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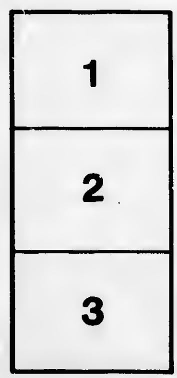
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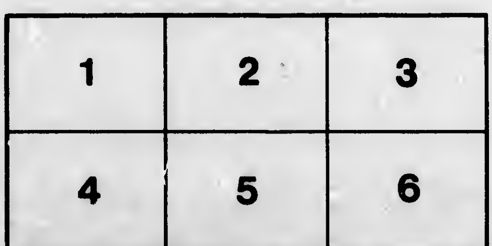
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A COMPARATIVE VIEW

OF THE

CLIMATE OF WESTERN CANADA,

CONSIDERED

IN RELATION TO ITS INFLUENCE

UPON

Agriculture.

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TORONTO:

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PREFACE.

My object, in submitting the following pages to the Canadian Public, is to draw attention to the characteristics of the Climate of Western Canada in its bearings upon Agriculture, with a view to the dissemination of correct views on that important subject. The usefulness of possessing information, based upon reliable meteorological data, is enhanced by considerations of a national character. Notwithstanding the enjoyment of a soil eminently fertile, and of a climate distinguished by remarkable salubrity; notwithstanding a decided superiority for agricultural purposes over the state of New York, the northern part of Ohio and Illinois, the states of Michigan, Iowa, Wisconsin, the Far West, and the whole of New England; in a word, over the wheat growing states generally; yet the impression undoubtedly prevails among multitudes, who are desirous of emigrating from Great Britain and Ireland, that the climate of Western Canada is distinguished by the characteristics of intense and almost unendurable winter cold, together with a hot and fleeting summer, which scarcely affords the agriculturist time to secure his harvest. The European emigrant, who is still deterred from seeking a home in Western Canada, by traditionary tales of the severity of the climate of the remote Eastern portion of the United Provinces, is ignorant of the fact, that in preferring any part of the United States, to which allusion has been made, he is actually selecting for himself a climate of greater winter cold and summer heat, and not only more unhealthy, but also far more hazardous to the agriculturist than that which it obtains in the Canadian Peninsula.

Our acquaintance with the climate of Western Canada, in its true relation to agriculture, is, as yet, necessarily imperfect and elementary. What we do know, however, is strongly confirmatory of the supposition, that, FROM THE PECULIAR SITUATION OF THE PROVINCE AMONG THE GREAT LAKES, it presents adaptations to the purposes of agriculture, which are not surpassed in any other portion of North America. That this is not a statement thoughtlessly advanced in a romantic spirit of patriotism, or in idolatrous acknowledgment of the sentiment, that "there is no place like home:" but that it is one which is reasonable and susceptible of demonstration, I shall endeavour to show in the following pages.

The most important points in which the climate of Western Canada differs from those of the United States, which lie north of the forty-first parallel of latitude, may be briefly enumerated, preparatory to further elucidation, as follow:

1st. In mildness, as exhibited by comparatively high winter and low summer temperatures, and in the absence of great extremes of temperature.

2nd. In adaptation to the growth of certain cereals and forage crops.

3rd. In the uniformity of the distribution of rain over the agricultural months.

4th. In the humidity of the atmosphere, which, although considerably less than that of a truly maritime climate, is greater than that of localities situated at a distance from the Lakes.

5th. In comparative immunity from spring frosts and summer droughts.

6th. In a very favourable distribution of clear and cloudy days, for the purposes of agriculture; and in the distribution of rain over many days.

7th. In its salubrity.

The points in which the climate of Western Canada differs favourably from that of Great Britain and Ireland, are—

1st. In high summer means of temperature.

2nd. In its comparative dryness.

3rd. In the serenity of the sky.

The meterological data introduced, are chiefly derived from the admirable and extensive series of observations which have been made at her Majesty's Observatory at Toronto, under the direction of Capt. Lefroy, R.A., F.R.S.; the Reports of the Regents of the University of the State of New York; Forrey's Climate of the United States; the American Almanac; and Dr. Drake's work on the Diseases of the Valley of North America.

I am conscious of having very feebly set forth the advantages which the climate of Western Canada offers to the enterprising agriculturist. The Province, however, is yet in its youth—and so also is its agriculture, and all matters relating to it, compared with what they will become, under a proper process of development, even ten years hence. In the meantime, I trust that these pages, in the absence of other connected representations of the climate of the Western Province, may tend to remove impressions which have hitherto proved very prejudicial to the progress of settlement.

Illustrations of the prevalence of these impressions might be advanced without number; they are, however, snfficiently numerous and common, as probably to have met the eye of all who may peruse these pages. They occur in almost every descriptive work of the country, written by a foreigner, which I have met with. They have lately been reiterated in some of the admirable descriptions which the English papers have given of Canadian excellence in the Industrial Arts;—and why not? when sleighs, bear skins, stoves, and blankets figured largely and prominently among our contributions. They are to be found in scientific works—for few distinguish between CANADA EAST and CANADA WEST—between the almost maratime climate of the one, and the truly continental climate of the other. And "Canada" is associated with Scandinavia and Siberia, being characterized as a "bleak clime;" (American Journal of Geology,) or with Russia and Sweden, (Stephen's Farmer's Guide,) and imaginary difficulties with respect to most important agricultural improvements, suggested in consequence.

With our American neighbours, the Snows of Canada form the subject of a more fertile theme than our Wheat; although the former, in the Western Province, are slowly diminishing, and not now sufficient for the purposes of communication, while the latter is rapidly increasing at the average rate of TWO MILLIONS OF BUSHELS EVERY YEAR.

If this little pamphlet succeed in awakening a better acknowledgment of the true characteristics of the climate of the Western Province, I propose shortly, endeavouring to develop more fully the circumstances under which husbandry in all its branches is, and may be prosecuted, in especial relation to the Geology and Physical Geography of the Province; for it is my conviction, that the properties and powers of her soil, due to its peculiar geological formation, in connection with a most favourable climate and well-directed popular industry, will soon enable the Western Province to become one of the great graneries of the world.

H. Y. HIND.

Toronto, August 1st, 1851.

CLIMATE OF WESTERN CANADA.

CAUSES WHICH AFFECT ITS TEMPERATURE.

A GLANCE at the map of Western Canada will enable us to distinguish at once some of the most influential causes which tend to raise or lower the temperature of its climate; others will probably suggest themselves, after a little consideration, to those who are but superficially acquainted with the general features of the country and the character of its seasons. It may, however, be well to enumerate, in general terms, those which operate most powerfully, and exhibit some of their effects upon its climate, by comparison with the climates of other countries.

Among the first class of causes, or those which lead to elevate the temperature, are—

1. Lakes Michigan, Huron, Erie, Ontario, and more remotely, Lake Superior.
2. The long continued serenity of the sky during the summer months.

Among the causes which tend to lower the temperature, we find the following:

1. The uniform extension of land, north and north-west of the lakes, towards the polar regions, in the direction of the prevailing winter winds (north-west).
2. Extensive forests, which, besides the shade they afford the soil, expose a great evaporating and radiating surface during the summer months.
3. The frequency of extensive swamps.
4. A clear winter sky.

The prevailing winter wind in the Canadas is the north-west; the climate, however, of that part of the Western Province only, which is bounded on the north by the 44th parallel of latitude, will be now considered. Other powerful influences begin to operate north of that parallel The prevailing wind, instead of sweeping over an unfrozen lake of vast extent and depth, traverses a frozen tract of country, extending far towards the poles. Hence the production of greater winter cold and summer heat in the valley of the St. Lawrence and the Ottawa valley, than south of the 44th parallel. When, therefore, the term *Western Canada* is employed in this pamphlet, it is to be understood as referring only to that portion of the Province which lies to the south of the 44th parallel of latitude.

DIRECT INFLUENCE OF THE GREAT LAKES ON THE WINTER TEMPERATURE.

The ameliorating influence of the Great Lakes upon the winters of Western Canada, will appear upon inspection of the subjoined table, containing the mean winter temperatures of various localities situated on their shores, and at considerable distances from them, towards the east and west.

PLACES.	Latitude.	Mean Winter Tempera-ture.	Numberof Observa-tions in years.		Approximate Mean.
	°	°			°
Council Bluffs	41·25	22·5	5	West of the Lakes.	20·5
Fort Crawford	43·3	19·89	2		
Fort Howard	44·40	18·8	4		
Toronto	43·39	25·51	10	On the Lakes.	27·67
Lewiston	43.15	30·02			
Rochester	43·8	27·5	10		
Utica	43·7	24·8	14	East of the Lakes.	24·4
Albany	42·39	26·6	17		
Concord	43·12	22·5	10		

It is shown in the following tables, that the intensity of occasional low temperatures is also greater at localities situated at some distance to the east or west of the lakes, than within a few miles of their shores; and also, that a difference of one, two, or even three degrees of latitude to the south, does not affect this general law. It must, however, be borne in mind, that the same causes (winds sweeping over a frozen soil) which produce very low temperatures at Utica, Albany, Muscatine, &c., exist to a small extent in Western Canada, at a distance of twenty to thirty miles from the lakes; but, since the distance of the most inland portion of the country is not more than fifty miles from Lakes Huron, Erie, or Ontario, their warming influence will still be felt there, though in a less degree than on their shores.

Table of minimum winter temperatures, observed at various places, east, west, and on the shores of the Lakes, (1849.)

	Names of Places.	Latitude.	Jan.	Feb.	Dec.
		°			
On the Lakes.	Rochester	43·07	—9	—7	2
	Lewiston	43·09	2	—4	6
	Toronto	43·39	—4	—9	—6
East of the Lakes.	Albany, N.Y.	42·39	—10	—7	5
	Lambertville, N.J.	40·23	—6	—3	18
	Biddeford, Me.	43·31	—8	—19	—7
	Providence, R.I.	41·49	—4	—1	7
West of the Lakes.	Muscatine, Ia.	41·30	—24	—22	—12

"It is well known that the temperature of Rochester, and of places about the same latitude as *Western* New York, *is never so low by many degrees,* as are many places on nearly the same parallel of latitude at the east."—R. R.

	Year 1844.	Mean Temp. Jan.	Mean Temp. Feb.
		°	°
On the Lakes.	Toronto	20·67	27·72
	Rochester	20·90	28·61
	Lewiston	22·81	30.09
East of the Lakes.	Albany	15·53	24.34
	Utica	14·98	24·06

Occasional minimum temperatures at Toronto, and at places east of the Lakes, in the State of New York, (1848.)

	Year 1848.	January.	February.	March.
South of Toronto in degrees of latitude.	Toronto	—11	0	0
	Albany	—15	—3	—1
	Fairfield	—18	—10	—8
	Granville	—30	—14	—8
	Utica.	—15	—6	—2
	Lowville (lat. 43·17)	—24	—12	—3
	Plattsburg (lat. 44·42)	—17	—4	0
	St. Lawrence (lat. 44·40)	—27	—15	—5

"At Council Bluffs, in the interior of the Mississipi and Missouri basin, we find an excessive, or true continental climate ; a winter cold, on single days of −32° and −37° ; followed by mean summer temperatures of 69° and 71°·4."—Humboldt.

It would be an easy matter to select localities to the east and west of the lakes, and in the same latitude as Toronto, or even two or three degrees to the south of that city, where the occurrence of intense degrees of cold is not unfrequent. I have, however, endeavoured to select stations which are not affected by aspect, or altitude above the level of the sea. The following table exhibits the occurrence of some of these terrible visitations of low temperature at the stations named below :

	Minimum Temperature.
St. Louis, Missouri,	−25
Fort Crawford, Wisconsin,	−32
Cuba, New York,	−26
Lowville, New York,	−35
Fort Howard, Wisconsin,	−32
Fort Snelling, Minnesota,	−40

Subjoined is a comparative view of the extent, elevation, and depth of the Great Lakes:

Names of Lakes.	Area in Square Miles.	Elevation above the Sea.	Mean Depth.
Lake Superior	32,000	596	900
Green Bay	2,000	578	500
Lake Michigan	22,400	578	1000
Lake Huron	19,200	578	1000
Lake St. Clair	360	570	20
Lake Erie	9,600	565	84
Lake Ontario	6,300	232	500
Total area, . . .	91,860		

The greatest known depth of Lake Ontario is 780 feet; in Lake Superior, however, a line 1200 feet long has, in some parts, failed in reaching the bottom.

Whenever westerly winds, having a temperature less than 32°, sweep over the surface waters of Lakes Huron, Erie, and Ontario, they will not only receive accessions of heat, but be also in some measure diverted from their courses. The mean temperature of the air at Toronto, during the three winter months, December, January, and February, is 25°·51; while that of the surface water of the open lakes, never less than 32°, and generally about 33°·5; in other words, 7° or 8° above the mean at Toronto. The effect of this difference is occasionally manifest in the high temperatures of the southern shores of lakes Erie and Ontario, and especially on the Niagara River, where the mean winter temperature does not fall 2 degrees below the freezing point of water. A similar effect is produced upon the northern shores of lakes Erie and Ontario, although in a less degree; while the warming influence of Lake Huron is felt over the whole western peninsula during the winter months. At Detroit, in latitude 42°·24, the mean of three years' observations, gives 27° for the winter temperature; whereas, the corresponding temperature at Lewiston, in latitude 43°·09, or nearly three-quarters of a degree farther north, is 30°. The influence of the State of Michigan (frozen during the winter season) on the temperature at Detroit, is sufficient to reduce it to that of Rochester, a degree further to the north. The duration of snow upon the ground, the average fall of rain, the serenity of the sky, and the humidity of the atmosphere, are all affected, on the shores of the Lakes, by the great depth and expanse of their waters.

Subjoined is a Table of the mean maximum and mean minimum temperatures, together with the range, of the different months of the year, as observed at Toronto, in her Majesty's Observatory; being the mean of eleven years, viz., from 1840 to 1850, both inclusive :—

	Mean. °	Maximum. °	Minimum. °	Range. °
January, ...	24.67	45.33	—4.41	49.74
February, ...	24.14	46.35	—4.37	50.72
March, ...	30.83	53.31	7.59	45.92
April, ...	42.17	71.44	17.96	53.48
May, ...	51.34	76.76	28.82	47.94
June, ...	61.42	76.44	35.72	40.72
July, ...	66.54	88.11	44.05	44.06
August, ...	65.76	83.98	45.02	38.95
September, ...	57.11	80.19	32.07	48.12
October, ...	44.50	66.10	22.17	44.30
November, ...	36.57	57.03	13.33	43.60
December, ...	27.18	45.25	3.52	46.27

Annual Mean, 44°.39

From the foregoing table of temperatures we glean the following facts :—

1st. The hottest month in the year is July: the coldest February.

2nd. There are four months in the year during which the average temperature is less than the freezing point of water. These months are January, February, March, and December. These constitute the winter months.

3rd. There are three months, April, October, and November, during which the temperature is above the freezing point of water, and below the mean temperature of the year.

4th. There are five months in the year during which the mean temperature is above the annual mean. These are May, June, July, August, and September. These months, with October, constitute the agricultural, or growing months of Western Canada.

5th. The mean highest temperature of the hottest month (July) is double of the mean annual temperature.

6th. The mean minimum temperature of the hottest month is the same as the mean annual temperature.

7th. The temperature is most uniform in August, and most fluctuating in April.

Compare the temperatures of the year 1849 (a very cold winter) at Toronto, in latitude 43° 39′, with those of Muscatine, latitude 41° 30′, Iowa, on the banks of the Mississippi :—

	Toronto. Mean Temperature, °	Muscatine. Mean Temperature. °	Toronto. Higher Temp. than Muscatine °	Muscatine. Higher Temp. than Toronto. °
January, ...	18.49	12.6	5.89	——
February, . . .	19.99	18.1	1.89	——
March,.	33.24	37.3	——	4.06
April, ...	38.74	44.3	——	5.56
May.	48.30	54.8	——	6.50
June, ...	63.01	67.6	——	3.59
July, ... ,	67.82	66.4	1.42	——
August, ...	65.08	65.2	——	0.12
September, . .	57.04	61.7	——	4.66
October, ...	44.94	48.9	——	3.96
November . . .	41.87	42.8	——	0.93
December, . .	26.56	18.3	8.26	——

Compare the monthly means of temperature at Toronto and Montreal ;—the capital of Lower Canada being subject to the same influences as Muscatine, and the Far West generally :—

	Monthly Means of Temperature. Toronto. Mean of 10 years. °		*Monthly Means of Temperature. Montreal. Mean of 5 years.* °
January, ...	24.67	Toronto, Warmer Winter Means of temp.	13.98
February, ...	24.14		16.08
March, ...	30.83		27.50
April, ...	42.17		40.02
May, ...	51.84	Montreal, Hotter Summer means of temp.	53.38
June, ...	61.42		65.97
July, ...	66.54		69.67
August, ...	65.76		66.21
September, ...	57.11		58.50
October, ...	44.50		45.10
November, ...	36.57	Toronto. Warmer Winter Means of Temp.	32.70
December, ...	27.18		18.69

It will be remarked that the climate of Montreal is of a true continental or excessive character, when compared with that of

Toronto; and is similar in many respects, as regards temperature, to that of Muscatine, in Iowa.

The intensity of cold at Muscatine, notwithstanding it is so much nearer the equator than Toronto, will appear upon inspection of the following table, which furnishes an illustration of the occasional winter cold in the Western States:—

	1840. °	1843. °	1844. °	1845. °	1848. °	1849. °	Mississippi Frozen and Closed. In Year.	No. of Days.
January,	—17	—15	—6	6	12	—24	1840	45
February,	—25	—19	6	6	—8	—22	1841	60
March,	12	—10	6	8	20	10	18H2	56
April,	27	5	30	16	28	22	1843	133
October,	25	12	16	16	16	28	1844	31
November,	18	10	7	—11	2	20	1845	78
December,	2	8	—6	—12	6	—12	1849	62

At St. Louis, Missouri, latitude 38° 37′, or five degrees south of Toronto, the subjoined minimum temperatures were registered:—

	St. Louis.—(1841) °	Toronto.—(1841.) °
January, ...	—6	—6·4
February, ...	4	—1·3
March, ...	25	—6·7
October, ...	18	20·6
November, ...	15	8·5
December, ...	12	3·1

(Thirty-eight thunder showers at St. Louis in 1841.)

The subjoined table exhibits a comparison between the minimum and maximum temperatures, and the range, at Toronto and Muscatine:—

Year 1849.	Toronto. Minimum Temp. °	Muscatine. Minimum Temp. °	Toronto. Maximum Temp. °	Muscatine. Maximum Temp. °	Toronto Range. °	Muscatine Range. °
January,	—14·2	—24	39·5	46	53·7	70
February,	—9·8	—22	40·6	48	50·4	70
March,	15·1	10	53 0	68	37·9	58
April,	15·5	22	72·0	74	56·5	52
May,	27·9	30	72·2	80	44·3	50
June,	35·2	44	84·4	86	49·2	42
July,	47·3	42	88·6	89	41·3	47
August,	45·2	36	79·0	86	33·8	50
September	32·7	37	80·1	84	47·4	47
October,	25·2	28	61·8	70	37·3	42
November,	24·2	20	56·4	72	32·2	52
December,	—6·5	—12	40·8	44	47·3	56

We observe the effect of a prolonged northerly wind at Muscatine in August. The temperature is reduced to within four degrees of the freezing point.

The climate of Muscatine affords a fair type of the climates of the North-Western States, beyond the influence of the Lakes, and as far south as latitude 40°, or three degrees thirty-nine minutes nearer to the equator than Toronto.

The characteristics of those climates are—

1st. Intense winter cold.
2nd. Intense summer heat.
3rd. A rapid change from high to low temperatures.

And, as will be shown in the sequel,

5th. A comparatively cloudless sky.

6th. The distribution of rain over a very few days; and sudden, violent, and destructive in its precipitation.

7th. A great and sudden range in the degree of humidity of the atmosphere.

MILDNESS OF THE CLIMATE OF THE CANADIAN PENINSULA.

The difference between the mean summer and mean winter temperatures of various localities is given in the subjoined tables, and is well worthy of attention, for the purpose of illustrating the mildness of the climate of Western Canada, when compared with the excessive climates of the Western States :—

Lautude.		Difference between the Summer and Winter Means of Temperature.
°		°
43·39	Toronto, ...	39·00
41·30	Muscatine, Iowa, ...	45·00
41·28	Fort Armstrong, Illinois, ...	49·05
43·3	Fort Crawford, Wisconsin, . . .	50·89
41·45	Council Bluffs, Missouri Territory	51·34
44·53	Fort Snelling, Minnesota, ...	56·60

Contrast the mean monthly temperatures of Fort Preble, on the Atlantic coast, in latitude 43°·38, and Fort Armstrong, Illinois, in latitude 41°·28, with those of Toronto, subject to the ameliorating influences of the Great Lakes:—

	Latitude 43·38 deg. Fort Preble, East of the Lakes. °	Latitude 43·39 deg. Toronto, On the Lakes. °	Lat. 41·28 deg. Fort Armstrong, West of Lakes. °
January, .	21·82	24·67	23·78
February, .	24·94	24·14	26·28
March, . .	33·41	30·83	37·47
April, . . .	45·44	42·17	51·26
May, . . .	54·49	51·84	63·83
June, . . .	64·29	61·42	73·59
July, . . .	69·71	66·54	77·92
August, .	67·19	65·76	76·21
Jeptember,	59·00	57·11	63·67
October, .	49·28	44.50	54·58
November,	38·45	36·57	39·82
December,	31·32	27·[illegible]	30·53
Mean, .	46·67	44·39	51·64

Fort Armstrong is more than two degrees south of Toronto, and yet the mean temperature of January is nearly a degree lower than at Toronto, while the mean temperature of the hottest month is upwards of eleven degrees higher than at the last-named place, situated on the Lakes. Fort Preble, to the East, in the same latitude as Toronto, has a mean temperature for January nearly three degrees lower than Toronto, and for July upwards of three degrees higher.

INFLUENCE OF COMPARATIVELY HIGH SUMMER MEANS OF TEMPERATURE.

It is impossible to form a correct judgment respecting the influence of climate on agriculture from annual means of temperature alone. The distribution of heat and light over the agricultural months, and the humidity of the atmosphere, afford the best criteria for opinion in such matters. A serene sky in the summer months is not only accompanied by increase of temperature during the day time, but also by a corresponding increase in the intensity of light. The vigorous and rapid growth of vegetables in Western Canada, is due to the serenity of the summer sky, and the uniform distribution of rain over the agricultural months. The effect, however, of too great serenity of the sky is detrimental to agriculture. In Iowa, Wisconsin, and the Western States generally, the extraordinary duration of the clearness of summer skies, and the unequal distribution of rain over the months of the year, render the cultivation of wheat, the grasses, and the root crops far more hazardous than in Western Canada. The mean annual number of clear days on the Lakes is about 120

Remote from the Lakes	210
Cloudy days on the Lakes	140
Remote from the Lakes	75

In illustration of the importance of direct light, or solar radiation, in place of the diffused light which falls upon vegetables when the sky is clouded, we may instance the climate of Cherbourg, in latitude 49°·29, where the mean annual temperature is 52°·1, and that of Heidelberg, in latitude 49°·24, where the mean annual temperature is 49°·5, or 2°·6 *below* that of Cherbourg. The wine of Heidelberg is celebrated throughout the world, yet Cherbourg produces no drinkable wine. Cherbourg is situated on the sea coast, under a sky frequently obscured by clouds; while Heidelberg is situated in the interior of the continent, and enjoys a clear and sunny sky.

Barley ripens in the Feroe Islands, (lat. 62½ deg.); but all attempts to introduce it into Iceland (lat. 63½ deg.) have completely failed. It succeeds, nevertheless, at Alton, in Lapland, where the monthly means of temperature are *lower* than those of the Feroe Islands or Iceland. In analyzing the causes of the failure, it is found to depend upon the circumstance, that a cloudy sky opposes all endeavours to introduce the cereals into Iceland.—Martins.

Humboldt says, that in no part of the world did he see such magnificent fruit, especially grapes, as in Astrachan, in latitude 46°·21: the mean annual temperature being 48 deg. The mean summer temperature rises to 70 deg., and in winter the thermometer falls from 45 to 54 deg. below the freezing point of water. High summer temperatures are the chief causes of the geographical distribution of plants over the surface of the earth. They necessarily influence, to a very great extent, the agriculture of any particular country. The yellow horse chestnut disappears on the Atlantic coast in latitude 36°, while it is found west of the

Alleghanies in latitude 42°. So with the black walnut, which, on the Atlantic coast ceases to grow in latitude 41°, yet is found west of the Alleghanies in the lake country as far as latitude 44°. The Canada shore of Lake Erie abounds in magnificent specimens of this valuable tree. Numerous individuals may be met within the woods which measure upwards of five feet in diameter.

In nearly every part of England and Ireland, the mean annual temperatures varies from two to five degrees *higher* than at Toronto. The mean summer tempereture is four or five degrees *lower* than at the last mentioned place. Hence, Indian corn will rarely ripen, or melons, squashes, and pumpkins grow to any size in the open air in the British Isles, while every one knows that these vegetables attain remarkable dimensions in Western Canada. The high latitude and insular position of the islands, favouring a cloudy sky, diminish the intensity of solar light and heat, although other circumstances concur to elevate the mean annual temperature far above that of the Province. The mean summer temperature of 57·2 deg. appears to be the minimum requisite for the successful cultivation of wheat. It is shown in a subsequent table that the mean summer temperature at Toronto is 64·51 deg.; and if the means of the whole of the Province were taken, it would probably be found to reach 66 deg.

Table of the mean temperature of the summer months, (June, July, and August,) at Toronto, during the years 1840 *to* 1850, *both inclusive; also Table of the mean maximum temperature during the same periods.*

YEAR.	MEAN SUMMER TEMPERATURE.	MEAN MAXIMUM SUMMER TEMPERATURE.
	°	°
1840	63·90	81·5
1841	65·3	88·9
1842	62·33	82·9
1843	63·33	83·7
1844	62·55	85·6
1845	65·30	88·1
1846	66·16	88·4
1847	63·26	82·5
1848	65·41	87·1
1849	65·30	84·0
1850	66·81	85·3
Mean,	64·51	85·26

To the east and west of the lakes, (especially in the latter direction,) high summer means of temperature are invariably associated with low winter means; in other words, great, and often injurious extremes of temperature occur, particularly in the Western States. Compare the subjoined mean temperatures of the seasons at the stations named.

Places.	Latitude.	Winter Mean.	Spring Mean.	Summer Mean.	Autumn Mean.
	°	°	°	°	°
Toronto	43·39	25·33	41·61	64·51	47·41
Hudson	41·15	25·70	48·20	69·20	46·40
Muscatine	41·26	25·80	49·90	69 00	49·30
Council Bluffs	41·28	24·28	51·60	75·81	52·46
Fort Crawford	43·03	20·69	48·25	72·38	48·09
Fort Winnebago . . .	43·31	20·81	44·67	67·97	46·10
Fort Dearborn	41·50	24·31	45·39	67·80	47·09
Detroit	42·62	27·62	45·16	67·33	47·75

Table of the mean summer temperatures at various localities in Europe, compared with those at Toronto.

	Mean Summer Temp.
	°
Toronto	64·51
Berlin, (Europe)	63·2
Cherbourg "	61·9
Penzance "	61·8
Greenwich "	60·88
Cheltenham "	60·04

	Mean Temp. of the Hottest Months.
Toronto	66·54
Paris	66·02
Frankfort on the Maine	66·00
Berlin	64·4
London	64·1
Cherbourg	63·2

The effects of high summer means of temperature, when associated with a uniform distribution of rain, are of the utmost importance, in their bearings upon the cultivation and growth of different kinds of vegetables, and also upon many practical operations of husbandry; first among which ranks that great modern improvement, subsoil draining. It will be sufficient for present purposes, to show that the intensity of solar radiation exercises such an influence upon the soil, as to remove at once the objection urged against subsoil draining in the Canadas, on account of winter frost, and the supposed congealation of the water at the mouths of the drains, or in the drain and soil itself. Stephens says, in "The Farmer's Guide," "The only practicable way I can therefore see, of retaining the water in a liquid state in such climates (Canada, Russia, Sweden), as it issues from the outlet, is to place the outlet at such a depth as to be beyond the reach of frost, and to convey the water in a deep and long covered drain. Much foresight is thus required, and much expense must be incurred, in making drains in countries where frost penetrates the ground to a great depth." It is much to be regretted that so little is known on the other side of the Atlantic respecting the climate of the Canadas, and especially of the Western Province, as to permit the introduction, into a standard work on agriculture, of so potent an objection to the most important physical improvement of soils, as above quoted. In presenting the actual influence exerted by frost, in its true bearings upon subsoil draining, it will be well to exhibit, as far as they are known, the effects of solar radiation; first, as relates to the actual temperature it is capable of imparting to absorbing surfaces, and especially to soils; and, secondly, the depth and degree to which those temperatures are susceptable of being propagated downwards.

Table of the intensity of Solar Radiation, during the year 1840, *at Toronto. (Mean summer temperature below the average.)*

1840.	May.	June.	July.	Aug.
Mean maximum temperature, ...	76·4	79·9	82·3	82·4
Solar Radiation above 100 degrees in number of days, ...	7	10	15	14
Solar radiation above 90 degrees in number of days, ...	12	19	27	28

The temperature of the surface of a dark-coloured soil, in the neighbourhood of Toronto, frequently rises to 130 degrees;—instances have been recorded when the temperature rose to 145 degrees. The effect of the intensity of solar radiation upon the soil, during the months of the year, is shown in a remarkable manner, in the following—

Table of the Temperature of the Soil, at the depths of three feet aud six feet, during the years 1840, 1841, *and* 1842.

	Temperature at a depth of three feet.			Temperature at a depth of six feet.			Mean at 3 feet	Mean at 6 feet.
	1840. °	1841. °	1842. °	1840. °	1841. °	1842. °	°	°
January, . .	——	34·2	36·5	——	38·2	40·5	35·3	39·3
February, . .	——	33·8	34·5	——	37·2	38·5	34·1	37·8
March, . . .	35	33·	35·5	38·	36·	38·5	34·5	37·4
April, ...	42	36·2	43·5	40·	37·5	41·5	40·5	39·7
May, ...	55	52·8	51·5	48·	46·2	48·	51·1	47·4
June, ...	59·2	60·	55·	53·2	52·5	51·5	58·1	52·4
July, ...	63·5	64·	63·	57·5	57·5	56·5	63·5	57·0
August, . . .	65·0	63·	64·5	60·	59·5	61·	64·2	60·
September, .	58·6	62·5	59·4	58·8	60·5	59·	60·2	59·8
October, . .	52·8	51·5	53·	53·6	55·0	55·	52·6	54·3
November, .	42·5	43·5	42·8	47·2	49·	47·4	42·9	47·8
December, .	38·2	39·5	37·5	40·4	44·	41·	38·4	41·8
Mean, . .	51·18	47·8	48·06	47·67	47·76	51·8	49·02	49·73

(*Toronto Meteorological Report.*)

The above table, considered in relation to the change which is likely to be produced in the climate of the country by the process of clearing the land of its forest growth, and exposing it to the rays of the sun, possesses peculiar interest. The tendency of a soil, warmed to the depth of some feet, is to diminish the duration of frost and snow in the spring months, and to retard its advent in the autumnal months. It tends also to diminish the amount of rain in the summer months, as will be shown in the sequel. It will be remarked, that the mean temperature of an exposed or cleared soil in August, at the depth of three feet, is about the same as the mean summer temperature. High summer temperatures of the subsoil, in their relation to the effects of subsoil draining upon the properties of soils and the growth of vegetables, can not be estimated too highly. In Western Canada, subsoil draining draws out the properties of the clay soils which abound in the country, in a manner truly remarkable; and the artifice may be prosecuted without the adoption of any precautions whatever against winter frosts. It is equivalent, as far as relates to the working of the soil, to an addition of three weeks or a month to the agricultural season for out-door operations. The writer had opportunities of observing the effect of winter frost upon the water issuing from the mouths of two long subsoil drains during the last winter. One of the drains in question was constructed in a clay subsoil, situated in the neighbourhood of the City of Toronto. The soil was first dug out to the depth of two feet; the opening being about 15 inches in breadth at the top, and 12 inches at the bottom. The drain was then made by digging a narrow water course, about 10 inches deep and from 3 to 4 wide, in the retentive clay. On the shoulders thus formed, rough pine slabs were laid, and clay firmly stamped upon them. The remaining open portion was filled with the soil. The length of the drain was a third of a mile, and its depth varied from two feet ten inches to three feet six inches, owing to inequalities in the surface of the soil. Drainage water (nearly soft) issued from it copiously throughout the winter. The mouth was left quite exposed, and was roughly formed of two side slabs, with the upper shoulder slab resting upon them. The temperature of the water was tested frequently, and when a thermometer exposed to the air sank to zero, yet it never fell below thirty-four degrees when introduced into the water issuing from the drain, and was commonly about thirty-eight. The exposed water in the water course, at the mouth of the drain, was never frozen within fifteen or eighteen inches of the covered extremity. Another drain, constructed of road metal, in a rich vegetable mould, and having a depth of two feet six inches, and a length of two hundred and fifty yards, ran during the winter with precisely similar results.

PREJUDICIAL INFLUENCE OF A SERENE SKY.—SPRING FROSTS.

On calm and cloudless summer nights, the leaves of vegetables radiate the heat they may have received from the sun during the day time, into the clear expanse above them. Their temperature thus becomes many degrees lower than that of the surrounding air. This difference frequently amounts to 10 or 12 deg. of Farenheit. It therefore often happens, that when the minimum temperature of the air is not more than 35 or 36 deg., tender plants are frozen by their own radiation, and hoar frost deposited upon the surfaces of all radiating bodies. The mean minimum temperature of June is about 36 deg; we need not therefore be surprised, that a clear night, promoting radiation, should occasionally reduce the temperature of vegetables below the freezing point of water, and thus check, if not injure the growth of the more tender species. The same circumstances which induce great heat in the spring months during the day time, namely, a serene sky and low latitudes (within certain limits), lead to night frosts; casualties which are occasionally terrible scourges to the east and west of the Lakes, where the serenity of the sky is more constant during the spring months than in the Canadian Peninsula. The faintest cloud or haze in the heavens, or the lightest covering of straw, suffices to arrest nocturnal radiation, and to prevent the temperature of vegetable surfaces thus protected, from sinking below that of the atmosphere. In the latitude of Toronto, frosts have been known to occur as late as June 11th in Western Canada. In districts remote from the Lakes, and one or two degrees to the south of their latitude, spring frosts operate very injuriously upon the labours of the husbandman. The subjoined tables and notices, furnish illustrations of the frequency with which spring frosts occur in various localities in the United States:—

Middletown, Connecticut. Latitude 41°·33.

1838 . . .	May 4th	1843 . . .	June 2nd
1839 . . .	" 11th	1845 . . .	May 31st
1841 . . .	" 4th	1846 . . .	" 22nd
1842 . . .	" 21st		

Lambertville, New Jersey, (the garden of the Eastern States.)
Latitude 40°·23.

1841 . . .	May 4th	1845 . . .	May 31st
1842 . . .	June 12th	1846 . . .	" 20th
1843 . . .	June 2nd	1847 . . .	" 18th
1844 . . .	May 13th		

In the year 1849, the peach in general was destroyed by frost.

At Marietta, in the State of Ohio, lat. 39°·25, or more than 4 deg. south of Toronto, a frost on the 18th of April, 1847, destroyed the bloom of the apples and peaches." "June 2nd a smart frost."—A. A. 1843. In 1849, frosts occurred until May; and about the 16th and 17th of April, the thermometer fell to 23 deg., or 9 deg. below the freezing point. Nearly all pear, peach, and plum blossoms were destroyed. "*Frosts, more or less intense, are expected when the peach and apple are in blossom along the immediate vicinity of the Ohio River.*"—Regent's Report.

North Salem, New York. Latitude 41·20°. *Latest Frosts in Spring.*

1840 . . .	June 9th	1845 . . .	May 31st
1842 . . .	May 31st	1846 . . .	" 22nd
1843 . . .	June 1st	1847 . . .	" 28th
1844 . . .	May 23rd	1848 . . .	June 1st
		1849 . . .	May 16th

Mean annual temperature at		North Salem	47°·40
Do.	do.	Toronto	44°·45

—*Regent's Report.*

North Salem, 1843.—"June 2nd.—A heavy frost on the 2nd, injured vegetation. Many forest trees were stripped of their leaves on their lower branches."

"June was below the average temperature, and was especially distinguished by a heavy frost on the 11th (1842), which cut off corn and other vegetables *very generally*. Oaks and sycamores were also stripped of their leaves to the height of twenty feet; the foliage above that being uninjured."—Regent's Report.

Most of the Academies in the north and west of the State of New York mention the snow and frost at this time. (June 11th, 1842). Minimum temperature at Toronto, 28·1 deg.

"The 1st of June, 1843, will be long remembered. Snow fell in Buffalo and Rochester. In this vicinity, (Albany, lat. 42°·39,) ice was formed. On Long Island, greens were frozen stiff. Strawberries, tomatoes, &c., are cut off. Corn, the most tender of plants, must be nipped off throughout the State. Not a blade could bear the severe frosts of Monday and Thursday nights."—Albany Argus, quoted in R. R. Minimum temperature at Toronto, 28·2 deg.

May 22nd, 1844—"A heavy frost, which destroyed most of the fruit in this region. Franklin, Prattsburg, Ithaca, and thus extended throughout the State"—R. R. Minimum temperature at Toronto, 33·2 deg.

1845.—"A frost on May 31st, injured corn at North Salem." —R.R.

One would suppose that St. Louis, on the Missouri River, in lat. 38°·37, or upwards of 5 degrees south of Toronto, would not be liable to the occurrence of very low degrees of temperature; yet during sixteen years observation, it was found that the thermometer sank below zero, or 32 degrees below the freezing point, no less than on thirty-three days: the lowest temperature it indicated was —24·4, or 55·4 deg. below the freezing point. The temperature in the shade rose, in summer months, to or above 100 degrees on twenty-two days, during the same period of time.

INFLUENCE OF FORESTS ON TEMPERATURE.—EFFECTS OF CLEARING.

The extensive forests with which the greater part of Western Canada is still clothed, tend, by their nocturnal radiation, to diminish the temperature of the nights during the summer season. Humboldt has clearly shown, that by the reason of the vast multiplicity of leaves, a tree, the crown of which does not present a horizontal section of more than 120 or 130 feet, actually influences the cooling of the atmosphere by an extent of surface several thousand times more extensive than this section. The upper surfaces of the leaves first become cool by nocturnal radiation; these again receive heat from the next lower stratum of leaves, which is, in turn, given off into space. The cooling is thus propagated from above downwards, until the temperature of the whole tree is lowered, and, as a necessary result, the air enveloping it. As the forests of Western Canada disappear before the rapid encroachments of the settler, we may look for a rise in the minimum temperature of the spring, summer, and autumnal nights. Late spring and early autumn frosts will probably become rarer, as the country becomes more cleared.

Notwithstanding the cold produced by the radiation of heat from the leaves of forest trees during summer nights, there is no reason to suppose that the destruction of forests elevates the mean temperature of the year. From observations extended over thirty years, at Salem in Masssachusetts, it appears that the annual mean temperature of the year oscillates in that neighbourhood within a degree about the mean of the whole number of years. The winters in Salem, instead of having become milder during the last 33 years, as supposed from the destruction of forests, have become colder by 4 deg. Fahrenheit.—(Forry, quoted by Humboldt.) The tendency of the destruction of forests is, *cæteris paribus*,

1. To elevate the mean temperature of the summer months.

2. To lower the mean temperature of the winter months, but to shorten their duration.

3. To accelerate the advent of spring.

4. To dry up swamps, shallow springs, and to diminish the supply of water in creeks.

5. To hasten the disappearance of snow from exposed districts.

The comparatively gradual approach of Spring, in the Canadian Peninsula, is a great advantage to the husbandry of the country. High maximum means of temperature, at that season of the year, with low minimum means, are treacherous, and often, indeed, ruinous to the agriculturist. Their influence on health is also very detrimental. Compare Toronto with Muscatine, Iowa, to the west of the Lakes, in these respects. (See page 14, for the range of temperature at Muscatine.) :—

	Toronto.				Muscatine.			
	March.		April.		March.		April.	
	Mean. °	Min. °	Mean. °	Min. °	Mean. °	Min. °	Mean. °	Min. °
1845,	35·68	6·6	42·13	15·5	40·3	8·	55·1	16·
1846,	26·25	5·4	39·06	9.3	40·5	20·	52·7	28·
1849,	33·24	15·1	38·74	15·5	37·3	10·	44·3	22·
Mean,	31·72	9.	39·97	13·4	39·3	12·6	50·7	22·

Hence, April, with a mean temperature at Muscatine of 50°·7, sufficient to force on vegetation, suffers occasional mean *minimum* temperatures of ten degrees below the freezing point; whereas the *mean* April temperature at Toronto is nearly 11 deg. below that of Muscatine, and effectually arrests the progress of vegetation until the danger arising from killing frosts' is greatly diminished. These are important considerations in estimating the adaptation of a climate to the purposes of agriculture.

The destruction of forests seems to have a marked effect upon swamps, springs, and running streams. In all parts of the country neglected saw mills may be seen, having been abandoned by their proprietors owing to the "want of water." It is indeed a constant and yearly increasing complaint, that springs and rivers are drying up, and that the supply of water in mill creeks is year by year diminishing. This decrease may reasonably be ascribed to the destruction of forests, whereby extensive swamps are exposed to solar radiation, and that supply of moisture which they received in the summer months from the condensation of the aqueous vapour of the atmosphere, by the leaves of the trees overshadowing them, being altogether cut off. The frequency of extensive swamps is one acknowledged cause of the retardation in the advent of spring, and the production of early spring frosts; it is evident, that with the progress of the settlement of forest covered tracts, these causes will gradually exert less influence in producing [illegible] of the most objectionable features in the climate of this country.

RAIN AND HUMIDITY.

RAIN-FALL IN WESTERN CANADA.

The absolute quantity of rain which falls during one year in any district is not of so much importance in its bearings upon agriculture as is its monthly distribution. The terms "rainy season" and "dry season" are unknown in Canadian Climatology. The distribution of rain over the months of the year is in general remarkably uniform.

Table showing the quantity of Rain which fell each year in the neighbourhood of Toronto, from 1840—1850, *both inclusive. Also Table of its average distribution over the months of the year during the same period.*

Year.	Annual Fall in inches.	Mean Monthly Fall in inches.		
	°		°	
1840,	29·575	Jan.	2·215	Mean of 10 years, 1845 imperfect.
1841,	36·670	Feb.	0·880	
1842,	42·790	Mar.	1·535	
1843,	43·555	April,	2·501	Mean of 11 years.
1844,	20·915 (10 months)	May,	2·901	
1845,	23·335 (9 months)	June,	3·065	
1846,	32·345	July,	3·901	
1847,	31·960	Aug.	3·225	Mean of 10 yrs. 1844 impf.
1848,	22·205	Sept.	4·064	Mean of 11 years.
1849,	32·215	Oct.	3·033	
1850,	———	Nov.	3·160	
Mean Fall, 33·914 (8 years)		Dec.	1·709	

It would appear, from the foregoing table, that the wettest month of the year is September, and the dryest February, as regards rain. The subjoined table shows, however, that the precipitation in February takes place in the form of snow:—

Table, showing the quantity of Snow which fell at Toronto, during the years 1843 *to* 1849, *both inclusive.*
Also, Table of Mean Monthly Distribution. (Nine inches of snow are equivalent to one of rain.)

Year.	Annual Fall of Snow, in inches.	Month.	Mean Monthly Fall of Snow, in inches.
1843,	66·2	January,	12·7
1844,	78·1	February,	27·2
1845,	55·7	March,	8·4
1846,	62·1	April,	1·4
1847,	49·8	October,	1·75
1848,	46·0	November,	2·13
1849,	43·0	December,	10·8
Mean,	57·2		

Upon inspection of the table of the mean monthly fall of rain, we observe great uniformity in the increase of the rain-fall during the agricultural months, corresponding with the increase of temperature, up to August. In September, the most rainy month, we discover an admirable adaptation to the growth of root crops, the mean maximum temperature being 80·19 deg. and the mean temperature 57·11. The greatest difference which has occurred during the last ten years, in the yearly rain-fall, amounts to 21 inches; at Muscatine, Iowa, it has exceeded 25 inches. The maximum difference in summer rain-fall, is 11·325 inches at Toronto; in Iowa it has been 19·8 inches.

—

The suddenness and copiousness with which rain falls, in districts to the West of the Lakes, is very remarkable, and occasionally proves destructive to the standing crops. Compare the rain fall at Muscatine, on the Mississippi, with that of Toronto, in the year 1849 :—

	Muscatine. Rain in inches.	Toronto. Rain in inches.
January, ...	2·5	1·17
February, ...	1·0	0·24
March, ...	2·4	1·52
April, ...	4·7	2·65
May, ...	4·7	5·11
June, ...	12·2	2·02
July, ...	1·4	3·41
August, ...	12·2	4·97
September, ...	5·0	1·48
October, ...	4·8	5·96
November, ...	6·6	2·81
December, ...	·4	0·84
Total Rain Fall, .	57·9 inches.	32·18 inches.

Twelve inches of rain in August, at Muscatine, or about three-eighths of the quantity which fell at Toronto during the whole year, could scarcely fail to prove destructive to the crops, and highly injurious to the surface soil.

Table, showing the average number of days on which Rain or Snow falls at Toronto, during the different months of the year.
(The average is that of ten years.)

Months.	Number of days. Rain.	Number of days. Snow.
January, ...	5·2	9·9
February, ...	3·5	10.8
March, ...	5·8	7·6
April, ...	8·6	2·2
May, ...	10·4	——
June, ...	10·5	——
July, ...	7·8	——
August, ...	9·4	——
September, ...	10·1	——
October, ...	11·0	1·9
November, ...	9·2	4·8
December, ...	5·1	10·2
Annual Mean, .	96·7	47·4

MEAN NUMBER OF RAINY AND SNOWY DAYS,

In the Lake Country, ...	120
Remote from the Lakes, ...	90
Average for all England, ...	152

Table of the Annual Fall of Rain in various Countries of the Old and New World.

Also, a Table of the average number of Rainy Days in several Districts.

Countries.	Mean Annual Fall of Rain, in inches.	Countries.	Mean No. of Rainy Days.
British Islands, (Plains)	24·51	South of France, .	76
Do.do. Mountain Ranges	40·59	Plains of Lombardy	96
Middle& NorthGermany	20·35	Toronto, ...	96
Middle Rhine Valley, .	25·62	Netherlands, . . .	170
South of France, . . .	23·54	East Coast of Ireland, ...	208
Burlington, (Vermont) .	39·44		
East Port, (Maine) . . .	36·28	Southern Europe, .	120
New York, (State) . . .	36·28	Central Europe, . .	146
Toronto, ...	33·2	Northern Europe, .	180
Rochester, ...	30·16	Average for England, ...	152
Utica, ...	40·57		
Albany, ...	40·76		

HUMIDITY OF THE ATMOSPHERE IN THE CANADIAN PENINSULA.

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The importance of a moderately humid atmosphere, considered in relation to Agriculture, can scarcely be estimated too highly. The most interesting, and perhaps the most advantageous form in which atmospheric humidity exhibits itself, is that of DEW. The quantity of this revivifying agent condensed on the leaves of vegetables in the Canadian Peninsula, is very great, and furnishes one important reason why Western Canada is less liable to suffer from those destructive droughts which are common to the West of the Lakes, and not unfrequent towards the East and South.

If we suppose that only one-thirtieth of an inch of dew is formed in one night, and that that small quantity represents the average deposition during one hundred nights, we shall still have upwards of 300 tons of water precipitated on every acre of grass land, by the agency of dew alone. This quantity falls far short of the real precipitation. "On every acre of the sandy heaths of England fall annually from 2,000 to 4,000 tons of rain, and about 500 tons of dew."

The cooling produced by the nocturnal radiation of forest trees has been already mentioned. We may safely infer, that under the comparatively serene summer sky of Canada West, in connection with a humid atmosphere, the annual deposition of dew on forest lands amounts to about 600 tons per acre, which, dripping from the trees, and being sheltered from solar radiation by the dense shade they produce, furnishes a steady supply to swamps and shallow springs.

The table subjoined, exhibits the difference between the mean monthly humidity of the atmosphere at Toronto and at Greenwich (England.) When air contains no aqueous vapour, its degree of humidity is represented by 0° ; when it is saturated by moisture, by 100° :—

MONTHS.	TORONTO. Degree of Humidity.	GREENWICH. Degree of Humidity.	DIFFERENCE in Degrees of Humidity.
	°	°	°
January	83	91	8
February	79	89	10
March	79	84	5
April	72	81	9
May	72	82	10
June	76	78	2
July	75	81	6
August	80	84	4
September	81	87	6
October	82	89	7
November	84	91	7
December	83	90	7
Mean,	78·8	85·5	7·5

"At Hudson, Ohio, thirty miles south of Lake Erie, Professor Loomis found the complement of the dew point for two years to be 8·10 deg. ; while at Toronto it is about 5·25 deg.—difference, 2·85 deg. in favour of Hudson (in relation to *dryness*), which is what might have been expected from their relations to the Lakes." —Drake.

It occasionally happens that the atmosphere in particular localities is saturated with moisture for hours together. When such periods of saturation occur during the summer months, they not unfrequently prove highly injurious to cultivated grain producing crops. Evaporation from the leaves necessarily ceases during the continuance of the state of saturation, and myriads of minute fungal spores, floating in the atmosphere at that season, find in the stagnant juices of vegetables a suitable soil for their growth. It is thus, that in moist summer weather, the stalks of the cereals, and especially of wheat, become clothed with mildew, and sometimes also with "rust." After the sudden and violent precipitation of rain common in the Western States, the atmosphere saturated with moisture, frequently, as with us, induces the destructive appearance of this unwelcome visitant.

A wonderful change is apparent in the humidity of the atmosphere west of the Great Lakes. The great physical characteristics of Iowa, Wisconsin, Minnesota, Illinois, Missouri, and the whole of the vast extent of country situated between those States and the Rocky Mountains, known by the name of the American Desert—the boundless prairies—furnish undeniable evidence of an arid atmosphere and soil, which cannot support the growth of those species of trees which are found in the Lake country, and on the borders of the rivers flowing into the Mississippi.

"When we cross the Mississippi, and advance into the West, every mile carries us farther from that humid south-west wind, which has traversed, or started from the surface of the Gulf of Mexico—and, of course, the quantity of rain suffers diminution—we enter a region which becomes dryer and dryer, the further it is penetrated; and beyond the hundred and second meridian, as Dr. Gregg has informed me, *scarcely ever refreshed by evening and morning dews*."—Drake.

The limits of the wooded country to the west of the Lakes, are well defined for many hundreds of miles. The vast and almost uninhabitable deserts they fringe, stretch from the Ozark Mountains to the north branch of the Saskatchawan, and are bounded on the west by the Rocky Mountains, and on the east by a line variably distant from the west bank of the Mississippi, between thirty and three hundred miles. The existence of this extensive arid region must oppose the westward progress of agricultural settlement, except along the immediate banks of its great rivers. For the same aridity and unequal distribution of rain over the months of the year, which is singularly effective in preventing the growth of forests, similar to those which extend between the east bank of the Mississippi and the Appalachian chain, will necessarily render agriculture a hazardous undertaking. In another quarter of a century, there will probably exist a comparatively dense population to the limits of the prairie country, on the east of the Rocky Mountains, and a rapid settlement of the humid region west of that great mountain range in Oregon and Upper California; but between those two widely separated tracts of country, a vast uninhabited desert, upwards of a thousand miles in breadth, will probably intervene, and materially affect their political relations.

The circumstance that dew is rarely deposited in the regions of the prairies, affords of itself sufficient evidence of the extraordinary dryness which prevails in the atmosphere of the Far West. The influence of such prolonged aridity is exerted upon the north-west and west winds, which have their origin in those widely extended wastes. Hence, we find, the number of clear, and, at the same time, scorching days, so much greater to the north-east, east, south-east, and west of the Lakes, than in the Canadian Peninsula, where the evaporation from the Lakes supplies moisture to temper the hot breath of the summer westerly winds, as in winter they exert their genial influence in subduing their harshness, during that inclement season of the year.

CONCLUSION.

The Agricultural productions of Western Canada are too generally known to require an extended notice. They include wheat, oats, rye, barley, Indian corn, buckwheat, pease, potatoes, beans, (to a small extent), mangel wurtzel, turnips, beet-roots, tobacco, flax, hemp, hops, clovers, and various grasses. The root crops are, as yet, but sparingly cultivated; for as long as the land will produce wheat, as a general rule, wheat is grown.

Within five and twenty, or thirty miles of Toronto, the better class of farmers consider thirty bushels of wheat to the acre an average crop; and this return is obtained in spite of all the imperfections of a comparatively primitive system of husbandry. If half the care were bestowed upon the preparation of land for wheat, which is devoted to that operation in Great Britain, fifty instead of thirty bushels to the acre, would be the average yield on first class farms. It must be borne in mind, that subsoil draining is unknown among our farmers; that top-dressing in the fall with long dung is never practised; a proper rotation of crops scarcely ever adopted; frequent repetitions of the same crop general; farm-yard manure applied without any previous preparation: and yet, under all these disadvantages of ART, NATURE, with her fertile soil and admirable *agricultural* climate, produces most abundant crops when she is not too grossly abused.

How different a state of things to the east of the Lakes. Professor Norton, in his Appendix to Stephen's Farmers' Guide, says, that "in many of the Eastern States, where wheat was once largely grown, its culture has greatly decreased; and in some districts scarcely any is to be found, excepting an occasional small patch of spring wheat. It is common to ascribe this to the Hessian fly, to the prevalence of rust, &c.; but after we have made all due allowance for these causes of uncertain produce, the principal reason, in my judgment, is to be found in the deterioration of the land."

The climatic adaptation of the Western Province to certain forage and root crops, is well deserving of notice. When ordinary care and attention is devoted to their cultivation, in the way of mere surface draining, and in the application of farm-yard manure, gypsum, or lime, they grow with remarkable luxuriance. White clover springs up wherever the virgin soil is stirred with the plough, or even exposed to the sun's rays, after the process of clearing the land of its forest growth. The red clover flourishes year after year, without diminution in yield, if sparingly top-dressed with gypsum or leached wood ashes. Certain varieties of beans, (not the common horse bean), such as the dwarf, French, and kidney beans, come to maturity with remarkable rapidity, and are at the same time very prolific. Some of the dwarf varieties are especially adapted for forage crops, or even for food, as in Germany and France. They may be sown in this country broadcast, as late as the middle of July; they produce most abundantly, and are well adapted to serve as a green manure, on light soils deficient in vegetable matter. Indian corn, as a forage crop, sown broadcast, has yet to be introduced. Jerusalem artichokes will bear mowing *at least* three times in the year; they will grow upon any kind of soil, and retain possession of the land with such singular tenacity, that a patch must be devoted to them alone. They derive nearly all their nourishment from the atmosphere, and require no care whatever in their cultivation. In the event of a dry autumn, when other forage is scarce, they are always to be found in vigorous health.

Vetches, which succeed most admirably upon the comparatively heavy soils some few miles north of Toronto, are very rarely to be seen. Lucerne is also well adapted to the Lacustrine climate of Western Canada: it attains dimensions far exceeding its average size in France and Italy.

Dye Plants are unknown among our agricultural productions, and yet the Safflower (Carthamus tinctorius)—to instance one only—attains dimensions which are rarely equalled even in Turkey, where it is largely grown. "It is the flowers of the plants which are used for dyeing. The dye is of two kinds, a yellow and red. The yellow is separated by maceration in running water. The remaining dye is a delicate red, more beautiful even than cochineal, but it is little permanent. When ground with pure talc, it forms the kind of rouge termed by the French *rouge vegetale*. The seeds yield an oil which is used in medicine and painting. The plant is cultivated in various parts of Europe, and extensively in Egypt and the Levant, where great quantities are imported into England for painting and dyeing."—Low. In relation to the cultivation of oil plants, very little, as yet, has been done by our farmers. It is true we have a few oil-mills, but the complaint appears to be well founded, that the mills are rarely adequately supplied with materials. The sunflower is a native of America, and in Europe it is grown for the purpose of extracting the oil from its seeds. Every one knows with what singular luxuriance the sunflower flourishes in Western Canada. Like the Jerusalem artichoke, it derives its nourishment almost altogether from the atmosphere, and requires but little care in its cultivation.

Among cultivated root crops in the Western Province, the parsnep does not appear to have attained a place, except on a very small scale, in gardens. This vegetable possesses the admirable characteristic of being able to resist the influence of winter frosts, and may remain in the soil throughout the most inclement season of the year, without the slightest injury. It is a great desideratum for farmers to have a plentiful supply of *sound* roots to give their cattle in the early spring months. Why not cultivate the parsnep, as in the Netherlands? "All animals are fond of it. To milch cows it is eminently favourable giving a flavour and richness to their milk, which no other winter vegetable but the carrot can give."—Low.

It would be beyond the scope of this pamphlet, to consider the question of climatic adaptation more minutely. Indeed, materials, as derived from really practical experiments, are very scarce and imperfect; and even were the question satisfactorily answered, that both climate and soil suited the cultivation of any particular species of vegetables, other important considerations in relation to labour, machinery, markets, &c., present themselves in multitudinous array. One fact, however, appears to be certain, that in a very few years the farmers in the front townships of Western Canada, will be compelled to pay more attention than hitherto to the cultivation of a *variety* of crops. Independently of that deterioration of the soil, which, as a general rule, must result from a frequent repetition of the same kind of crop, and the absence of cheap special fertilizers, the aspect of coming years induces the belief that the price of Canadas' staple agricultural production—wheat, will not maintain even its present diminished range. It is, in fact, at the present time, a matter not only of individual, but also of national importance, that farmers should turn a careful attention to the agricultural productions of other countries, and endeavour to see how far they, by their introduction into this Province, may be made to assist and develope its husbandry. It is equally a matter of individual and national importance, that every earnest well-wisher of Western Canada should contribute his mite to elevate the industry of the country, and extend the knowledge of her capabilities to the tens of thousands across the seas, who would willingly, and even joyfully, make this fertile British Province their home, had they confidence in its climate and soil.

THE END.

Advertisement.

(Second Edition now in the Press.)

LECTURES

ON

AGRICULTURAL CHEMISTRY;

OR,

ELEMENTS OF THE SCIENCE OF

Agriculture.

BY HENRY YOULE HIND,

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This Work is the Second Edition of Two Lectures on Agricultural Chemistry, published by the Author in December last. It has, however, been so greatly enlarged and extended, that it has been found necessary to divide the contents into *Eight* instead of Two Lectures, as in the first edition. The Lectures are divided into Sections, numbered 1, 2, 3, &c., as far as 200; and at the termination of each Lecture, a condensed recapitulation of its contents is attached. Subjoined is a synopsis of the matter of each Lecture :—

PART I.

On the Relation of Vegetables to the Air and Soil in which they grow.

LECTURE I.

Introduction—Object of Agricultural Chemistry—Conditions of Vegetable Life—The Atmosphere—Its Composition and Properties—Atmospheric Food of Vegetables—Carbonic Acid—Influence of Light—Water—Its Relations to Solids and Gases—Its Composition—Ammonia—Nitrogen—Organic and Inorganic Elements of Plants——Composition of Vegetables—Recapitulation.

LECTURE II.

General Structure of Vegetables—Transmission of Water through Vegetables—The Soil—Substances common to Soils and Vegetables—Action of Water on Soils—Inorganic Food of Vegetables — Sulphur, Phosphorus, Potash, Soda, Magnesia, Lime, Flint, Iron, Chlorine, Iodine—Flint, Lime, and Potash Plants—Analysis of a "worn out" Soil—Analysis of a Fertile Soil—Vegetable Matter in Soils—Recapitulation.

LECTURE III.

Artifices for ameliorating the condition of the Soil—Ploughing, Draining, Evaporation, and Filtration—Fallowing—Rotation of Crops—Rotation Courses—The Sap—Ascent and descent of the Sap—Recapitulation.

LECTURE IV.

Manures—Farm-yard Manure—Urine—Green Manuring—Mineral Manures—Gypsum—Lime—Marl—Leached Wood Ashes—Action of Soils on Manures—Surface Action—Recapitulation.

PART II.

On the Relation of Vegetables to Animals.

LECTURE V.

Division of Vegetable Compounds—Compounds containing Nitrogen—Compounds not containing Nitrogen — Woody Fibre — Starch—Sugar—Isomeric Bodies—Oils and Fats—Nitrogen Compounds—Relation to Animal Life—Recapitulation.

LECTURE VI.

Composition of Crops—Nutritious Compounds—Relative value of different kinds of Vegetables for the purposes of Nutrition—Rations for Working Cattle—Milch Kine—The Calf—Cheese—Feeding of Cattle—Conditions of Fattening—Recapitulation.

LECTURE VII.

Function of Digestion—Function of Respiration—Animal Heat — Purposes served by Food—Opposite Functions of Plants and Animals—Production of Manure—Relative Values of Animal Manure—Recapitulation.

LECTURE VIII.

Parasitical Vegetables and Insects—Rust—Mildew—Smut—Potato Disease—The Hessian Fly—The Wheat Fly—The Wire Worm—The Turnip Fly—Weeds of Agriculture—Chess—Canada Thistle, &c.—Climatic adaption of Canada West to the Cultivation of certain Vegetables—Conclusion—Recapitulation.