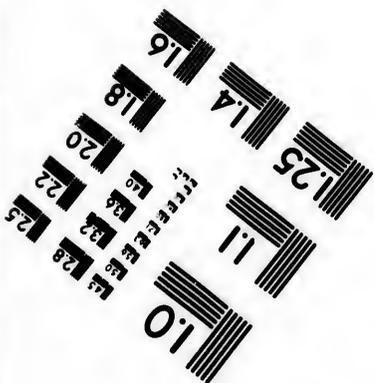
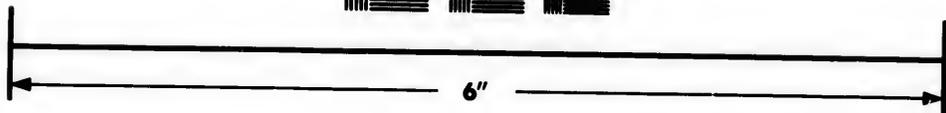
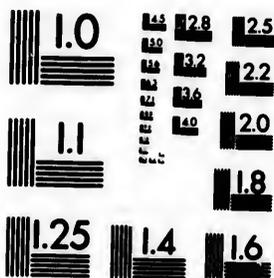


**IMAGE EVALUATION  
TEST TARGET (MT-3)**



**Photographic  
Sciences  
Corporation**

25 WEST MAIN STREET  
WEBSTER, N.Y. 14580  
(716) 872-4503

E 128 125  
E 132 122  
E 120  
E 118

**CIHM/ICMH  
Microfiche  
Series.**

**CIHM/ICMH  
Collection de  
microfiches.**



**Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques**

10

**© 1982**

**Technical and Bibliographic Notes/Notes techniques et bibliographiques**

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- Coloured covers/  
Couverture de couleur
- Covers damaged/  
Couverture endommagée
- Covers restored and/or laminated/  
Couverture restaurée et/ou pelliculée
- Cover title missing/  
Le titre de couverture manque
- Coloured maps/  
Cartes géographiques en couleur
- Coloured ink (i.e. other than blue or black)/  
Encre de couleur (i.e. autre que bleue ou noire)
- Coloured plates and/or illustrations/  
Planches et/ou illustrations en couleur
- Bound with other material/  
Relié avec d'autres documents
- Tight binding may cause shadows or distortion along interior margin/  
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/  
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- Additional comments:/  
Commentaires supplémentaires:

- Coloured pages/  
Pages de couleur
- Pages damaged/  
Pages endommagées
- Pages restored and/or laminated/  
Pages restaurées et/ou pelliculées
- Pages discoloured, stained or foxed/  
Pages décolorées, tachetées ou piquées
- Pages detached/  
Pages détachées
- Showthrough/  
Transparence
- Quality of print varies/  
Qualité inégale de l'impression
- Includes supplementary material/  
Comprend du matériel supplémentaire
- Only edition available/  
Seule édition disponible
- Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/  
Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/  
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>									

The copy filmed here has been reproduced thanks to the generosity of:

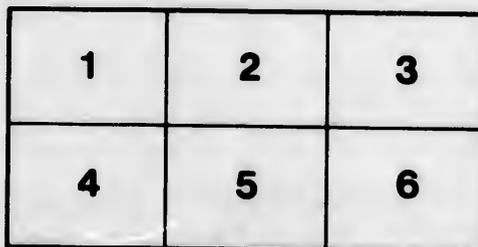
Library Division  
Provincial Archives of British Columbia

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol  $\rightarrow$  (meaning "CONTINUED"), or the symbol  $\nabla$  (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

Library Division  
Provincial Archives of British Columbia

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

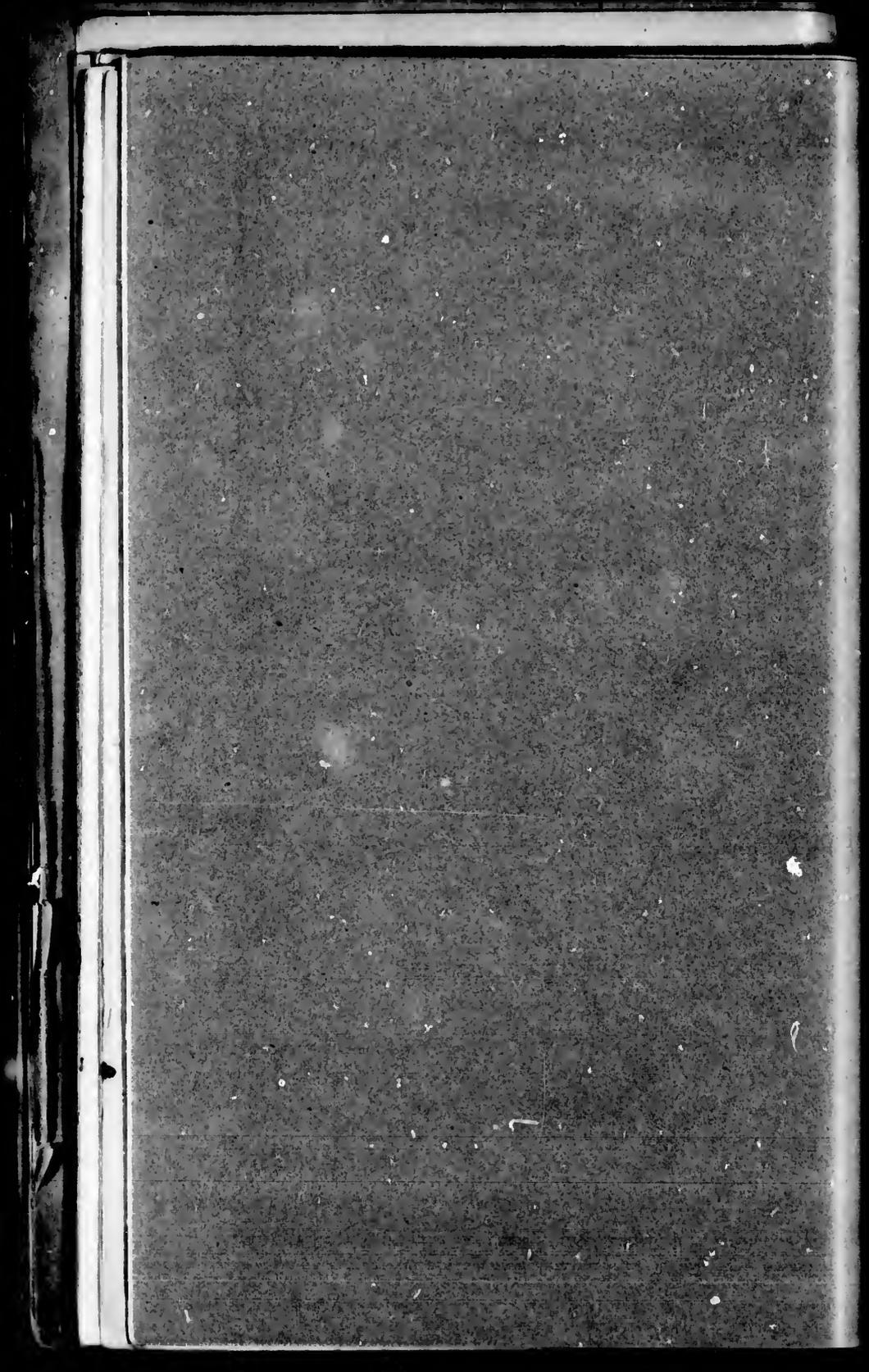
Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole  $\rightarrow$  signifie "A SUIVRE", le symbole  $\nabla$  signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.

rrate  
co

pelure,  
n à



nos 12. 13. & 14.

# MANITOBA

HISTORICAL AND

# SCIENTIFIC SOCIETY

WINNIPEG,

TRANSACTION 12.

## THE RED RIVER,

*By Wm. Murdoch, Esq., C. E., April 24th, 1884.*

TRANSACTION 13.

## THE RED RIVER,

*By J. H. Rowan, Esq., C. E., April 24th, 1884.*

TRANSACTION 14.

## THE PRAIRIE CHICKEN,

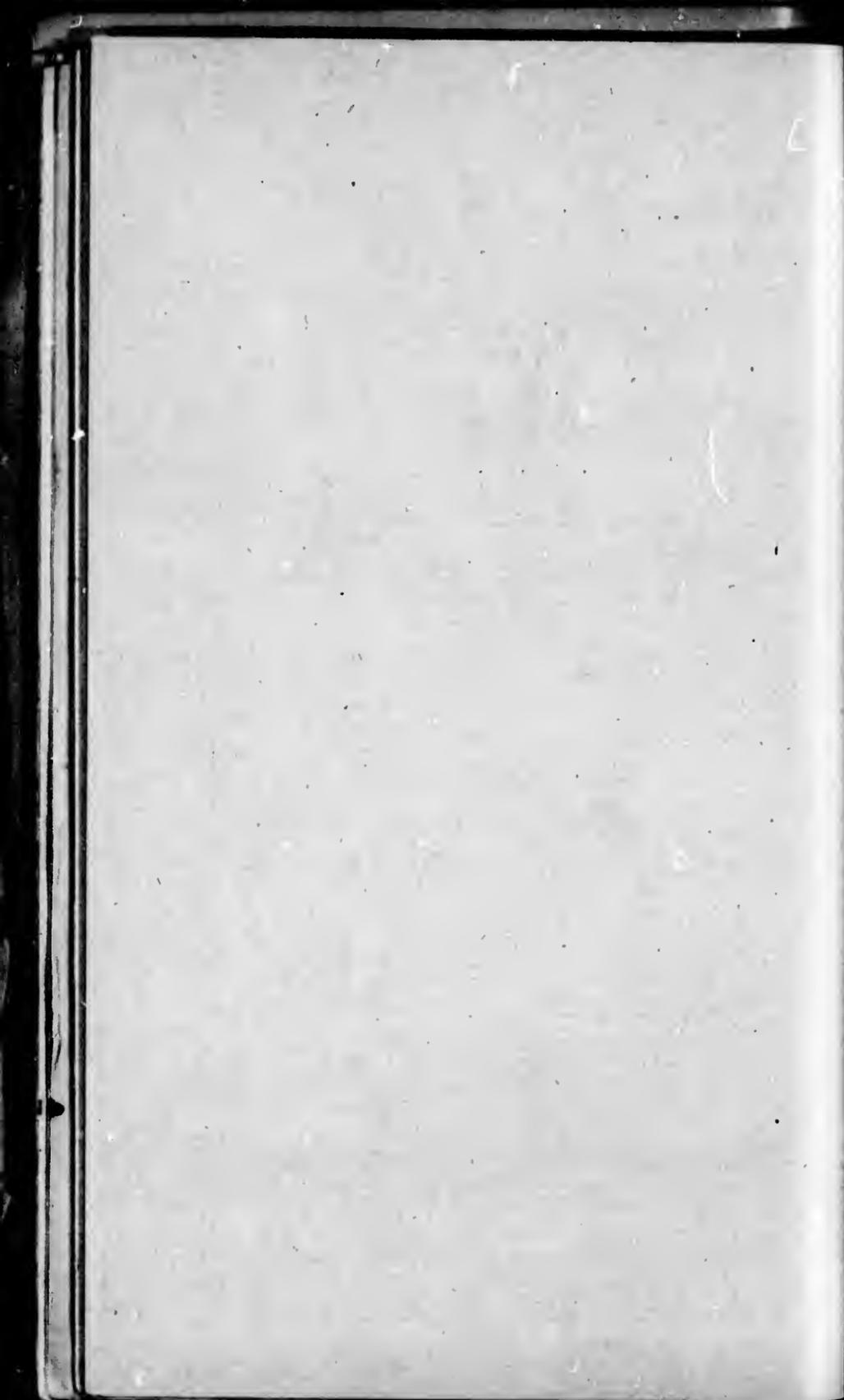
*By Ernest E. T. Seton, Carberry, Man., 22nd May, 1884.*

PAPERS READ BEFORE THE SOCIETY

SEASON 1884.



WINNIPEG:  
MANITOBA DAILY FREE PRESS.  
1881.



# THE RED RIVER

BY WM. MURDOCH, ESQ., C. E.

The Hudson's Bay Company established their first fort at Lake Winnipeg in 1669, but it was not until 1763 that they began to enter into the Red River country. It takes its rise or head waters at the Height of Land, from Lac Bois de la Poudre, which divides it from one branch of the head waters of the Mississippi River, and only a short distance from it, to the 45th parallel of north latitude, between the 95th and 101st degrees of longitude. According to the estimate of the United States authorities its valley extends east and west 225 by north and south 300 miles. It contains approximately 67,500 square miles, or 259,200,000 acres of land, 80 per cent. of which is prairie.

## THE FINEST FARMING LAND

for the production of cereals and stock-raising in the world. Wheat, corn, oats, barley and flax are raised in abundant quantities, and with less labor than in the older States or Territories. The Red River south of us up to the boundary line from Breckenridge, a distance of 41-100 miles by river, has a total fall of only 22-100 feet, or an average of very nearly 6 inches per mile. Between the international boundary and Winnipeg there are some small rapids and shoals. From here in low water there is a fall of only nine feet to St. Andrews, from there to Lake Winnipeg there is a fall of only seven feet; at the mouth of the river there are several channels through the prairie which has formed there, and which are rising nearer to the surface of the water every year, and extending into the lake at the rate of

## SIX FEET PER YEAR.

The river is tortuous in its course, more so than of us to the north, and its course has cut its way through the alluvial deposits and clays on an average of 100 feet below the prairie level to the ordinary low water mark. The depth of the river varies from two feet in places to 20

feet (but this only in the unimproved portions), and averaging 400 to 800 feet in width, and in the year 1880 was open and free from ice 214 days, or over seven months. It passes through one of the most fertile valleys in the world. In 1815 Mr. Robert McBeth, surveyor, of Kildonan, first knew Red River, and he says the river is now about one-third wider than then, and that in the fall of that year boats got aground at several points on the river coming up—viz., at St. Andrews, St. Pauls, and a short distance above where Broadway bridge now stands. At that time there was

## A BELT OF TIMBER

along the river on each side, in places a mile deep, and very good timber, oak, elm, ash and poplar. The Hudson's Bay post was where Fort Garry now stands, or what remains of it. There are people now living in St. Boniface who, 60 years ago crossed the Red River opposite the Archbishop's on horseback and on foot, jumping from one stone to another. Roger Goulet (surveyor) has walked across Red River opposite St. Boniface. Father Dugast has seen half-breeds crossing frequently on horseback, and says that the point between the Red and Assiniboine rivers has lost fully 400 feet in the last thirty years. In 1833 Father Thibault crossed the Assiniboine river on a fallen tree at the point where Main street bridge now stands. Mrs. Moyses, now living at Armstrong's Point, tells me that in 1851 a York boat would touch both banks of the Assiniboine in turning. Also at Moorhead, on the Red river, about forty years ago, Andre Beauchemin took a running leap and jumped across the river.

## THE ST. BONIFACE CLERGY

state that the river has increased in width some 150 feet on their side in the last sixty years, the same process going on on the other side of the river shows some 300 feet added to its width, which can be

easily accounted for from the combined action of the water and frost; the former, at high water, acts as an undermining agent in the very valuable and slippery clays, which occur in layers; and the latter, by downward as well as by side penetration in the banks, producing cracks along the shore line that become filled with rain and in time are forced by the ice expansion into great gaps, but this combined action slides huge masses into the river yearly, the lighter particles of which are carried

#### BY MECHANICAL SUSPENSION

to the delta of the river mouth, thus in time lengthening the river and filling up a portion of the lake, making new farms for future generations.

You will thus see from the foregoing evidence what remarkable changes have taken place in the memory of the old inhabitants, and men who are now living among you are witnesses of the fact; and these changes are going on at the present time, making the Red River yearly more capable of carrying off its own freshest water within its own banks, and unlike some of its tributaries not perceptibly lessening its depth. On the other hand all the evidence goes to show that the channel is deeper than formerly, as steamers now ply over in the lowest water where York boats used to ground—and the greatest of all changes since 1872 is the noble service it has performed in floating every requirement to build railways, bringing in locomotives, railway iron, immigrants and freights of all kinds.

#### ESTABLISHING PROSPEROUS CITIES

on its banks and settling its fertile valley—with farmers. Now we have a railway on both sides of the river, which has for a time rendered it of little value as a highway for traffic except to supply the saw mill with timber from its sources and tributaries. Although there are more steamers and of greater tonnage now than formerly plying upon it from Winnipeg north only, the question now presents itself, what will its future be? and what part will it play in the development of this wonderful country of ours? It is the international commercial link which joins us by a natural highway to our cousins over the boundary line, which ere long will bring on its water millions of bushels of grain seeking its natural outlet by Hudson's Bay. It was once supposed that the extension of railways would destroy the usefulness of waterways, but experience has shown that the

navigation of the Ohio grows greater year.

#### THE CARRIAGE OF FREIGHT

now far exceeds the traffic on any river in the country and at a cost of less than half what would be required for carriage on any railway. If any gentleman present will consult the annual report of the Chief of Engineers of the United States army he will find that the Government have been giving yearly appropriations for the improvement of the Red River of the North through Minnesota and Dakota. And what have they done? They have made a low water channel for 100 miles of three feet continuous depth on the upper waters of the river of ours, which has increased traffic from one bushel sent previous improvement to twenty bushels since improvement, and so much important attached to this work that they are ready \$200,000 to construct a lock and dam at Goose Rapids to facilitate the direct trade of the upper waters of this international and important highway. What are we doing to meet them? Well, we have made a good beginning; we have necessary outfit to begin river improvements with.

#### THE DOMINION GOVERNMENT

have built for the Red River a first-class steam tug, a steam dredge and two scows similar to those used by the Government for river improvements. By the time the ice is fairly out of the mouth of Winnipeg the outfit will be there begin operation on the steamboat channel through the delta at the mouth of the river, which is the first step to make the city of Winnipeg the head of navigation, which means much to the place, and in order to attain this desired object a lock, with a narrow dam, could be constructed at St. Andrews, which would give a constant depth of water, and which in high water would be no obstruction. If Winnipeg and this Province have their interests at heart, and wish to sustain their prosperity,

#### IMPROVE THE WATERWAYS.

Get Minnesota and Dakota grain to Hudson's Bay, and you can send Manitoba wheat to within 350 miles of sea board for 2 to 4 cents a bushel according to facilities, and all other freights in proportion during the season of navigation, as against the rates by other outlets—surely the Red River of the North deserves such helping measures at a comparatively small cost, as will en-

vince to re-  
and it will p-  
ers' resolute  
policies. It i-  
in Winnipeg  
ing centre,  
of grain, ca-  
over the en-  
a prospero-  
is the essen-  
ce between  
consumption  
THE COST O-  
nects the re-  
e present da-  
as ours, run-  
ea, 783 mile-  
to the g-  
d at a saving  
ushel of whe-  
products in-  
e producer i-  
e profit. La-  
mmercial a-  
ince alone th-  
wheat, whi-  
25,000 addit-  
on last year  
rt on one ar-  
ate, and the l-  
with the pr-  
e, and w-  
ra to come,

THE OUTFIT  
ed, in the ne-  
in mind our  
are in the vic-  
n taken place  
this land we  
ago was o-  
d, and which  
world, and to  
d to be, Pro-  
ar with its  
all countries  
to come in  
year. In c-  
a paper on  
valley, by  
arks are equ-  
er, its tributa-  
his heritage o-  
Northwest h-  
as the

FINEST  
the benefit o-  
rds, has give-  
worthy of ou-

grows greater province to reap richly for any out-  
 and it will prove a perfect cure for  
 or's resolutions and outcry about  
 policies. It means the establishment  
 in Winnipeg of a great grain dis-  
 tributing centre, which will equalize the  
 of grain, cattle and all other pro-  
 over the entire country, thus mak-  
 a prosperous and contented people;  
 is the essence of a contract, and the  
 between points of production  
 consumption reduces

THE COST OF TRANSPORTATION  
 meets the requirements of commerce  
 the present day, and navigable waters  
 as ours, running in a direct line to  
 sea, 783 miles shorter than any other  
 to the great consumers of the  
 at a saving of from 9 to 10 cents  
 bushel of wheat; and on cattle and  
 products in proportion, this means  
 the producer in this country an im-  
 mense profit. Last year it was conceded  
 commercial authorities that in this  
 province alone there was 2,500,000 bush-  
 els of wheat, which at 9 cents per bushel  
 would yield an additional profit to the far-  
 mer on last year's product available for  
 export on one article alone. With such  
 a rate, and the larger areas cultivated,  
 with the present population would  
 be ample, and with such incentives for  
 the farmer to come,

THE OUTLOOK IS BRIGHT.  
 ed, in the near future; always bear-  
 in mind our youth as a country.  
 ere in the wide world has such a tran-  
 sition taken place in so few short years  
 as this land we live in, which only ten  
 years ago was called the Great Lone  
 Land, and which is now the attraction of  
 the world, and to make it what it is de-  
 sired to be, Providence has peopled it  
 with its most energetic workers  
 from all countries, and they are contin-  
 uing to come in greater numbers year  
 after year. In conclusion, I will quote  
 from a paper on the floods of the Missis-  
 sippi valley, by "N. H. Shaler," whose  
 remarks are equally applicable to Red  
 River, its tributaries and the waterways  
 of this heritage of ours. Applying it to  
 the Northwest he says: Nature in giv-  
 ing us the

FINEST RIVER VALLEYS  
 the benefit of our race that the world  
 has given with it a burden of la-  
 bor worthy of our Government.

Unhappily at the present time the evils  
 of our system of appropriations for inter-  
 nal improvement have brought a certain  
 odium upon all the schemes for the bet-  
 terment of our waterways. There is an  
 unreasoning disposition among our peo-  
 ple unreflectingly to condemn all such  
 projects. This state of the public mind  
 will, it is hoped, prove transitory. The  
 problem of the Red and other river sys-  
 tems is a Dominion one, and it will soon  
 become so urgent that it must be treated  
 in a Dominion way. If the Federal Gov-  
 ernment, led by a sectional feeling that  
 is in striking contrast with the state of  
 the public mind a decade ago, refuses to  
 undertake the matter, then it will be nec-  
 essarily undertaken by some form of  
 association among the provinces  
 and States that are most im-  
 mediately concerned therein. It  
 needs no Daniel come to judgment to  
 show that such an associated action of  
 Provinces in a matter of continuous  
 governmental work would be full of the  
 gravest political dangers. It would be a  
 federation within the Dominion for  
 mutual protection against a danger that  
 the Federal Government had failed to re-  
 pel, it could not fail

#### TO WEAKEN THE BOND

of common interest, the source of common  
 obligation, and fraught with danger to  
 the Dominion at large. Once let it be  
 established in the public mind that the  
 vital interests of each section must be  
 cared for by association of the Provinces  
 and States immediately concerned there-  
 in, and the idea of a great all-sustain-  
 ing commonwealth will be fatally weak-  
 ened. Such a sundering of the moral  
 union of the people would pave the way  
 to it if it did not in itself warrant a polit-  
 ical disintegration of the Dominion. It  
 seems to me certain that no such policy  
 of blithely neglect can ever meet with con-  
 tinued approval in this country. Practi-  
 cal modern government exists for such  
 duties, and will be properly judged by  
 the efficiency by which they accomplish  
 them. So the Government of the prac-  
 tical age we are entering upon will stand  
 or fall by their power to combat the ele-  
 mental enemies—pestilence, flood and  
 famine, or what else of ill to which man  
 tamely submitted.

T

What is now  
the north, ta  
most numbe  
e southern po  
a portion of  
ate of Minn  
ation on the  
out 25 miles  
y of the St  
minutes. I  
therly direc  
miles until  
little to the  
high point it  
est and follo  
dge a distanc  
Here it is jo  
ver, which f  
ake Traverse.  
about 22 m  
flutary flow  
out half wa  
nd Breckenric  
Lake Traver  
f water, stretc  
ade 45 degr  
out 30 miles  
iles in wid  
e height of  
e country,  
ow into the  
high empty  
hese latter w  
esota River,  
iles to the  
nd of Lake T  
out a miles  
ig Stony Lak  
hat similar s  
urving in exa  
ome 25 mile  
out 4 miles  
n end of w  
ontinues, and  
reds of miles  
hen to the n  
lississippi Riv  
t. Paul.  
It is unnece  
f waters furt  
erred to her  
ears ago, an

# THE RED RIVER.

BY JAMES H. ROWAN. ESQ., C.E.

What is now known as the Red River to the north, takes its rise in a region of most numberless lakes, situated in the southern portion of Becker and northern portion of Ottertail Counties, in the State of Minnesota, not far from Detroit station on the Northern Pacific Railway; about 25 miles east of the western boundary of the State in latitude 46 degrees, 5 minutes. From thence it flows in a westerly direction for a distance of about 50 miles until it reaches a point east, and a little to the south of Breckenridge, at which point it makes a sharp turn to the west and follows that course to Breckenridge a distance of about 25 miles.

Here it is joined by the Bois de Sioux River, which flows from the south out of Lake Traverse. The Bois de Sioux River is about 22 miles in length, and has one tributary flowing into it from the east, about half way between Lake Traverse and Breckenridge. Name unknown.

Lake Traverse is a crescent shaped sheet of water, stretching from south west latitude 45 degrees, 30 minutes to north, about 30 miles in length and from 1 to 2 miles in width. At its southern end is the height of land which, in that part of the country, divides the waters which flow into the Arctic Ocean from those which empty into the Gulf of Mexico. These latter waters begin here in the Minnesota River, which take its rise about 25 miles to the northwest of the southern end of Lake Traverse and flowing within about 4 miles of this point, empty into Big Stony Lake, a sheet of water of somewhat similar shape to Lake Traverse, but flowing in exactly the opposite direction, some 25 miles in length and averaging about 4 miles in width; from the southern end of which the Minnesota River continues, and after flowing some hundreds of miles first to the south east, and then to the north west, empties into the Mississippi River in the neighborhood of St. Paul.

It is unnecessary to follow this system of waters further, and they are only referred to here because, about 25 or 30 years ago, an effort was made to bring a

steamboat into the waters of the Red River by this route. For, during periods of high water, Lakes Traverse and Big Stone are united, and I believe the only reason why the attempt was not successful, was, that she did not get to the height of land during the period of high water. Her machinery was, at a subsequent date removed and placed on board the "International" which some of those now present may remember to have seen on our river some years ago.

I opened this paper by stating "What is now known as the Red River, because, that portion of it extending from its source to Breckenridge, which is the point we had reached, was formerly called the Ottertail River. From this we find it following a general course almost due north to Grand Forks, a distance of about 120 miles.

At Grand Forks the Red Lake River flows in from the east and from this point down to Lake Winnipeg, a distance of about 190 miles, still following a course almost due north.

It may here be stated, in order to prevent mistakes as regards distances, that the lengths of the river heretofore given have all been given in straight lines, and that, in order to arrive at anything like a true estimate of the length of the river, it is necessary, for that portion of it extending from its source to Winnipeg, to multiply the distances *by two*. More accurate detailed distances of the river will, however, be given in a subsequent part of this paper.

The course of the river from its source to its outlet having been traced, I shall now proceed to name its tributaries, taking those which flow into it from the east first, and commencing from the south: The first of them is Buffalo River, which, rising some miles north of the source of Red River, in a country of very similar character; and, after flowing a distance of 60 or 70 miles, empties into the Red River at Georgetown, about 50 miles north of Breckenridge.

Wild Rice River empties in 75 miles north of Breckenridge.



The greater part of this vast area may be described as rolling prairie, the soil of which is of unsurpassed richness and fertility.

Through a part of this prairie the Red River has cut for itself a very tortuous channel, so that it now flows, at low water, at a level of from 20 feet to 50 feet above the prairie level. Between the high and low water levels there is a strip or interval of land about 10 feet wide at low water, covered with a thick growth of various trees, principally, oak, ash, elm, maple, cotton wood and willows. During the summer it supports a rank vegetation of ferns and various other plants; in some places it is under cultivation.

This interval averages about one quarter of a mile in width, and through it the river winds from side to side. Where it reaches the sides, or in other words, the prairie bank, the sides are steep, and is a peculiar fact, noted by the United States Engineers, that in nearly every place the deep water or channel is near these points, while the bars or shoals are in the bends, or, in other words, the channel is on the convex and the shoals on the concave side of the river.

The bed of the river is composed of alluvial sand and blue clay, principally the latter, on top of which is the true prairie soil of black loam, varying in depth from one to two feet in the upper river, to four to five feet north of the International Boundary.

The United States Congress have within the past five years had surveys made, soundings taken, and appropriated various sums of money for the improvement of the navigation of their portion of the river. From the reports of the Chief of Engineers of the United States Army, which give very full and interesting information on this subject, I have collected some facts and data which are appended to this paper, being supplemented by information gathered by myself on that portion of the river flowing through Canadian territory.

From the above reports it would appear that the navigation of the river from Breckenridge to Abercrombie, a distance of 25 miles, is not practicable except during high water. From the latter point to the International boundary they are furnishing a low water channel of 3 feet in depth by 60 feet in width, by means of digging and the building of a lock and dam, at a point called Grose Rapids.

This latter work is estimated to cost \$100,000.

No appropriation has been made, as yet, by Congress, for this work, consequently nothing beyond the survey has been undertaken; but \$113,000 has been voted and \$90,800 expended in dredging, removing snags and overhanging trees on that portion of the river extending from Breckenridge northward to some distance below Fargo, up to 30th June, 1882. The accompanying table shows how largely the local trade on the river has increased within the last few years, and the authorities are of the opinion that this is due, to a considerable extent, to the improvements which have been made; and, were improvements of a similar character made in the portion of the river flowing through Canadian territory, giving a channel 60 feet wide and 3 feet deep at lowest water, from the International Boundary to Winnipeg, and from here to the lakes say 100 feet wide by at least 6 feet deep at lowest water, there can be little doubt but that the Red River would become an important factor in the transport of grain, &c., towards the sea board, in the near future, when the transatlantic route via Hudson's Bay is opened up.

On this subject as well as that of the floods caused by the river, and the best means of overcoming them, I intended to have spoken this evening; but as I have already trespassed largely on your patience, and these are subjects which will require some considerable time to elucidate, I shall have to defer them to another occasion; in the meantime I submit some reliable information, in the form of a table, on the subject of high water, and the quantity of water discharged by the river during that period, at various points.

In this connection it is worthy of note that, assuming the sectional area of the river during the low water period, to be represented by the figure 1; its capacity of discharge when full up to, but not overflowing the prairie, would be represented by 20, for all that portion from the mouth of the Assiniboine to a little below St. Andrew's rapids, while, from there down to below the Stone Fort but above Selkirk, the sectional area would be represented by the figure 8, or less than half the other; that this has a very important bearing on the question of high water at Winnipeg I think there can be little question.

TABLE OF SLOPES AND DISTANCES BY RIVER FROM BRECKENRIDGE TO LAKE WINNIEPESKONG

FROM BRECKENRIDGE TO STATION.	FALL BETWEEN STATIONS	TOTAL FALL.	DISTANCE BETWEEN STATIONS	TOTAL DISTANCE FROM BRECKENRIDGE	SLOPE PR. MILE BETWEEN STATIONS	HEIGHT ABOVE SEA LEVEL.		
Breckenridge.....	0.00	0.00	0.00	0.00	0.00	947.72		
Fort Abercrombie.....	35.54	35.54	25.97	25.97	1.36	912.18		
Mouth of Rice River.....	35.12	70.66	56.50	82.47	0.62	877.06		
Fargo.....	5.74	76.40	19.10	101.57	0.30	871.32		
Elm River.....	31.59	107.99	61.52	163.09	0.51	839.73		
Goose River.....	14.97	122.96	28.63	191.72	0.52	824.76		
Ol.....	1.42	124.38	1.00	192.72	1.42	823.34		
Proposed Dam.....	10.37	134.75	11.64	204.36	0.89	812.97		
Frog Point.....	13.48	148.23	13.85	218.21	0.90	799.49		
Grand Forks.....	12.80	161.03	35.00	253.21	0.36	786.69		
Turtle River.....	6.20	167.23	25.00	278.21	0.25	780.49		
Pelican Bar.....	20.66	187.89	70.50	348.71	0.28	759.83		
Penbina.....	9.33	197.22	48.00	396.71	0.19	750.50		
International Boundary.								
Joe Creek.....	No detailed levels have been taken along this portion of the river. It is assumed that the fall is near uniform throughout, except at "Crooked Rapids."		3.12	399.83	where there is probably a fall of about two feet in one and one half miles.			
Roseau River.....			11.50	411.33				
Riviere aux Marais.....			1.30	412.63				
Outlet Marion Lake.....			10.23	422.86				
Plum River.....			6.97	429.83				
Scratching River.....			12.10	441.93				
Crooked Rapids.....			18.49	460.42				
Rat River.....			4.63	465.05				
Pointe Coupe.....			11.66	476.71				
Riviere Salle.....			7.28	483.99				
Assiniboine River.....			215.82	17.84		501.83	731.90	
Riviere la Seine.....		0.10	215.92	1.84		503.67	0.05	731.80
St. John's College.....		0.05	215.97	1.32		504.99	0.04	731.75
Kildonan Church.....		0.25	216.22	3.37		508.36	0.07	731.50
Tait's Creek.....	2.58	238.80	6.66	515.02	0.37	728.92		
St. Andrew's Rapids.....	}	0.97	219.77	4.22	519.83	0.02	727.95	
		4.87	224.64	0.87	520.70	5.59	723.08	
Stone Fort.....		3.76	228.40	3.04	523.74	1.23	719.32	
C. P. R. Crossing, Selkirk		0.61	229.01	5.40	529.14	0.10	718.71	
Lake Winnipeg.....		2.50	231.51	20.50	549.64	0.12	716.21	

NOTE!—The distances along the river are given by the United States Engineers from Breckenridge to Penbina. If this means Fort Penbina, or the town of Penbina, and not the International Boundary, the distance (by river) between either these points (which is unknown to the undersigned) would have to be added to Northern points, as they are measured from the International Boundary to the lake.

FLOOD LEVELS.

		LOW WATER.	HIGH WATER.	DIFFERENCE.
Fargo.....	}	1881	871.32	27.3
		1882	871.32	904.50

water disch  
h water disc  
River.....  
iles below t  
w water disc  
h water disc  
onia or (G  
Forks.....  
ina.....  
e average he  
w water disc  
h water disc  
h water disc  
w water disc  
h water disc  
Andrews Ra  
Fort.....  
erage height  
R. Crossing  
erage height  
TE:—The n  
sl as rough a

water discharge feet per second  
 high water discharge feet per second, estimated at 20,000 feet.

River.....	}	1881	839.73	864.90	24.17
		1882	839.73	874.90	35.17

miles below this point.  
 low water discharge feet per second.  
 high water discharge feet per second, estimated 30,000 feet.

onia or (Goose River).....	1882	824.76	864.36	39.60
Forks .....	1882	786.69	829.19	42.5
Pembina .....	}	10 May 1873	750.50	783.40
		26 April 1874		770.00
		26 April 1875		779.50
		22 April 1876		776.90
		June 1877		778.10
	1882		789.00	38.50

average height of the banks at Pembina is 787.00  
 low water discharge.  
 high water discharge, estimated 40,000 to 50,000 feet.

Winnipeg.....	}	1826		769.15	}	37.25
		1852		767.15		35.25
		1861		764.87		32.97
		1875	731.90	757.07		18.17
		1882		758.68		26.78

average height of the banks or Prairie level, at Winnipeg is 765.00  
 low water discharge per second, (below Assiniboine River,) 4,000 to 5,000 feet.  
 high water discharge per second, (below Assiniboine River,) 80,000 to 100,000 feet.  
 low water discharge per second, (above Assiniboine River,) 3,000 to 3,500 feet.  
 high water discharge per second (above Assiniboine River,) 50,000 to 60,000 feet.  
 low water discharge per second, Assiniboine River, 1,000 to 1,500 feet.  
 high water discharge per second, Assiniboine River, 30,000 to 40,000 feet.

Andrews Rapids (head of).....	}	1826	727.95	755.30	}	27.75
		1852		751.25		23.30
		1875		742.10		14.15
		1882		744.01		16.06

average height of bank of river, 760.00

Fort.....	}	1826	719.5-	751.75	}	32.43
		1852		747.71		28.39
		1875		739.83		20.51
		1882		736.17		16.58

average height of bank of river, 753.00

R. Crossing, Selkirk.....	}	1826	718.71	739.00	}	20.29
		1852		732.76		14.05
		1875		732.76		14.05
		1882		732.14		13.42

average height of bank of river, (Prairie level,) 745.50

NOTE:—The number of cubic feet per second given as the discharge are only in-  
 dicated as rough approximations.

LAKE WINNIPEG  
 HEIGHT ABOVE SEA LEVEL.  
 00 947.72  
 36 912.18  
 52 877.06  
 80 871.32  
 51 839.73  
 52 824.76  
 42 823.34  
 59 812.97  
 00 799.49  
 36 786.69  
 25 780.49  
 28 759.83  
 49 750.50

two feet in one and one half miles.  
 05 731.90  
 04 731.50  
 07 731.75  
 37 731.50  
 02 728.92  
 59 727.95  
 23 723.08  
 10 719.32  
 12 718.71  
 716.21

States Engineer  
 the town of Pe  
 between either  
 to be added to  
 lary to the la

ER DIFFEREN  
 0 27.  
 0 33.

The sectional area of the river, speaking in general terms, at low water being as 1. for any point between the mouth of the Assiniboine, and a short distance above the Stone Fort. Its relation to the high water area, between the banks up to prairie level, but not overflowing the latter, between the Assiniboine and St. Anthony rapids, is as 1 to 20; between the latter point and a short distance below the Stone Fort it is as 1 to 8.

RAIN FALL.

Abercrombie.....	Rain—1873.....	11.42 in.
	Snow—not measured in 1873.	
	Average of 12 years—4 inches per year.	
Pembina.....	Rain—average of 3 years.....	13.16 in.
	Snow—not given.	
Wadsworth.....	Rain—average of 5 years.....	18.95 in.
	Snow—not given.	
Winnipeg.....	Rain—average 11 years—1871-1881.....	17.57 in.
	Snow.	

STATEMENT SHOWING AMOUNTS APPROPRIATED BY THE CONGRESS OF THE UNITED STATES OF, FOR, AND EXPENDED ON THE IMPROVEMENT OF THE RED RIVER 30TH JUNE, 1883, AND 1ST JULY, 1883, RESPECTIVELY.

APPROPRIATIONS.		EXPENDITURES.	
14th August, 1876.....	\$10,000 00	1st July, 1878.....	\$ 8,438
18th June, 1878.....	30,000 00	do 1879.....	15,260
3rd March, 1879.....	25,000 00	do 1880.....	15,157
14th June, 1880.....	20,000 00	do 1881.....	9,846
3rd March, 1881.....	18,000 00	do 1882.....	42,162
2nd August, 1882.....	10,000 00		
	<b>\$113,000 00</b>		<b>\$90,863</b>
Balance unexpended.....			22,136
			<b>\$113,000</b>

Major Farquhar's original estimate for improvement of river .....	\$145,310 18
Already appropriated.....	\$113,000 00
Required to complete.....	32,310 18
	<b>\$145,310 18</b>
Major Farquhar's original estimate cost of lock and dam, Goose Rapids .....	\$219,287 99
Subsequently reduced by.....	29,287 99
	<b>190,000</b>
	<b>\$335,310 18</b>

Owing to enhanced prices of material and labour United States Engineers estimate that the work will cost from 30 to 50 per cent. more than the original estimate.

## COMMERCIAL STATISTICS.

## FREIGHT RECEIVED AND SHIPPED—SEASON 1878.

BY WHAT LINE.	NO OF LBS. FREIGHT DOWN.	NO OF LBS. FREIGHT UP.	PASS- ENGER.	REMARKS.
..... 11.42 in				
ndin Line.....	25,000,000	12,000,000	not stated.	Steamers.
H. Davy .....	220,000	1,200,000	"	"
ns & Finkle .....	1,890,000		"	Flat boat
k & McClure.....	2,000,000	247,000	"	"
out.....	10,000,000		"	"
River Transportation Co.,...	24,560,000	4,916,000	13,190	Steamboat & barge
..... 17.57 in				
	62,670,000	18,363,000	13,190	

## FREIGHT RECEIVED AND SHIPPED—SEASON 1879.

BY WHAT LINE.	NO OF LBS. FREIGHT DOWN.	NO OF LBS. FREIGHT UP.	PASS- ENGER.	REMARKS.
ndin Steamer.....	2,522,949	5,431,683	not stated.	Local freight.
ck Steamer.....	800,000	1,200,000	"	"
do .....	240,000		"	"
Boats.....	577,860		"	"
do .....	17,817,196			Moorhead to Win- nipeg.
River Transportation Co.,...	7,040,390			Fishers landing and St. Vincent to Winnipeg.
do do		88,659		Winnipeg to St. Vincent.
	28,998,389	6,720,342		

## FREIGHT RECEIVED AND SHIPPED—SEASON 1880.

BY WHAT LINE.	NO OF LBS. FREIGHT DOWN.	NO OF LBS. FREIGHT UP.	PASS- ENGER.	REMARKS.
..... \$145,310				
..... 10 18				
op Line Steamers.....	5,999,181	3,997,000	not stated.	
Boat and Raft.....	9,833,345			
ges.....	1,170,320			
ndin Line of Steamers.....	4,590,284	10,568,995		15,620,215 of the total freight was wheat.
River Transportation Co.,....	7,040,390	102,000		
	28,633,520	14,667,955		

States Eng  
than the orig

FREIGHT RECEIVED AND SHIPPED--SEASON 1881.

BY WHAT LINE.	NO OF LBS. FREIGHT DOWN.	NO OF LBS. FREIGHT UP.	PASS- ENGER.	REMARKS.
Alsop Line Steamers.....	5,258,854	2,783,865	not stated.	27,000,000 lbs the total freight was wheat.
Grandin Line Steamers.....	4,497,180	16,680,000		
Selkirk Steamers .....	13,596,000	5,148,000		
Flat Boats and Barges .....	5,150,365			
	28,502,399	24,612,062		

During the season of 1880 there were 8 steamboats and 22 barges, with a number of flatboats, engaged in the commerce of the river between Abercrombie and Winnipeg, but the Canadian authorities having placed an embargo on American flatboats plying in Canadian waters, the numbers were reduced in 1881 to 4 steamboats and 15 barges on the United States portion of the river, the balance being sold to Canadians to run north of the International Boundary.

ESTIMATE OF WHEAT RAISED IN THE UNITED STATES PORTION OF THE RED RIVER VALLEY DURING THE SEASON 1879.

Minnesota .....	}	Clay County,	640,000 lbs
		Wilkin "	300,000
		Polk "	510,000
		Marshal "	75,000
Dakota .....	}	Kittson "	150,000
		Richland "	150,000
		Cass "	1,300,000
		Traile "	900,000
		Grand Forks "	500,000
		Pembina "	150,000
Total.....			4,675,000

T  
Scientific Descri  
BY ER  
THE PRAIRIE C  
ROUSE (PEDI  
For brevity i  
ouse, resemb  
e family in i  
pearance, bu  
without any  
fts, and its t  
d stiff, excep  
r, which a  
ey project an  
d end the tail  
It is a matter  
o long feathe  
rely develop  
eir insertion  
e true quills  
at they are  
pe they grad  
ning quill fe  
ablishes the  
true rectrice  
ity of the tail  
me of "sha  
ouse, though  
is best know  
in Manitoba  
tribution is  
aries. I hav  
e Big Plain.  
d Shell river  
w far west it  
been found  
Lake Superi  
one time it r  
ath than at p  
ating before  
(trao cupida)  
Manitoba by  
ave seen a n  
shin twenty  
arable that a  
facts regard  
instead of gi  
the bird a sp  
ited. There

# THE PRAIRIE CHICKEN.

Scientific Description of the Bird and its Habits. Hints on Rearing and Domestication.

BY ERNEST E. T. SETON, ESQ., OF CARBERRY, MAN.

THE PRAIRIE CHICKEN OR SHARP-TAILED GROUSE (PEDICETES PHASIANELLUS.)

For brevity it may be described as a grouse, resembling the other members of the family in its general anatomy and appearance, but differing in that its neck without any specially developed feathers, and its tail feathers are very short and stiff, except, however, the central pair, which are softer and so long that they project an inch beyond the others and end the tail in a point.

It is a matter of doubt whether these so long feathers are true tail feathers or merely developed coverts. The fact that their insertion is slightly above that of the true quills would seem to indicate that they are coverts, but in color and shape they grade perfectly into the adjoining quill feathers, which fact, I think, establishes their claim to be considered true rectrices. It is from this peculiarity of the tail that the bird gets the name of "sharptailed" or "pintailed" grouse, though, throughout this country, its best known as the prairie chicken.

In Manitoba at least this bird in its distribution is co-extensive with the prairies. I have found it abundant in the Big Plain, Turtle Mountain, Souris and Shell river districts, but cannot say how far west it extends. In the east it has been found as far as the north shore of Lake Superior. It is supposed that some time it ranged much further to the west than at present, but that it is retreating before the pinnated grouse (*Trao cupida*) which has already entered Manitoba by the Red River Valley. I have seen a number of specimens taken within twenty miles of Winnipeg. It is desirable that a record be kept of any facts regarding this encroachment.

Instead of giving a detailed description of the bird a specimen of a female is exhibited. There is little difference in gen-

eral appearance between the sexes. The male has over or behind the eye a patch of bare papillaceous skin, which is of a brilliant yellow (not red as was supposed by Eastern naturalists) and on each side of the neck a bare air sac of a blue color and about the size of a pigeon's egg. These are connected with the mouth for they can be inflated by blowing into the throat. When not displayed the sacs are merely sunken under the surrounding feathers which are not in any way specially developed as in the Ruffed and Pinnated Grouse. During the breeding season they are more or less inflated and are highly colored even when the bird is quiescent.

The female differs only in having these bare skin ornamentations much smaller (not absent as I have seen stated). The young of both sexes are indistinguishable from the female (or from the male in non-breeding season) except that they are smaller and have the hair-like feathers on the feet shorter and more marked with clouded gray. The leg-feathering ends at the base of the toes and half conceals them by reason of its length.

Their toes, as with all grouse, are notably pectinated. Not having heard any theory as to the use of these combs, except that of cleansing their feathers, I give the results of a few observations. In early spring the combs begin to drop off, just an odd one adhering here and there. In a week or two they are all gone and during the summer the toes are clean and smooth. After the second or third week, (about mid-August or earlier) both the young and parent birds begin to show a row of growing scales along both sides of each toe. These develop with the growth of the chicks until October, when the birds are full grown, and then the young and old show their snow combs perfectly developed. The combs

existing only in winter, it is natural to infer that they are meant to act as snow-shoes or as extra claws to stay the bird from slipping on the crust and on the icy limbs of the trees where browse forms its winter food. These snow combs continue in perfection during the six months of winter, but are at once shed on the advent of warm weather.

The tail feathers, already alluded to, are exceedingly stiff and sonorous. When the male is strutting before the female, or when either the male or female is shot at and dying the tail is rapidly opened and shut, the stiff feathers making a loud noise like porcupinos' quills, or like the shaking of a newspaper. The muscles for expanding the tail seem to be very largely developed.

The chickens winter in the dense bush, but in spring, before the snow is quite gone, they scatter over the prairies, where only they are found during the summer. In the spring they are very shy for it is only the shy and wary ones who have successfully run the gauntlet of such winter hunters as owls, foxes, wolves, minks and Indians.

Their advent on the still snow-covered plains might be reckoned premature and fatal to many, but they find a good friend in the wild rose (*Rosa lucida*). It is abundant almost everywhere, and the red-ripe hips, unlike other fruit, continue to hang on the stiff stems high above the damage of wet and earth. The rose grows most abundantly on the high, sandy knolls, where the snow is thinnest, and here the grouse congregate and are fed. In this section of the Northwest gravel is not abundant, so that birds requiring to use it to aid digestion would be in a dilemma were it not that the stones found in the rose-hips answer the same purpose. The rose-hip supplies at once both millstones and grist, the flesh at the same time receiving a delicate flavor, the gizzard of a newly-killed grouse emitting also a pleasing odor of rose. It is difficult to over-estimate the importance of the rose to this and other birds. To illustrate the usefulness of the rose, I append a table of observations on the contents of the crop of the grouse.

April Rosehips—Birch and willow birds.

May Do.—Sandflowers (anemone patens.)

June Do.—Grasshoppers, grass and various.

July Do.—Star grass seed (an Iris.)

August Do.—Grass and berries.

September Do.—Do. do.

October Do.—Do. do.

November Do.—Birch and willow browse, arbutus berries, &c.

December Do.—Juniper berries and browse.

January Do.—Browse and Equisetum (horsetail) tops.

February Do.—Browse.

March Do.—Do.

This, of course, is a mere list of staple food, the grouse being quite omnivorous, but shows the importance of the rose-hips for they are always attainable even in winter, through their two valuable qualities of growing where the snow lies the nest, and of not falling when ripe.

I doubt not that the bird and the fruit are mutually serviceable, for the millstones are passed with unimpaired vitality and germinate more readily by the cooling becoming thinner by the operation and the hips are distributed over a much larger area.

Next after the hips their most important food in May is the sandflower (*Anemone Patens*), which purples with its millions the prairies from the Great Lakes to the Rockies. The fruit of this flower is large, fleshy, pungent and apparently very nutritive. It comes up before the snow is gone and ere the grass begins to show and forms the food of buffaloes, deer, horses, cattle, cranes, grouse, geese, &c.

When the snow disappears and warm weather sets in the chickens meet every morning in companies of from four, five to 20, on some selected hillock or knoll to indulge in what is called "the dance." They commence at dawn. The birds may be seen standing in ordinary attitude until suddenly one lowers his head, spreads out his wings horizontally, but slightly dipped, and his tail perpendicularly. He extends his air sacs and erects his feathers then taking the very shortest steps, stamping his feet so fast and hard that the sound is like that of a kettle drum. He careers about, beating the air with his wings and vibrating the tail so that it rattles loudly, uttering a sort of creaking crow, which seems to come from the throat. When one commences all join in rattling, stamping, drumming, dancing, lowering and louder, faster and faster, till as they madly whirl about they are fairly leaping over each other in their excitement. They continue for a minute or two, then they gradually relax, but only for a short time, when they are again started

one leading  
dance remi  
ree dance" a  
the birds wa  
n exercise, th  
hi-hi's of t  
the wing c  
pping and c  
e space usua  
from fifty to  
is called in  
e name of the  
e dance is in  
morning fr  
erally till th  
throughout  
it will be see  
newhat to th  
orld Ruff, a b  
polygamous  
sons I exp  
ven that the  
When the bi  
they do no  
mediately tal  
as they r  
ack," "cack  
gh. This i  
ultaneously  
ags, and so  
se circumsta  
ed it was ca  
since have  
en the bird  
on the grou  
ntly. They  
ar whistle of  
and a sort of  
ned in by t  
eir mode of f  
ms every for  
id and stro  
t I have seen  
his swiftness  
grime falcon  
escape by flig  
The hen nests  
erally near  
timber. The  
hed over by t  
h a few straw  
eggs no large  
son. Just be  
delicate blu  
y show a pu  
after a few  
e of a deep  
dark spots  
y gradually c  
ed partly  
the scratching  
ing them.

one leading off. The whole performance reminds one so strongly of a "ree dance" as to suggest that the dance of the birds was the prototype of the Indian exercise, the drumming noise, stamping, hi-hi's of the Indian corresponding to the wing drumming, tail rattling, clapping and crowing of the chickens. The space usually beaten by the dancing is from fifty to one hundred feet square, and is called in the Western States by the name of their "scratching ground." The dance is indulged in at any time of morning from dawn till noon, but generally till the sun is up, and is carried throughout the month of May.

It will be seen that this corresponds somewhat to the manoeuvres of the Old World Ruff, a bird that is well known to be polygamous and for this and other reasons I expect that it may yet be proven that the grouse do not pair.

When the birds are disturbed on the ground they do not hide in the grass, but immediately take wing and scatter, uttering as they rise a peculiar vibratory "cack," "cack," "cack," almost like a whistle. This is nearly always uttered simultaneously with the beating of the wings, and so rarely heard except under these circumstances that I at first supposed it was caused by the wings alone, but since have heard the sound both when the bird was sailing and when it was on the ground, besides seeing it fly off suddenly. They have also a call, a soft, low whistle of three slurred notes, E A E and a sort of grunt of alarm, which is uttered in by the pack as they fly off. Their mode of flight is to flap and sail by turns every forty or fifty yards, and so light and strong are they on the wing that I have seen a chicken save himself his swiftness from the first stoop of a peregrine falcon, while another was seen to escape by flight from a snowy owl.

The hen nests in the long grass tangle, generally near cover, or on the edge of timber. The nest is a slight hollow dug over by the grass and lined only with a few straws. She lays from 14 to 16 eggs no larger than that of a common hen. Just before expulsion they are a delicate blueish-green, on being laid they show a purplish grape-like bloom, and after a few days exposure they become of a deep chocolate brown with a few dark spots. In a fortnight after they gradually change to a dirty white, and are shed partly by bleaching and partly by the scratching of the mothers bill in cleaning them.

Common as are added or unfertile eggs in the barnyard I never in nature found more than one and that was of the present species. I found the nest in June, the hen was sitting on eight eggs (less than the compliment). I left it undisturbed and returned some weeks after to find that all had been hatched but one and this on inspection proved non-fertile. Assuming that they really and faithfully pair it may be accounted for in this instance, by supposing that the male was killed, and that the female laid her last egg unimpregnated and carried out her duties alone.

Having determined to raise some of the grouse in the barnyard, I set two common hens with prairie chicken eggs. The eggs were subjected to some very rough usage, all of them having made a long journey, either with a man on horseback or in a buggy over the prairie. The amount of shaking they bore would have endangered the vitality of any barn fowl egg. Besides this, through the negligence of the hen, they were several times left cold for some hours. Notwithstanding these disadvantages, after about twenty days the whole of the eggs came out. I put them with one large hen and enclosed for them a piece of prairie, in its natural state, so as to have their surroundings as natural as possible. They were bright little chicks, clad in golden down, with black spots above. When they squatted in the grass their color was a perfect concealment. Their only note was the triple whistle-call, in a higher key, however, than that of the old ones. At first their wings all appeared with rows of large blood quills. As soon as they could run they showed a desire to drink, and on water being set before them they drank much and often. This was rather surprising, as in a state of nature they are hatched in the driest places and far from water.

2nd day.—They are very active, catching flies, etc., they care little for any kind of food but that of living insects, but will now and then eat a little hard-boiled egg, or if oatmeal be wetted and splashed about the grass they will peck off a good deal of it.

3rd day.—Three are dead; one was drowned and two were killed by the hen trampling them. The hen was a Brahma and weighed about six pounds. I would recommend that a Game or Bantam hen be used in future, as the mother prairie chicken weighs barely two pounds at

this time. This left me now twenty-two chicks.

4th day.—The chicks are now developing their scapulars.

7th day.—They can now fly a little, as the wing quills are very large and strong. I have reason to believe that when wild, that their development is even more rapid.

8th day.—They are now fledging on the neck, the wings are completely feathered; otherwise they are clad in down. At this time, when in a state of nature, should the old bird be surprised, she goes off with a loud whirr, but immediately a dozen little "whirrs" are heard as she flies, and is followed by what appears to be the unpractical eye, like a flock of sparrows, but in reality by her brood, which are already strong on the wing.

9th day.—All fly well, and their voices are changing from the high-pitched "peep" to the deeper "chuck" of the old ones.

13th day.—They now number but fifteen, the loss being caused by the clumsiness of the foster mother and the strict confinement. Yet if they be let out, they would be lost in the long grass, and could not be gathered together again by the hen, as they do not understand her "chuckle." They are now well grown and feathered on the back. They still adhere to insect food, rarely eating anything of a vegetable nature except that they are fond of wild strawberries. An ant's nest that would quite fill an ordinary bucket they pick clean in a day.

14th day.—A cold day, though this is the 13th of July. Fearing for the safety of the chickens I took them into the house. They sat under the stove on the tin. Here they chanced also to receive the direct rays of the sun as it shone through the window. Suddenly one of them jumped up and commenced to dance in the same manner as the old ones did on the hill, immediately the whole brood joined, their little feet stamping together on the tin under the stove, sounded like so many kettle drums, while their miniature crowing and strutting combined to form a most ludicrous spectacle.

17th day.—They number 13. They are now more than ever fond of the dance. They show the bare skin patches over the eye and on the neck, but these are neither colored nor inflated. Their heads are beginning to fledge and

their tails to grow. Their wings are much longer in proportion to those of adult birds.

About this time I was traversing a scrub land by night when suddenly heard at my feet a well-known whirr, clutched in the darkness and caught young prairie chicken in each hand. One of these on examination was found to have hanging from the anus eight large intestinal worms, which at once began to recede into the canal. Some of the worms were sent to the Smithsonian Institution, but being imperfect could not be identified. They were probably nondescript. I have yet to investigate the subject.

18th day.—The wild chickens, apparently of the same age as my penned birds, can fly a mile or more, indeed they seem as strong on the wing as the adult.

20th day.—The chicks number 12, small one which died weighed only one ounce. I would here contrast its development with that of the adult. An adult prairie chicken weighs two pounds, each of its wings is eleven inches long and five inches across, which gives a total wing surface of 110 square inches or 22 square inches to each ounce of weight. The young one weighs an ounce, each of its wings is four inches long by two inches across, which gives a total wing surface of 16 square inches to its one ounce of weight. Therefore the young chick has in proportion nearly five times as much wing support as the mature bird, although, of course, the latter is more than compensated by the vastly greater proportion of muscular power.

22nd day.—They now have the adult voice and are all feathered except on the throat, neck and breasts, where they still retain the yellow down. They will now eat a little grain and are fond of cured eggs and soaked bread, but insects continue to be their favorite food. Burning beetles, however, they will not eat.

28th day.—To-day I emptied a lot of ashes into the pen, whereupon they indulged in most extravagant expressions of delight, and for a long time continued to dust themselves most vigorously.

31st day.—Trised them with a domestic hawk. All chuckled and squatted except two, the latter spreading their wings and tail and raising their feathers, crowing loudly and defiantly. I imagine the wild mother will often battle for her young successfully against harriers and other inferior birds of prey.

It is not necessary to follow further detail the growth and development of

grouse,  
to illustra  
h and to  
them. To  
are fully fe  
and fully gro  
at this age c  
though at t  
seven chick  
rd, out of  
of 15, still  
oned by t  
natural ener  
ke.

to be obac  
grain in  
not appear  
standing  
are fully g  
to the stacks  
capacity which  
largely to his  
small damage  
parts of the  
estimating,  
y continue  
arms until  
immediatel  
asse to the ti  
summer the  
ren at night  
in the gras  
them their  
y on the bro  
clump of bir  
every mornin  
sportsmen, fo  
flavored. T  
and are very  
ch seems to  
en is able to  
as a duck.  
ash of the le  
are of feathe  
el, yet the l  
and seemed  
the winter a  
into the pla  
parsely wood  
as is sandy  
bushes. In  
properly ad  
of a ground  
ly from one  
and walk a  
ct case, see  
time there  
upon a tree  
that feeling  
which makes  
prey to p

grouse, as sufficient has been to illustrate the rapidity of their growth and to guide all who desire to raise them. To be brief, I may add that they are fully feathered when six weeks and fully grown at two months. They at this age continue with the mother, although at this time not more than seven chicks are seen with the parent, out of the average original brood of 15, still I think that the loss is caused by their falling victims to natural enemies or are destroyed by accidents.

It is to be observed that I never yet saw grain in their crops so that it does not appear that they can be injured by standing grain. But when they are fully grown they do find their way to the stacks with a regularity and facility which permit the farmer to be largely to his table luxuries, while the small damage they can do to the exports of the grain in stack is hardly worth estimating.

They continue on the plains and about farms until the first fall of snow immediately causes them to depart for the timber.

In summer they rarely perch on trees, even at night, for they sleep squatting in the grass, but in winter they find them their favorite stations and live upon the browse there gathered. Any clump of birch is sure to contain a grouse every morning. This is the time sportsmen, for now they are fat and well flavored. They afford good sport, and are very hard to kill. Although they seem to be fatal to partridges, a grouse is able to carry almost as much as a duck. I shot one which had the flesh of the left breast shot away; it was full of feathers, and the ribs were exposed, yet the bird was strong on the ground and seemed active enough.

As the winter advances they cease to frequent the woods, and enter the plains, their haunts being the sparsely wooded country, especially where the soil is sandy and well supplied with bushes. In winter they act more as a properly adapted tree dweller than as a ground-frequenting bird, for they fly from one tree to another and walk about the branches with great ease, seeming to spend much more time there than on the ground. Upon a tree they are not possessed of that feeling of security from all hunters which makes the ruffed grouse so difficult a prey to pot-hunters. The "pin-

tail" when so situated, is, on the contrary, very shy and disposed to fly at 150 yards. Like most wild birds they have a fore-knowledge of storms and when some firewood searcher returning from the woods reports that the chickens are going into the bush, that is leaving the open timber for the denser fir coverts, the settler makes ready for a severe storm.

The prairie chicken like most of the grouse family spend the night in winter in a snow drift. Out on the plains the wind pounds the snow into drifts of ice, like hardness, but in the bush it continues soft, this softness affording another security to the chickens by causing the wolves and foxes to quit the bush in the winter, though they live there by preference the rest of the year. In the evening the chickens fly down either headlong into a drift or run a little and then dive. Each makes his own hole. They generally go down six inches or so and along about a foot. By morning their breath has formed a solid wall in front of them so that they invariably go out at one end. In Ontario observers are less likely to have the non-conducting powers of snow impressed upon them as in Manitoba, so I may illustrate this. For days together the thermometer may range at twenty degrees below zero (F) with six inches of snow resting on a quarter of an inch of ice, completely keeping the water beneath at a temperature of thirty-two degrees above zero. Without the snow the same ice increased in a day to a thickness of two inches. Likewise, under ten inches of snow the ground continued unfrozen, after the thermometer had for one month ranged from zero to forty degrees below. Thus we can easily see that under six inches of snow and one inch of feathers, the chickens do not suffer even at fifty degrees below.

The great disadvantage of the snow-bed is that when there the birds are more liable to become the prey of foxes, etc., whose sagacious nostrils betray the very spot beneath which rests a bird in sound slumber. I am inclined to think that this is the only chance a fox has of catching an old bird, so wary are the birds at all other times.

As the winter wanes it is not uncommon for a snow-storm to be accompanied with sleet. The storm at once drives the chickens into the drifts and afterwards levels off the holes they have

formed, the sleet then freezes and forms a crust and imprisons or starves the birds, and in this way many perish. In the spring the melting of the snow exposes to view the remains of bones and feathers. There is little else to note about their bush life or winter life. By spring many of the birds, by continually pulling off frozen browse, have so worn their bills when closed there is still a large opening right through near the end.

About the middle of April, although reduced in number since their entry on bush life, those who remain, the survival of the fittest, once more spread over the prairies, at first in flocks, but soon to disperse to enter on their duties of reproduction.

There is another matter that I would like to refer to, but can only do so at present very briefly, and that is the prairie chicken's fitness for domestication. To what extent the stock of poultry on a farm in this country may be increased, is a subject worthy of consideration. Our farmers require a fowl which have no delicate appendages like combs, wattles, etc., but which has its legs and feet well protected by feathers, and will be able to withstand a great degree of cold. The abundance of hawks renders it desirable that the bird be not glaringly bright in color like some of the common fowls. The prairie chicken seems to me worthy of a trial, as it has many of the qualities which are wanting in that of the common fowl, and in addition it has the merit of maturing early and rapidly. In ten weeks a prairie chicken is full grown, while a common fowl takes thrice as long. The grouse weigh only about two pounds, yet it yields more nutritive food for man than a 3½ or 4 lb. domestic chicken, and it can fatten on food that the domestic chicken will not touch, and can take at one meal sufficient to last a whole day if necessary, such is the size of its crop. I am not positive, with my personal experience, that it can be domesticated, but it is worth trying. I know of one instance where a chicken was kept for six months, but at the end was as wild as ever, but then it was caught when full grown.

Audubon tamed the pinnated grouse

with little trouble, and Wilson was successful with the quail. The nest of eggs laid would doubtless increase if they were cautiously removed, though I confess I found them rather suspicious for on taking 6 eggs out of a nest the rest were deserted. The 6 eggs were hatched by a hen, but earlier than her own, and I found the young had crushed. Wilson says that all attempts to raise the young have failed for want of proper food. Perhaps he is right. From what little I know of the raising pheasants in the old country from the situation of the prairie chicken nests, I think their young could be successfully raised in a pen with dry sandy soil and a few of ant hills and rose bushes. Ant eggs are the best food for them.

The flesh of the prairie chicken is the most delicate flavor, but this is lost in domestication.

So long as the prairie chicken is abundant in their wild state it is not probable that farmers will try to domesticate them, but with the anticipated immigration it is just possible they will not be so abundant in a few years. I think that the experiment is worth trying, however, and if any member of the Historical Society is inclined to take the trouble I will endeavor to find the necessary stock to start with.

#### COMMENTS.

The reading of the paper was followed by a discussion in which several members took part. The chairman expressed the impossibility of domesticating the grouse of Eastern Canada, commonly known as the "partridge," and that the same trouble would be found with the prairie grouse. Mr. C. N. Bell referred to the territory over which a variety is found, spreading as far as the Rocky Mountains. Dr. Agnew criticized one or two of the theories of Seton. He was also of the opinion that the bird could not be domesticated. After some further discussion a vote of thanks was given to Mr. Seton, seconded by Dr. Agnew and carried. On motion of Mr. Bell, a vote of thanks was also tendered to Mr. McKillegan for reading the paper.

u  
re  
re  
at  
re  
er  
at  
ro  
is  
ne  
tr  
ch  
p  
to  
em  
en  
in  
ck  
tr  
ne  
nt  
ne  
er  
or  
er  
Lai  
e  
fo  
al  
un  
in  
un  
th  
ri  
De  
hic  
ve  
er  
s  
io  
l  
f  
A  
r  
ls  
re

