standing out like small islands in the grassy expanse.

~~The distance from the source~~  
The source of the Roseau R. is  $6\frac{3}{4}$  miles from that of the Red R. in a South westerly direction, but ~~as~~ the track through the tamarac winds deviates considerably in some places to avoid tamarac groves & so increases the <sup>actual</sup> distance which must be passed over in taking ~~over~~ a canoe from one river to the other.

After passing the shallow edge of the swamps above described which may be about half a mile in width, it becomes softer & deeper







with Lamerack, & willow bushes.  
 The banks soon begin however, to rise  
 higher & poplar becomes the prevailing tree.  
 Some elms, <sup>oaks</sup> & ash-leaved maple also fringe  
 the stream. The forest retains the character  
 as far as Roseau Lake, & where small openings  
 occur Roses, <sup>bushes</sup> Asters, Convolvulus (*Calyptoglia septimana*)  
 wild Hop (*Humulus lupulus*) & Prickly Cucumbers  
 (*Echinocystis lobata*) <sup>Night hush, Cranberries</sup> form a tangled thicket.

About ~~3~~ 3 miles from the Source of  
 the river & 2 1/2 miles from ~~it~~ where it crosses  
 the 49th parallel a tributary nearly as large  
 as the main stream enters from the  
 north. A few miles above Roseau Lake  
 a second large <sup>stream</sup> tributary comes in from the  
 south-east. The banks ~~are~~ of this part  
 of the river are high, ~~generally~~

The banks of this part of the river are generally  
 high & are as much as 15 feet above the  
 water level when the <sup>it</sup> river crosses the line.

As far as can be seen from the edges of the  
 river the land continues dry & supports a good  
 growth of timber but ~~probably becomes swampy~~  
~~as it retreats~~ For several miles before reaching  
 Roseau Lake the dry banks <sup>form</sup> narrow ridges at the sides of the river, &  
 open grassy swamps lie both N & S of them.  
 The whole upper & E. Roseau River is at-  
 present much incumbered by jams of drift-  
 timber & lower dams. Two large blockades  
 of fallen trees, which must have existed for  
 many years under portaging necessary.

Roseau Lake is a shallow expanse of open water  
 in the middle of a great <sup>great</sup> region of reeds swamps  
 & lies about 4 miles S of the line in the State of Minnesota



If the old high water mark now surrounding the Lake of the Woods be taken as representing its highest stage, a range below this of at least five feet may ~~only~~ be allowed <sup>necessarily</sup> from analogy with the great Lakes ~~the observations quoted above~~. This would allow a depression of <sup>about</sup> two feet below the water level of the <sup>for the ~~present~~ stage</sup> present year, which would be quite sufficient to convert the <sup>supposed</sup> position of the reference monument into an eligible camping ground, especially in the early summer months before the lake reaches its annual maximum.

This however would place the <sup>present</sup> water level ~~at~~ below the mean line, while as already stated the evidence <sup>is entirely in favour of</sup> ~~favours~~ the belief that it is at least a foot higher than the mean. The height above the present level at which the high water mark stands, or the <sup>great</sup> depression which is known to take place below the present water line, ~~shows~~ shows that the <sup>greater</sup> fluctuations affecting this lake are greater in amount than those in any of the great lakes; rendering it probable that in the dry years 1899-2000 a depression of 5 or 6 feet below the present level obtained.



Facts bearing on ~~possible~~ recent changes of level in the Lake of the Woods.

In the treaty fixing the boundary between British N America & the United States the line, after leaving St. Superior was required to follow the ~~course of the~~ <sup>course of the</sup> N.W. Angle of the Lake of the Woods, ~~to the~~ <sup>to the</sup> ~~fixed the Eastern~~

followed the natural ~~water communication~~ <sup>water communication</sup>.

It was defined to run westward from thence ~~along the 49th parallel~~ <sup>along the 49th parallel</sup> portion of the line & ended their labours at the shore of latitude.

The part of the boundary lying E of the N.W. angle was surveyed ~~in 18-~~ <sup>in 18-</sup> & the position of the latter point fixed

by the observation of latitude & comparative longitude, ~~of the~~ <sup>of the</sup> ~~actual position~~ <sup>actual position</sup> of the angle was determined by the distance up the N.W. inlet which loaded canoes could easily go, & consequently lay in a stretch of marsh & shallow reedy water bounded at no great distance by a fringe of bushes & trees, growing for the most part on a wet sub-soil. As it was impossible to place a ~~mark~~ <sup>mark</sup> monument actually in position it was decided to erect one to take the necessary astronomical observations on the ~~actual~~ <sup>actual</sup> spot itself. It was decided to do so on the "nearest dry ground", & in a place so defined a reference monument composed ~~of~~ <sup>of</sup> ~~wood~~ <sup>wood</sup> & chained ~~to~~ <sup>to</sup> the actual angle determined. This took place in June? 18- & it is hardly ~~to be~~ <sup>to be</sup> ~~imagined~~ <sup>imagined</sup> that after the lapse of - years ~~in~~ <sup>in</sup> the Autumn of 1872 ~~no~~ <sup>no</sup> monument could ~~be~~ <sup>be</sup> found. It is unnecessary to ~~state~~ <sup>state</sup> the means taken to fix again the place of this mark. The astronomical position have been ~~found~~ <sup>ascertained</sup> as nearly as possible a search for the monument was begun but was unsuccessful till some indices long acquainted with the locality were engaged. They recollected the monument & said it had been buried & at once lead to a ~~trough~~ <sup>trough</sup> & light some square oak timbers immersed below ~~about~~ <sup>about</sup> 18" of water ~~but~~ <sup>but</sup> ~~open~~ <sup>open</sup> in a position which ~~was~~ <sup>was</sup> ~~close~~ <sup>close</sup> with the ~~position~~ <sup>position</sup> astronomically determined.

Two circumstances however seemed to throw doubt on this identification. First the swampy, flooded character of the ground denominated dry. Second the ~~of~~ <sup>of</sup> a point of land

by the surveyors of 18-

by the surveyors of 18-



now dry in immediate proximity to the actual position of the N.W. angle. The latter if not <sup>caused by</sup> ~~caused by~~ some local change would tend to show a subsidence of the waters of the Lake, the former a rise.

The possibility of the formation of the point or spit of land subsequent to the <sup>original</sup> determination of the angle <sup>thereby</sup> ~~thereby~~ <sup>becoming</sup> ~~becoming~~ to be an interesting question. The point however shows no signs of such recent origin. Very little running water enters this arm of the Lake & as the watershed lies only about twelve miles west of it, is very low of the whole country, thickly wooded there appears <sup>to be</sup> ~~to be~~ <sup>little</sup> ~~little~~ <sup>probability</sup> ~~probability~~ of floods of any magnitude. The point is covered with a rapid young growth of poplars & willows many, especially of the yellow breeds of which have been killed by <sup>recent</sup> ~~recent~~ fires; & through the brush in all directions lie the prostrate remains of a former growth of large poplars, the ~~trunks~~ <sup>trunks</sup> ~~trunks~~ <sup>trunks</sup> which have been uprooted by the wind & partly burned. Several of these poplar logs on the part of the ~~the~~ point nearest to the position of the angle were examined as to indications of age by being carefully cut across where sufficiently sound, & the rings of growth counted. Care ~~was~~ <sup>was</sup> taken to be as accurate as possible & in doubtful cases minimum <sup>results were</sup> ~~results were~~ <sup>accepted</sup> ~~accepted~~.

One <sup>this examined</sup> ~~tree~~ <sup>tree</sup> 31 year ring, another 32. Another about 36 or still another from 30 to 33. <sup>a</sup> ~~Another~~ <sup>fifth</sup> ~~large~~ <sup>large</sup> & rotten poplar quite hollow at the base gave a minimum of 48 annual rings at 27 feet from the roots. All these trees were more or less decayed & burned & had fungi growing on them & from their appearance must have lain at least 4 or 5 years. An age of at least about 50 years is thus ~~proven~~ <sup>proven</sup> for this point of dry land. This would show an age of at least 50 years for the point of land in question.

Geographical evidence.

Besides the old terrace level ~~already~~ <sup>in a previous part of the report</sup> ~~mentioned~~ <sup>mentioned</sup> there are other facts tending to show fluctuation of the waters of the Lake. The island lying N of the ~~mouth~~ <sup>mouth</sup> of Rainy ~~River~~ which is marked on Thomson's <sup>map</sup> ~~map~~ of Survey made in — as lying N of the mouth of Rainy River nearly parallel with the coast, & with a length of about



four or half geographical miles; now no longer exists as such, but is divided into four or five separate small islands. There is no rocky substructure to these islands so far as could be seen. They ~~seem~~ are at present high sand dunes partly covered with bushes & grass & connected ~~together~~ <sup>by a</sup> ~~by~~ <sup>wide</sup> sand bar on which there was not more than 3 or 4 feet of water at the time of my visit, it being possible to touch the bottom with an ordinary paddle while passing over it in a canoe. The probability of these islands having been one in former years is increased by the fact that Dr Peary who explored the lake in 1823? & who has made minor alterations in <sup>the map of</sup> other parts of the ~~lake~~ <sup>region</sup> in his reduction of Thomson's Survey, retains his rendering of this island & names it Sable Island ~~on~~ ~~map~~ showing evidently that he was familiar with its character.

Some small islands marked on Thomson's map as lying N of the southern promontory of the LeKakeyote Sandhills, also no longer exist.

An island marked in the same map as about 1/3 mile long <sup>& several smaller ones associated with it</sup> & lying off the North-Eastern point of Reed River bay are not seen at present but are represented by a shallow sand & gravel bar on which the waves break ~~for a long way out with a~~ with a strong Easterly wind.

In the northern part of the lake, filled as it is with islands, their omission & misplacement on the map is no matter of surprise. The coast line of the Southern portion however seems to be rendered with great fidelity ~~other~~ ~~absence of former landmarks~~ & the few islands which ~~were~~ ~~then~~ were probably correctly placed at the time.

existing

Sand dunes like those at the mouth of the Renny R must have been formed by the lake itself during a long course of years & accommodated themselves to its conditions. It is therefore difficult to imagine <sup>that action</sup> of the lake on them <sup>so</sup> would change materially <sup>costly effort their removal,</sup> unless by some alteration of <sup>its</sup> general level.



An old but very distinct <sup>high</sup> water mark exists on all the rocks & rocky islands of the lake. This I found on July 27 1873 near the entrance of the N.W. angle inlet to be 3' 6" above the then water level. A second mark of less prominence was 11" above the ~~present~~ same datum. The first-mentioned is exceedingly <sup>plainly</sup> ~~distinctly~~ indicated even from a distance as it constitutes the downward line of lower edge of the <sup>strata of</sup> lichens which cover & tint the upper parts of the rocks in many places. The second is ~~scarcely~~ a stain mark on the rock surface.

A second measurement of the same line (near Rat Portage)

Prof. Bell of the Geological Survey in passing through the lake on the second day of October 1872, found this mark to be 3 ft above the then water level.

on August 12 gave 3' 4 1/2", ~~stratification during~~ ~~days of its~~ ~~existence~~. The growth of shrubs of some size below this old water line in many parts of the lake shows that it has not been reached by the water for any ~~time~~ considerable time during the summer months for some years at least. Though carefully looking for any signs of trees <sup>growing or having grown</sup> below this line I was unable to find any <sup>such</sup> ~~one~~ ~~tree~~ reaching Rat Portage, near which two small pines were observed both dead. The first of these which was situated about 2 feet below the high water line showed 25 annual growth rings, & from its <sup>present</sup> ~~annual~~ ~~growth~~ ~~weathered~~ appearance seemed to have been dead at least 10 years. The second which stood 18" below the line showed 20 annual rings & appeared to be in somewhat better preservation than the former. From evidence subsequently to be adduced I have now little doubt that they were both killed by the high water of about 13 years ago.

(*Pinus strobus*)

The glacial markings on the surfaces of rocks in the Lake of the Woods show a peculiarity which must depend on the level of the water to some extent. They are found to be remarkably perfect near the present <sup>(summer)</sup> water line, while a few feet above it the surface is roughened by the action of the weather & in the granitic & gneissic regions <sup>is</sup> exfoliating in sheets. A foot or so below the water line the same rocks are very frequently shattered & fissured & lying in detached blocks.







This probably depends on the yearly <sup>fluctuation</sup> variation present & is mentioned. The zone of rock lying between that which is <sup>protected</sup> ~~covered~~ by soil & clay ~~which frequently shows~~ <sup>well preserved scratches</sup> & that usually covered by the water has been eroded by the weather. That below the average summer level is ~~is~~ acted on most intensely by the frost, at the lower winter level <sup>of the lake</sup> & pressured & split in the way remarked. As an evidence of <sup>this</sup> protective influence of water on the surface it may be mentioned that on granite rocks ~~it was noticed that where from the seeping water a pool constantly~~ rock bounded hollow was continually filled the glacial surface was preserved, but in hollows with free drainage no such effect was seen.

the glacier polished surfaces of small pools continually supplied with water <sup>and</sup> very perfectly preserved, while in neighbouring hollows having free drainage no such effect was seen.

The tendency of the evidence from the state of preservation of the glacial markings would therefore be towards the conclusion that the water of the lake is at present very near its average level. not far from its <sup>usual</sup> ~~general~~ level.

During my stay on the lake I heard several times of a portage called Skat-a-wa-wimigum, which is a name said to mean "the dry passage" & ~~is~~ <sup>has been</sup> ~~invented~~ <sup>invented</sup> by the place in question. but that "since the waters have been high" <sup>several half loaded boats can cross without</sup> ~~can cross~~ <sup>unloading</sup> ~~portaging~~ <sup>even half loaded boats can be taken over.</sup> An indian employed by me & baptised by the name of John Taylor said that since "high water" or as he thought for about five years back canoes could cross it without portaging at all times, & this fact was confirmed by another indian present at the time though he would not remember how many years it had been so.

~~John on further questioning informed me that the portage is not over rock but soil or clay like that forming the bottom of the lake. On being questioned as to the existence of a current he said doubtfully that he thought there was a current according to the direction of the wind. This being the case it is possible that the portage may have been washed away during some time of high~~



\* Prof Keating in his "Narrative of an expedition to the sources of the St. Peter's River, Lake Winnipeg & Lake of the Woods" performed in 1823. Gives the following <sup>very interesting</sup> note with regard to the same portage, under date Aug 26. "With a view to avoid a circuitous navigation round a projecting peninsula, it is usual for voyagers to make a small portage over this point. It did not exceed one hundred yards at the time we crossed it. Mr. Fink says that it is often under water, so that the canoes pass without difficulty. This requires a rise of about five or six feet above the level of the waters at this time. (Vol II. p. 106)

Prof Hind in Aug. 22 1857 Remarks on the very unusual height of the water of that season in the Rainy R. "The extraordinary height of the water at this season of the year is seen by the lodge poles of former Indian encampments at the foot of the bank. They are under water to the depth of one & even two feet. The river does not appear to rise high in the spring, as the trees fringing the banks to the waters edge show no action of ice." (Appendix 3. To XVI Vol. Journ. Leg. Assen. Prov. Canada. 1858. p. 119) This perfectly agrees with Palliser's observation of July 4 & shows a high state of the water in this year.

Hind in June of next year (1858) writes "The waters of the rivers & lakes on the East side of the high land, the Lake Superior water-shed, were high, while those on the left side, or the tributaries of Lake Winnipeg, unprecedentedly low. In many of the lakes recent water-marks 4 & five feet above the present level were frequently observed. This remarkable course of the water is attributed by the half-breeds & Indians to the very small quantity of snow which fell on the western slope last winter. (Report Arsenborn & Saskatchewan exploring expedition. p. 3.)



~~water has remained so since then though~~  
Pow-wassin An influential Indian says he thinks the  
 portages are less now than they formerly were.

Skot-a-wa-wominjenn lies about 20 miles Eastward  
 of the Angle station & though circumstances prevented  
 me from visiting it I think it may be ~~about~~  
 certainly identified with a portage marked on Dr. Kipby's  
 & some subsequent maps as Portage des Bois. Of this  
 place Palliser says in 1857 "we were off at sunrise &  
 steered for a narrow strait, by means of which, with a  
 small portage across a narrow neck of land, we cut off  
 a large headland which projects from the Eastern shore.  
 In this place we landed for breakfast in a place where the  
 shore is composed of high shelving rock on which are to be  
 seen both the effects of the Lake ice & of <sup>also</sup> true glacial markings.  
 On coming to that portion of our route known as the Portage  
des Bois we found the Lake waters so much above their  
 usual level that we were able to sail right over it!"

(Exploration in B. N. America p. 84.) +

There is a very general concurrence of testimony showing  
 that for some years past the crop of wild rice (*Zizania aquatica*)  
 on which the Indians largely depend for their winter  
 supplies has been deficient. I was shown a bay about  
 20 miles E. of the ~~N.W.~~ Angle where wild rice was formerly  
 gathered but where that plant does not now grow the  
 water having become too deep for it. Albert-Augouin  
 an Indian some time in my employ said that rice had  
 been scarce, he thought, for 8 years. Lac Plat is one of <sup>the</sup> ~~the~~  
 great rice gathering grounds & being in communication  
 with Lake of the Woods is equally affected by <sup>all</sup> its fluctuations.  
Macpherson ~~was~~ in his statement to be given presently  
 says the rice has been scarce for about 3 years & is  
 probably more nearly correct as the Indians are singularly  
 loose in ~~their~~ estimates of time.

In August last during a protracted talk with the Indians then at  
 the N.W. angle (about 30 men) I put the question as to  
 the rise or fall of the lake in late years. All agreed that



it had been rising, & Low-wasser already spoken of said that long ago (but as I understood him with in memory of the state living) ~~that~~ the reedy inlet on which the Government station stands & up which the largest boats pass easily, was <sup>very nearly</sup> ~~just~~ ~~about~~ dry. Also that the reference monument had been on firm ground, but that for many years the water had been continually gaining. When questioned as to the high water mark on the rocks they did not seem to know anything very definite. One old man said he was ~~xxx~~ ~~xxx~~ 80 or perhaps a hundred years of age & that he did not remember <sup>the water being there</sup> & that in any case it could only have been for one summer.

Albert Baylis, Macpherson, & others say that the lake is one to two feet lower <sup>during</sup> ~~at~~ winter than in summer, that after the ice breaks up in spring it begins rising slowly & continues to do so till it attains its maximum height ~~late~~ well on in the autumn. This agrees perfectly with what I <sup>was able to</sup> observe myself while on the lake, & with other facts.

who has known it for many years, & is

By far the clearest account of the fluctuations of the lake was however obtained from Fur Macpherson ~~who~~ now living at the North West Angle, ~~who~~ <sup>he</sup> was long stationed at Rat Portage in the Hudson Bay Company's service. He says that the water this summer (1873) is higher than it was last summer at the same time & that for several years it has been higher than usual. For at least three years there has been very little rice for that reason. He connects the change with an increased rainfall. He says that when he first came to the lake many years since a mark about the same height as the high water <sup>mark</sup> now seen existed but that it was old-looking & moss-grown. That thirteen years ago the water touched this mark being the only time within his knowledge. That season the water began to rise in May & continued till October & the summer was very wet, "every cloud turned into a thunder-storm." Since then he says the mark has remained <sup>distinct</sup> ~~but~~ but



The present line of the  
watermark is considerable  
& could tend to show the  
very slow growth of lichens.

Separating the lake  
from Winnipeg River

the water has never been so high. At this time also  
according to his statement the water flowed over at Rat  
Portage proper, where ~~now~~ now passes & also crossed  
the ridge at two other places, one East & one West of the  
Portage. It is probable that this ~~has~~ relieved the lake  
& prevented a still higher rise.

Two classes of fluctuations are indicated by the foregoing  
observations & statements. First ~~various~~ variation  
of the water level extending ~~of~~ over periods of several or  
many years. Second a well marked annual change  
which ~~depends~~ <sup>follows that of</sup> the seasons. This change is just such  
as usually occurs in the waters of a thickly wooded country,  
where in winter the streams & swamps are stopped by  
frost, & where the returning warmth does not act  
through the covering of woods with sufficient rapidity to  
produce a well marked spring flood, this taking place  
in a gradual manner & becoming merged before its  
decline in the increase of water due to the heavy summer  
rainfall, very little of which is lost by evaporation before  
reaching the lake.

Besides these two, a third species of fluctuation of quite  
temporary & local character depending on the prevailing  
direction of strong winds, & may be altogether disregarded  
for the ~~present purpose~~ <sup>in</sup> the present inquiry.

Two causes ~~ought~~ <sup>seen likely to have determined</sup> the first class of fluctuations  
or those taking place over long periods, ~~are~~ Change of rainfall  
or change of conditions at the outlet of the lake.

A visit was paid to Rat Portage for the purpose of  
determining whether any local conditions might operate in  
the latter way. The following is a description of the locality.  
The general <sup>geological</sup> structure of which has already been  
described. Across the rocky ridge separating the lake  
from the river the ~~first break~~ <sup>to the Eastward</sup> most  
eastern break is near the present H.B. Fort, <sup>& constitutes the Rat Portage fall</sup> The channel at  
first wide & resembling an indentation of the coast  
rapidly narrows & for about 200 yards becomes quite



a gorge, the rocks to the east, <sup>where</sup> ~~for which~~ the portage path lies) forming a steep slope; while to the west present a craggy cliff of 40 or 50 feet in height. At the fall itself the river is quite narrow perhaps only 40 feet across. The actual descent of the water I estimated at the time at from 15 to 20 feet. ~~Mr~~ <sup>Kind</sup> in the account of his expedition gives it as 16 feet (actual leveling) (Appendix 3. Journ. Legislature Assnally Prov. Canada 1858) The great volume of water being contracted into so small a space shoots forward in a ~~great~~ <sup>powerful</sup> spout-like projection into the deep rocky pool below, & after a few windings passes into a great lake like expansion forming the byway of the Winnipeg River. There is nothing here which would favour the ~~idea~~ <sup>idea</sup> of change of conditions & no rock masses of sufficient magnitude to effect ~~the~~ any permanent alteration seem to have fallen. The length of the portage path here is according to the authority just quoted 13 chains.

The next break in the ridge is about one mile farther west & through this a <sup>quantity</sup> ~~quantity~~ probably considerably in excess of that at the fall passes. This opening is much wider & the rocks though high are not so precipitous as at the fall. The water shortly after entering the channel rushes down over a succession of foaming rapids <sup>in</sup> which no boat or canoe is ever ventured. The portage path here is also on the East bank but is very long & difficult & is scarcely used except as a means of gaining the foot of the rapids for sturgeon spearing. The bed of the river is almost entirely of ~~fixed~~ <sup>hard</sup> rock.

The third break in the ridge ~~so~~ properly speaking Rat Portage & is about two miles west of the H.B. Fort.

A river like channel assembling the East passes northward but before reaching the Winnipeg turns to the west & dies away. The landing for the portage path is near the concave side of the bend ~~at~~ <sup>on</sup> a low sloping rock. The portage path is very short & cannot exceed 200 yards. No water now flows through this gap, but the height of the lowest <sup>lying</sup> ~~part~~ <sup>across</sup> of the portage probably does not exceed



Six feet above the present level of the lake. Indeed I could find no complete rocky barrier to the waters of the lake at their present level, & if the earth & boulders were removed from the lowest part of the passage it is possible that a small quantity of water might pass through between the rocky knolls even at ~~present~~ <sup>now</sup>. The ~~width~~ <sup>opening</sup> of this channel however even if the lake were several feet higher than at present would ~~not~~ be of sufficient importance to cause any change of level. John Taylor already referred to says that the Indians remember the water to have flowed over <sup>here</sup> at the "high water" of many years ago.

The whole appearance ~~of~~ <sup>at of</sup> the outflow of the lake would seem to negative any recent physical change there affecting the water level, & it therefore becomes probable that the fluctuation depends merely on ~~the~~ changing rainfall.







As a means of correlating this rather vague & sometimes conflicting evidence, & also of judging to what extent ~~such~~ <sup>level</sup> changes are likely to take place, I have instituted a comparison with ~~the American Great Lakes, having collected the observations bearing on~~ ~~with what data exist regarding similar changes in the~~ ~~Great Lakes, lying to the East.~~ <sup>them for the purpose</sup> Much of the information on this subject is contained in various publications of Col. Chas. Whittlesey, but it is unfortunately not nearly so complete as might be wished. (See Geological Report on L. Superior Land district. 1851. Chapt. XIX. also a paper on the North American Lakes read before the Am. Ass. 1858. & Smithsonian Contributions XII 1859 on the Fluctuations of the Great Lakes.) Whittlesey divides the phenomena into three classes: 1. A "Secular variation" depending on peculiar combinations in the meteorology of the country drained. 2. "Annual variations" "the period of which is completed in about 12 months" & which occurs regularly without reference to the general height of the waters". & 3. "Sudden, frequent, but irregular movement varying from a few inches to several feet" depending on the winds & other not ascertained causes which may be called "transient variations".

Lake Superior is the only one of the Great Lakes which shows effects strictly its own & would therefore appear to be the best for comparison. It derives the greater part of its water from the same high & mountainous region as the Lake of the Woods, & corresponds with that lake closely in its <sup>period of annual variations</sup> ~~yearly variations~~. Its high water is usually ~~is usually~~ <sup>is usually</sup> in ~~the~~ ~~month~~ ~~of~~ ~~September~~ ~~as~~ ~~a~~ ~~rule~~ though sometimes (according to observations of the U.S. Lake Survey (Report of Chief of Engineers 1870) reaching its height as early as July & as late as October. The other lakes show effects due not only to rainfall in the Lake Superior region but to local circumstances as well, though ~~It should be remembered that nearly the whole of the~~ ~~Great Lakes is derived from the Laurentian region to the~~ ~~North.~~ Lakes Erie & Ontario have been most carefully observed the former shows a close correspondence with Superior, while the latter being the mean of so

thus fluctuation

It is unfortunate that the observations for this lake are so ~~incomplete~~ <sup>imperfect</sup>

Kind in a passage already quoted speaks of high water on the East side of the axis & low water on the West in 1858 but this is in all probability quite exceptional with a watershed so much resembling a table-land in contour.

though they all derive <sup>again</sup> nearly the whole of their water from the Laurentian region to the North.



many causes departs much more widely from it. The high water month of Superior Bay, as already stated, is taken said as a rule to be September & the mean annual Range for 10 years (1859 to 1869) is according to General Comstock, is 1.35 foot. Of Lake Huron the high water period is in July or August & the mean range 1.20 foot.

(Report Chief of Engineers U.S. 1870)

In L. Michigan, <sup>high water from</sup> June to August. range 1.34. In L. Erie high water usually in June. mean range 1.89 foot. In L. Ontario high water in June. mean yearly range from 1854 to 1869 1.866 (Kingston Year Book of Canada 1871)

The <sup>facts</sup> observations on Secular variation requiring for this discussion accurate observations extending over long periods of years are naturally not so complete, <sup>& are especially false generally with regard to L. Sup.</sup> the following are the observed greatest differences.

Lake Superior. Whittelsey speaking of data up to 1856 says the greatest <sup>difference</sup> measured ~~distance~~ is 2 feet 6 inches between Sept 1851 & March 1854. ~~These years do not show any remarkable difference in the level of the other lakes.~~ The extreme range for the ten years between 1859 & 1869 is according to General Comstock about 3 feet. These years ~~also~~ are not unusual <sup>now</sup> in ~~the level of the other lakes,~~ <sup>the lower</sup> the extreme change there during the same period being about three or a half feet.

In Lake Erie the greatest measured & permanent difference known, is between June 1819 & June 1838 & amounts to 5.1 foot. (Whittelsey Smithsonian Contributions) Dr Houghton however as quoted by the same authority in <sup>the Lake</sup> Superior Land District Report gives measurements which "if computed from Feb. 1820 to June 1838" would give a total variation of about 6 feet 8 inches.

The greatest range of the general surface between 1819-20 & 1838 was, taking the mean of observations Detroit, Black Rock, Buffalo & Cleveland; a little over 5 feet 7 inches. (L. Sup Land District)

In Lake Ontario according to observations of <sup>his</sup> ~~James~~ Fiddings from 1815 to 1827 (quoted) Whittelsey in Smithsonian Contributions) the greatest measured difference ~~at the same~~ season of the year is <sup>4 feet</sup> between July 1819 & July 1827.

~~Neither has maximum or minimum been reached by the water line since. The lake, if his observations are correct, not reaching the mark of July 1827 in~~



July 1838 (maximum year for the other lakes) by about two inches. Whittelsey states the greatest absolute difference of level on this lake to be six feet six inches.

Col Whittelsey in summing up his observations on the great lakes in his memoirs of 1851 & 1859 rejects the popular idea of cyclical variations with periods of seven or fourteen years. "Between 1796-8 & 1819-20, a period of 20 years there was a gradual depression & rising of the lakes. From 1816 to 1819-20 the waters fell to a lower level than even their previous stage of depression. From 1819-20 to 1838 a period of eighteen years, there was a steady increase of elevation, when the water attained

its greatest known height." "Other tables show an uninterrupted decline from 1838 to 1841, three years; in 1841 a slight rise; from 1842 to 1851, a regular decline of eight years" "These remarks apply specially to Lake Erie."

~~The more accurate observations since that time show another well marked period of maximum in all the lakes 1859. Subsequent to 1859 the lakes declined for a few years & since then have remained without violent change at least a uniformly high level without great oscillation in either sense.~~

but may be taken as tracing in a broad general way the fluctuations of the lakes as a whole

Continue General Statement to 73 when table complete & show especially secondary relation Erie & Superior

?



Secular changes comparable in Amount - with those observed in the great Lakes would therefore be quite competent to explain the phenomena of the present overflow of the supposed former position of the reference Monument. That changes quite as great & probably even greater obtain in the Lake of the Woods can hardly be doubted, from the evidence adduced. Keating in 1823 judged that a change rise of 5 or 6 feet was necessary to allow canoes to pass ~~across~~ the Portage des Bois. For several years past canoes can do so easily, & there is a water line ~~on~~ on the rocks of the Lake indicating an <sup>exceptional</sup> rise of more than three feet above the present level. This would show a range within the last fifty years of about 9 feet.

There is every reason to believe that the present ~~mean~~ level of the Lake <sup>which has been several times for several years</sup> is one or two feet above its average mean.

In constructing a probable curve representing the probable fluctuation of the Lake of the Woods for the last fifty years I have used whatever data exist, & ~~where~~ connected them according to report of the Indians &c. & ~~the~~ analogy with the movements of the great Lakes. That this analogy is correct may I think be safely assumed not only from the physical geography of the region, but from the coincidence of such points as ~~the secular variation can be traced~~ of the Lake of the Woods with similar well marked changes in the great Lakes as far as the data go.

Lake Superior in its annual variation as has been already shown coincides most closely with the Lake of the Woods, but as the observations here are meagre & Erie will offer the best terms of comparison, in 1823 when Prof. Keating remarked the very low state of the Lake of the Woods, La Erie



though about a foot higher than in 1819-20 was still remarkably low. Macpherson's Statement placing the Lake at the lowest known level in 1859 or 60 corresponds exactly with the highest stage of the Great Lakes since the high-water of 1828. His Statement that before 1859 the mark to which the waters rose in that year was old musogrowns would place the last-mentioned period of high water more than thirteen years back, as the mark of 1859 cannot yet be so described. Thirty years would probably give time for the growth of cedars so as to completely obliterate such a mark, & the high water to which it <sup>now</sup> refers its origin may with great probability be placed in 1838 at a time when all the Great Lakes were in flood. The dead pines found at Rat Portage also tend to confirm Macpherson's Statement with regard to the high water of 1859 & show at least that the water level is probably seldom much above its present level for any length of time. It is also a curious coincidence that the age of these pines is exactly comprised between the <sup>supposed</sup> high water of 1838 & the known high water of 1859.

From Hind & Palliser's accounts the Lake in 1857 must have been near its present level or somewhat above its mean. This would agree well with <sup>a comparison of</sup> the corresponding periods in Lakes Erie & Ontario. In 1859 the Lake according to Hind was unusually low. I have no data for this year in any of the Great Lakes but Ontario & there no corresponding depression appears. Hind in his account ~~that year~~ speaks of old water marks in Lakes tributary to Lake of the Woods 4 & 5 feet above the then water level. If the marks correspond with the high water mark of the Lake of the Woods a fall of one foot from the present mean



level would at the season when he passed through, be ample to account for this.

Taking then the present <sup>high</sup> water mark ~~of the~~  
 Taking then, the old high-water mark surrounding  
 the lake as representing its highest periods, &  
 giving it a range below this of at least five feet  
 as may be safely done from analogy with the  
 other lakes, the average water level of the present  
 year must be two feet above the minimum.  
 A fall of two feet would be sufficient to convert  
 the position of the Reference Monument into an  
 eligible camping ground especially in the early summer  
 months before the lake reaches its annual maximum.

If however it is supposed that the lake stands  
 at present over a foot above its mean, as  
 seems probable on <sup>other</sup> grounds, & that the high-  
 water mark represents its highest stage, the fluctuations  
 would appear to be greater in amount than in  
 any of the other lakes mentioned, & a still lower  
 stage in the dry years of 1819-20 &c must be  
 supposed. This supposition is fully borne out  
 by Prof. Keating's observation.

To be changed



Appendix  
to Lake of Woods  
Report.

Fluctuations

in rise and fall  
of water level.

[Bundle 24#67

McGILL UNIVERSITY  
ARCHIVES  
ACC. NO. 909B/24  
REF. 6



Geol Struct. Laurentian. Huronian. Possible limestone  
drift.

Botan. Description of shore which examined. Trees observed  
swamps <sup>Hay</sup> Roseau Pass. Wild Rice. Rushes.  
~~Crops cultivated~~ Areas cultivable. & which might be  
made so. Crops now cult. by Indians: Corn.  
Potatoes, Wheat &c.

Geol Struct. Drift: Probable underlying limestone

Botan. <sup>Pine lumber</sup> Trees &c. Muskup. Seat of means of transport.  
Wood of means of transport or of Roseau R.  
General character of Country. Extent of swamp  
on line. possibility of drainage. Area which  
may be considered as opened up by the Rd &  
Rd R. Possible R.R.

Geol. Civ. Eng. Report - 7-10-18.  
Will forward corrected map & map.  
do not page.

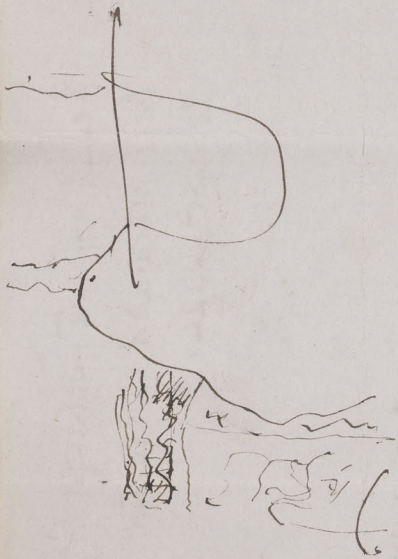


With reference to that portion of the western shore  
of the Lake of the Woods which is contained  
between the Lake shore line ~~of the Lake~~ and  
the Meridian of the North West point of  
the Lake: —

1. What is its ~~geol~~ geological importance?
2. do natural botanical ——— ?  
agricultural

— With reference to <sup>so much of</sup> that ~~portion of Manitoba~~  
part of the country which is bounded by  
the Red River, the Dawson road, the  
Meridian of the North West point of  
the Lake of the Woods and the 49<sup>th</sup> of  
N. lat. — and is not opened up by the Dawson road  
and Red River

1. What is its geological importance?
2. ——— natural botanical ——— ?
3. ——— agricultural ?





The exposures of rocks belonging to the Cretaceous Series actually observed last Autumn were few. The time spent on that formation being small, & the lateness of the season preventing the exploration of river valleys or other promising localities lying off the <sup>line of</sup> route.

The rocks of this Series are besides seldom well exposed in the region lying North of the 49<sup>th</sup> parallel & the information acquired concerning them by previous explorers among whom may be mentioned Hector Hund; has been fragmentary & often inconclusive though great areas of country were traversed.

Description of exposures noted.

In the valley by which the Commission Trail ascends the escarpment <sup>called</sup> Pembina Mountain ten miles North of the line Cretaceous strata appear for the first time in a bare hill-side which is however ~~so~~ sloping & crumbled down by the weather & yields no good section. The rock is a rather dark greenish grey clay-stone in which no organic remains appear. It holds at least one, & probably several, layers of poor clay ironstone of ~~about~~ an inch or two in thickness, dark brown fragments of which strew the front of the bank. The bank must represent at least thirty feet of the strata which appear to be fault horizontal.

The iron in a sample of the ironstone examined amounted to only 19.14 per cent & was in the form of carbonate associated with much clayey matter.

Seven miles further west the so-called Calf Mountain though only about 30 feet in height forms a prominent feature. It appears to be the oblique of a fault sloping ridge running Northward. This may be due to the surface contour of the drift but possibly indicates the line of outcrop of some harder bed of the Cretaceous.

At the crossing of the Pembina River its banks are which runs about 300 feet below the surface of the plain, the banks of the valley are remarkably abrupt & steep & in any formation composed of harder, or



are uniformly soft-rocks than this part of the  
 Carboniferous, would in all probability present many  
 sections. As it is though examined with some care  
 but a single such locality was found & here the  
 arrangement only became apparent when the bank  
 had been scarped down with a pick & shovel.

The section was as follows.

Grey Clay Shale	6'
Ironstone nodules	0-2"
Rusty decomposed Clay shale	3-0
Blackish soft clay shale	30-0
	<u>39-2</u>

The lower shale is so soft as to merit rather the  
 appellation of hardened clay. It is blackish in colour  
 apparently from containing a small quantity of  
 carbonaceous matter. It also holds small siliceous  
 crystals & fragmentary fish remains. The latter  
 are not uncommon, & consist chiefly of small  
 scales, & detached bones generally vertebrate. They  
 appear to have belonged to fishes of the ordinary or  
 teleostean type. From the nature of the containing clay &  
 their decomposed character it is almost impossible  
 to preserve them. Above this is a bed three feet in



Above this is a bed three feet in thickness & composed of decomposed clay-slate, soft, & rusty in colour. It holds much selinite in small stellar groups, generally arranged in fissures & partings of the shale. They have been developed no doubt by the decomposition of iron pyrites originally contained by the bed, under the influence of the air. The layer of ironstone is nodular & has about 2" in average thickness. The material itself is grey, waxy & rather compact, weathering brown & soft externally. It is useless as an ore & was found on trial to contain but 21.78 per cent iron.

The upper portion of the section consists of harder clay-shale. It is comparatively soft when examined below the surface & filled with moisture & also shows little tendency to break parallel to its deposition planes. When weathered however it becomes much harder & splits into rather thin leaves. Its colour when in the

It contains no fossils unless certain rounded rusty lines which it is penetrated represent fusoids.

bank is a sombre olive grey but when weathered it becomes light whitish grey. The lower part of this stratum is probably 60 feet above the level of Pembina R & though it was not actually seen in place higher in the banks of the river valley, its crumbled remains exist in many places. It also constitutes a great part of the subsoil wherever the surface has been disturbed sufficiently to bring it to view for some distance W of Pembina River & at the top of the bank on its West side. As the beds appear to be perfectly horizontal this would make the thickness of the stratum at least 240 feet.

Seventeen miles West of this & then miles E of Long River ten miles North of Lat 49°, the bank of a coulee gives another exposure of the underlying rock. The rock is covered by several feet of drift & the highest layer seen is about 35 or 40 feet below the average level of the prairie.



Vegetable Soil 1' 6"  
 Whitish sandy clay with  
 rolled pebbles of the underlying rock 3'-0"  
 Thin bedded grey Oolite  
 Shale. 15' or more

The shale is quite similar to that seen <sup>(in the upper part of the section at)</sup> at ~~Elkhorn~~ <sup>Elkhorn</sup> River & like it appears to be unfossiliferous & in a horizontal attitude.

At the crossing of Long River a cliff on the west bank. The material exposed is however chiefly drift & will be described in connection with the superficial formations. The lower part of the bank where it becomes a steep slope is composed of Oolite shale similar to that just described; & this is pretty well seen in banks in other parts of the river valley. Though carefully examined very few traces of organic remains were found. Many these however were fragments of Trilobites about in thickness & showing the prismatic structure of the shell distinctly. Also



McGILL UNIVERSITY  
ARCHIVES  
ACC. NO. 909B/24  
REF. 4

Cretaceous Form.

1873

[ Bundle 24 # 1 ]

1873  
24  
1



By far commonest form *Zetularia*, of two kinds  
 the usual one broad sometimes as broad as long, ~~the~~  
 large globular chambers rapidly declining & small end  
 sometimes bent. Mouth large. Second variety far  
 probably *Z. globulosa* determined by Shrenberg from  
 Missouri Cretaceous. & probably identical with D's  
*Z. fibrosa* now inhabiting the Mediterranean in 50 to 100  
 millions. *Z. globulosa* also found in Brighton & Sparwood  
 Chalk by Shrenberg & one of commonest forms in latter.  
 also found at Mendenhall's France.

So stated by P & J.  
 Geol Mag. Vol VIII  
 No 11.

A second form of *tetularia* larger in proportion  
 is quite rare comparatively & seldom large. It may be  
*Z. missouriensis* of Shrenberg & probably does not  
 differ far from the type of *Z. agglutinans* = Var *pygmaea*  
 (See P & J on nomenclature foraminif. in Ann. Nat. Hist. D's.  
 Also Pictet. for type forms & chalk fossils)  
 See Microgeologia Shrenberg for Cret. forms from Missouri.

of not uncommon  
 shows first two or  
 three chambers very  
 small & with  
 appearance of  
 linear.

Also ~~*Globigerina* *halvickii* or ? Cretacea.~~  
 Also ~~*Rotalia* & probably *orbolina*~~  
 both. Suble forms

All with few exceptions minute. Singularly  
 resemble the assemblage of forms in the upper  
 Chalk of England. Two types of *Zetularia* as  
 there.  
 all belong to Carpenter's family *Globigerinidae*.

The common spiral form *Discorbina* (*Rotalia*)  
*globularis* Dorb. sp. Probably identical with *Rotalia*  
 (*Rotalia*) *globularis* character of T very common in  
 the upper & lower Chalk of England. This form must  
 be the same as *Planorbolina globulosa* recognized  
 by Parker & Jones from Shrenberg's figures as occurring  
 in the Mississippi Cretaceous. (Quart Journ Geol Soc.  
 May 1872)



These authors there remark that *Planorbolina globulosa* Ehr. sp. "must not be regarded as worth much, being a very minute rotaline & such a form as several species might present in their earliest stage of growth." It may be remarked however that this small form ~~is the only one~~ is the abundant & largest in both the Wautota & San Juan Coast. Specimens of P of S are common everywhere from shore down to 50 fathoms in the Atlantic & worldwide. It becomes flatter at greater depths. Specimens flattened.

A smaller rotaline shell of different species flatter with more & smaller chambers is referable to <sup>*Planorbolina (Planulina)*</sup> *Arunculus* & etc. included under *P. lactea* & *P. S.*

Last

Both belong to Inesi-rotaline & Nautiloid forms of P of S. (See from from N Atlantic & Arctic oceans) Phil trans 1864. These small more or less symmetrical *planorbolinae* stated to be very common in some secondary deposits & abundant in present Seas from 100 to 1000 fms.

Forms described probably <sup>same as</sup> referable to those described by Ehrenberg some of which figured Ehrenberg in his *Pol. from Sander horizon* & cutaneous in ~~Paris~~ on Missouri Mississippi & named

in Smithsonian Check list.

This form according to P of S also common in the English Chalk & found in tertiary as well as recent. Also in Chalk of Mien Denmark.



Larger coccoliths about 3000 than species with  
general size in Chalk of England.



McGILL UNIVERSITY  
ARCHIVES  
ACC. NO. 9098/24  
REF. 5

*Mexico. Cent.*

*Forams.*

[Bundle 24#5]



## Tortuous Character.

July 8

After passing the crossing place of the old St-Paul Road the ~~river~~<sup>stream</sup> though with a strong current, shows no broken water or accumulations of boulders. It is exceedingly tortuous & often shallow, at first the bottom is at first composed of gravel & sand derived from the ridges to the East by the Loon. Changes however to fine mud like that of the Red River, the water becomes deep, & at the same time loses its clear amber tint & assumes a muddy appearance. The banks are ~~of the~~ often heavily timbered with oak, Elm, & Spruce, & fringed with willows along the edges. The river maintains this character from this point to its confluence with the Red River which takes place ten miles N of the 49<sup>th</sup> parallel. The distance in a straight line from the St-Paul Road to the Red River is about ~~7~~<sup>14</sup> miles, but following the windings of the Roseau River the distance must be at least three as much.

The <sup>west</sup> Roseau River would seem to be navigable by small steam launches from its confluence with Red R nearly to the old St Paul of ferry Road. From there nearly to its intersection with the 49<sup>th</sup> parallel the rapids it is barred by the rapids above described. From a point a few miles S of the Line, a similar craft style of craft might pass through the Roseau Swamps & Roseau Lake, & ascend the E. Roseau possibly some distance North of its intersection with the 49<sup>th</sup> parallel.

nearly to

No rock in place was observed in any part of the route the whole country being thickly covered by drift deposits.

Dufferin Manitoba  
April 21. 74

Your obt. Servant  
George W. Dawson  
Geologist & Naturalist N.B.S.C.



Casper.  
Notes on Reed &  
Roseau River Route.  
Prepared for Capt  
Anderson.  
April 21-74

[ Bundle #3 ]







a sufficient <sup>amply</sup> to account for this.

And the above  
 being stated  
 at least

Taking then, the old high-water mark surrounding the Lake as representing its highest periods, & fixing it a range below this of at least five feet - as may be safely done from analogy with the other lakes, the average water level of the present year must be two feet above the minimum. A fall of <sup>from the present level</sup> two feet would be sufficient to convert the position of the Reference Monument into an eligible camping ground, especially in the early Summer months before the lake reaches its annual maximum.

If however it is supposed that the Lake stands at present over a foot above its mean, as seems probable on many grounds, & that the high-water mark represents its highest stage, the fluctuations would appear to be greater in amount than in any of the other lakes mentioned, & a still lower stage in the dry years of 1819-20 &c must be supposed. This supposition is fully born out by Prof Keatings observation.

It however the present water line, is like that of the Great Lakes somewhat above the mean level

The whole of the observations however tend to the conclusion that the Lake of the Woods, like the Great Lakes, is at present somewhat above its mean level. The fluctuations above & below the present level proved by the observations are greater than those known to occur in the Great Lakes, rendering it probable that in the dry years 1819-20 &c a depression of 5 or 6 feet below the present level obtained.



McGILL UNIVERSITY  
ARCHIVES  
ACC. NO. 9098/24  
REF. 2

Quadrants 12 Scrubs.  
Franklins 6 clematis.  
10 pring cuts.  
20 of leaves.

Lake of Woods  
Flint.

[Bundle #2]