

METEOROLOGICAL NOTES.—BY F. W. W. DOANE, M. CAN. SOC.
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(Read 16th May, 1905)

The last notes read before the Institute in connection with precipitation ("Rainfall Notes," *Trans. N. S. I. S.*, vol. x, p. 399) recorded observations to December 31st, 1900. Since that date several new "records" have been noted.

RAIN.

The rainfall at Halifax for the month of June, 1901, is given by the Dominion Government Meteorological Agent at 6.959 inches, of which 4.099 inches fell on the 24th in 13.7 hours. This is not the heaviest rainfall on record as a reference to our *Transactions*, vol. ix, p. 282, shows that on Oct. 19th, 1896, 4.394 inches fell in 14.3 hours. The rate of fall is about the same in each instance, viz: .3 inches per hour. The maximum rate during the storm cannot be ascertained as automatic gauges are not provided.

The storm on June 24th, 1901, extended over a large area. It was very heavy, not only throughout Nova Scotia, but in the United States. The rain began about six o'clock in the morning and continued until after one o'clock. At 9 a. m. the gauge showed .33 inches. The figures given convey no idea to the average reader of the severity of the storm. During the greater part of the storm thunder roared, lightning flashed, the streets were deluged and torrents swept down the steep hills destroying the roadways. The rush of water carried down stones as large as a man's head and heaped up earth and road metal in mounds and ridges two feet high on the street railway

tracks. The sewers on some streets became surcharged so that the water spurted from the manholes to a height of several feet. Seldom has a continuous downpour lasted for so many hours.

The Director of the Observatory at St. John, N. B., reports a record-breaking thunder shower on July 15th, 1901, at the close of one of the hottest days of the season. The fall was .58 inches, nearly the whole of which fell in about 10 minutes. The Director estimates that during the greater portion of that time the fall exceeded the rate of $3\frac{1}{2}$ inches an hour. The measurements were made with an ordinary gauge as the observatory was not provided with an automatic register.

The total precipitation in Halifax in February, 1901, was .966 inches. The smallest fall previously recorded for that month was 1.61 in 1873. In May, 1903 only .676 inches fell the next smallest being 1.769 in May, 1894.

SNOW.

The winter of 1904-5 will long be remembered for its excessive snowfall. The first sleighs appeared on the streets of Halifax during the evening of December 13th and runners were in continuous service until March 27th.

Snowstorm followed snowstorm in rapid succession until streets, roads and railways were piled high, blockading traffic and paralyzing business. Each heavy storm was pronounced the worst by far for the past twenty to fifty years, yet each succeeding storm seemed worse than its predecessor.

In the city the street railway company managed to get their lines open after each storm, except in the western suburbs, the track from Coburg Road to Willow Park being snowed under on February 11th by a heavy gale and storm and remaining closed until April 5th. On portions of the main line the snow piled so high that the sweepers could not throw it clear and on some streets the track became walled in by four feet of packed

snow. Streets became impassable and teamsters were obliged to utilize the cleared sidewalks in order to reach their destination.

In the country, blizzard after blizzard blocked the railways until not a wheel turned for days on any line in Nova Scotia except on the Yarmouth to Barrington line. Slight thaws following the great falls of snow caused the water to lodge along the rails the snow preventing it from running off. Then frost came suddenly, the thermometer falling below zero and miles of rails became incased in a solid mass of ice, which could be removed only by the thaws of spring or the pickaxes of hundreds of men. The smaller roads succumbed during the first week in February, the heavy storm of January 31st having stolen a march on the "weather man" whose prediction was "fair and cold" and tied them up as completely as if they had never been completed.

Then on top of a month of snowstorms which had partially paralyzed railway communication in Nova Scotia and practically put an end to all trade between the capital and provincial points, came another storm, the severest of them all (Feb. 15-17). The Intercolonial Railway flyers were buried on Folleigh Mountain and the line to Sydney completely closed, through traffic not being in good working order again until the 27th. The Dominion Atlantic Railway was unable to get a train through from Halifax to Yarmouth until March 9th.

In Halifax business of all kinds suffered. The raging, howling blizzards sent blinding drifts sweeping in every direction. The milk train was cancelled for the first time since it became known as such and the condensed article sold at a premium. In order to relieve the tightness in the meat market two cattle dealers were obliged to bring their droves through on foot from Annapolis County. Funerals had to be postponed until the roads could be made passable. Buildings suffered from the depth and weight of snow on roofs which strained

them and caused them to leak and in some cases to collapse. Men, women and children moved about the streets on snow shoes.

Outside the city the conditions became even more serious, and places depending on the railway obtained relief none too soon. Hundreds of cars of freight were stalled along the Inter-colonial Railway, numbers of locomotives were isolated, coal hoppers innumerable were imbedded in deep snow drifts, water gave out in stalled engines and trains were without heat, causing passengers to suffer much inconvenience and discomfort.

Schools, churches, electric light stations, foundries, &c., had to close. because wood could not be hauled and coal supplies were exhausted. Meat, flour, oil, butter, milk, eggs and feed became scarce. Farmers were obliged to destroy cattle and horses because they could not obtain hay and had difficulty in getting water for their stock. Lumbermen were forced to abandon their work in the woods in consequence of the depth of the snow.

In Windsor the water supply became short. In Sydney several departments of the steel works were compelled to shut down, being handicapped by the scarcity of cars and the impossibility of moving out their product and by the lack of fuel and other supplies buried deep in the monster snow drifts.

The administration of justice was interfered with, the presiding judge being unable to reach Sydney for the regular sitting of the supreme criminal court. The aid of the legislature was required to straighten out the tangle caused in this instance, parliament being in session.

The mail service was completely demoralized. Steamers were pressed into service between St. John, Yarmouth, Halifax and Sydney, while nearer towns, Windsor, Lunenburg, Bridgewater, &c., were reached by team before the railways could be dug out.

The loss to the province was enormous ; trade being temporarily paralyzed, and the prices for supply of fuel, food and other necessaries increased rapidly as the stores decreased.

In olden times when snow fell deeply (but, perhaps never so deeply), and communication was wanted the roads were used, but in these days in winter only main roads are kept open, and when the snow falls deeply people stay at home or go by rail. In but few districts are supplies put in to last the winter through. The railways are depended on to provide from day to day or week to week. A winter such as that of 1904-5 demonstrates the extent to which the whole economic system of the country now hinges on the railways and how with all our progress we are still merely the plaything of the elements.

A call from the pulpits of Wolfville and Kentville brought volunteers to attack the ice and snow fetters of the Dominion Atlantic Railway. Professors, teachers and students from King's and Acadia Colleges, Horton Academy and Acacia Villa rendered valuable assistance in clearing the line, while ladies helped on the work by ministering to the wants of the laborers. The first train to Kentville after the disastrous blockade got through on February 27th with four cars of coal. The line to Sydney was opened on the 22nd, but the railway to Yarmouth (Dom. Atlantic Ry.) defied the best efforts of man until March 9th. Even after the railroads were opened snow continued to fall and drift into the cuttings, walled in by perpendicular banks of snow level with the roof of the cars. One incident reported in connection with the snow blockade on the Folley Mountain is worthy of note : A farmer who was working his weary way along a country road with a pair of horses and load of hay was stopped at a railway crossing by a 12 to 14 feet cut in the snow which had been opened by an Intercolonial Railway train leaving the sides perpendicular. The crossing problem was solved by backing the snow plow into the cut and driving the team over the bridge thus temporarily provided.

It was feared that the snow which, without rain or soft weather, had piled so high, would be melted by a rain storm when great loss would have resulted. Rivers would flow through the streets and along car tracks and sidewalks, flooding cellars, as few gutters or catchpits had been kept open. Bridges would have been carried away and roads and railways washed out, making transportation dangerous to life. Fortunately the sun did the work gradually and practically unaided, until the danger was passed and the great snows of 1904-5 had disappeared.

A comparison with past meteorological history shows that the past winter has been the worst snow winter on record. While it takes second place in total depth of snowfall, it takes first place in minimum depth of rainfall. In the winter of 1881-2 the snowfall (the deepest on record) was 124.72 inches and the rainfall for December, January, February, March and April, 20.543. In 1904-5 the figures are 123.92 and 9.959. While the difference in depth of snow is a fraction of an inch only, the difference in rainfall is over 10 inches. The snow falling in 1904-5 came in severe storms, and from December to March there was almost no rain and practically no thaw. The result was that the snow piled up to a greater height with each storm, while in an ordinary winter rains and thaws dispose of the surplus snow.

The accompanying tables show in detail the snow records since the establishment of the Government Meteorological Station at Halifax. A study of these tables shows that during the 36 years the heaviest snowfalls have occurred every 10 to 12 years, viz.: in the winters 1871-2, 1881-2, 1893-4 and 1904-5, the fall in the last three being practically the same. It may also be noted that there were at least three years in succession above the maximum.

As there have been two heavy years only this time, there may be another due in the winter of 1905-6.

Comparison with the precipitation of other years would also seem to indicate the possibility of a dry year in 1905. The last heavy snowfall, 1893-4, one of the greatest on record, was followed by the smallest rainfall.

<i>Year.</i>	<i>Rainfall only.</i>	<i>Total precipitation.</i>
1872	42.270	54.060
1882	47.610	62.022
1894	34.567	45.808

Acknowledgement is due to the Dominion Government Meteorological Agent at Halifax from whom valuable assistance was obtained in the preparation of this paper.

PRECIPITATION AT

YEAR.	1869.		1870.		1871.		1872.		1873.	
	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
January	3 040	14 0	5 180	14 9	2 330	14 7	2 580	13 1	4 780	26.6
February	3 200	8.4	6 820	29.6	4 110	19.3	2 400	19.3	0 490	10.7
March	4 110	29 3	1 640	14 4	4 390	15.1	0 760	43 0	2 460	15.5
April	2 210	2 7	3 780	.8	3 420	13 4	2 770	.8	1 930	6.5
May	5 510	5	3 190	T.	2 590	T	4 440	T	1 580	7.4
June	3 920	.....	1 690	.....	2 960	.....	4 230	.....	2 960	.....
July	2 920	.....	3 2 0	.....	3 380	.....	2 880	.....	3 900	.....
August	2 580	.....	2 2 0	.....	3 690	.....	6 820	.....	4 450	.....
September	1 570	.....	3 330	.....	4 810	.....	1 410	.....	4 430	.....
October	7 030	2.3	6 750	.8	4 490	.....	4 880	.....	8 630	.....
November	5 190	3.5	5 670	7.7	3 210	10 0	6 230	4.4	7 400	5 8
December	5 140	4.8	4 810	10 7	1 880	24 8	2 870	32.3	2 210	18.9
Totals	46.420	65.50	48.270	78.9	41 310	97 3	42 270	112.9	45 270	91.4
Total Precipitation..	54 530		56 160		51.140		54.060		55.440	

YEAR.	1880.		1881.		1882.		1883.		1884.	
	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
January	5.393	23.4	2.737	8 7	3 160	36.80	2 400	25 30	3.616	7.90
February	3.242	18 8	2.939	23 9	1.672	42.77	2.428	14 32	4.701	14.60
March	1 015	23.5	5.915	6.4	5.458	16.10	3 641	13.00	3.814	32 20
April	4.97	7 0	3.236	2 6	3.679	11.45	2 933	7 70	6.895	3 18
May	4.088	.....	2.460	.....	4.677	.....	8.613	.....	3.629	.....
June	1.343	.....	5 301	.....	5.507	.....	3 3 2	.....	3.773	.....
July	3 086	.....	3 177	.....	5 071	.....	3.510	.....	8.294	.....
August	3.920	.....	3 062	.....	3.925	.....	5.342	.....	2.771	.....
September	5 712	.....	3 105	.....	5.914	.....	3.864	.....	1 788	.....
October	4.590	.....	4.206	.....	7.403	.....	5.841	.....	3.083	0.10
November	4.344	3.6	3 120	13.0	0.832	5 60	2.628	8 50	5 652	3 40
December	3.213	11.8	6.574	4 6	1 312	21.40	4.008	26.70	7.416	17.03
Totals	44.043	88.1	45.832	59.2	47.610	134.12	48.560	95 5	55.132	78 46
Total Precipitation..	52.853		51.755		62 022		58.112		63.278	

YEAR.	1891.		1892.		1893.		1894.		1895.	
	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
January	6.099	22.84	5 339	9 82	3.10	16.80	1.732	53.90	7.321	28.10
February	6.940	18.00	3.845	17.60	2.21	37.60	2 871	7 00	1.223	33 82
March	1.567	11.18	4 433	15.53	1.73	5 60	1.723	19.0	3 963	19.68
April	3.528	4.82	2 480	1.73	3.63	5 80	3 422	22.26	3 896	.60
May	4.195	.....	5.459	.....	5 05	.....	1.769	.....	4 089	.....
June	4.131	.....	3.638	.....	1.75	.....	3.803	.....	1 827	.....
July	4.003	.....	2 710	.....	4.75	.....	1.059	.....	3.924	.....
August	3.385	.....	6.809	.....	5.95	.....	3.993	.....	5.502	.....
September	3.052	.....	1.744	.....	4.39	.....	1.010	.....	2 491	.....
October	9.616	0 05	3 472	.....	5.64	.....	3.863	.....	5.437	1.90
November	2.388	.....	9.240	.....	3 60	1.56	5.422	3.63	8.22	.....
December	3 984	0 92	2.352	7.01	8.15	20.10	3.900	6.62	5 549	2.97
Totals	52.888	57 81	48.521	51.69	49.98	87.60	34.567	112.41	53 445	87.07
Total Precipitation..	58.669		53.690		58.74		45 808		62.152	

HALIFAX, N. S., 1869-1905.

1874.		1875.		1876.		1877.		1878.		1879.	
Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
3.860	15.7	0.610	23.71	1.311	21.10	0.840	33.10	6.987	5.35	0.070	43.30
2.280	29.9	2.929	29.63	3.133	31.23	1.0.4	7.9	1.977	7.20	0.631	23.70
3.630	3.7	0.711	14.02	5.774	5.6	7.423	12.3	9.439	7.95	5.082	11.20
1.9.0	26.5	2.958	4.20	2.130	9.95	3.621	1.70	3.176	0.26	2.291	11.90
4.760	0.1	3.977	.....	4.574	0.90	4.024	.....	5.759	.....	4.687	.....
7.920	.....	4.067	.....	3.384	.....	3.811	.....	4.477	.....	1.191	.....
2.290	.....	5.612	.....	3.914	.....	4.468	.....	1.483	.....	3.843	.....
3.370	.....	3.555	.....	1.9.0	.....	3.539	.....	3.127	.....	4.827	.....
5.040	.....	2.060	.....	6.094	.....	3.161	.....	0.8.0	.....	2.596	.....
2.400	.....	9.976	.....	4.067	0.01	6.623	0.9	5.061	.....	4.755	T
3.370	2.1	5.154	3.90	7.397	T	8.678	.....	6.853	0.56	2.997	18.26
4.420	11.0	0.834	7.30	0.618	25.58	3.027	14.4	4.231	8.38	2.179	18.50
45.240	89.0	42.493	87.81	44.335	96.37	5.277	70.30	53.770	29.70	35.149	126.86
54.180		51.274		53.972		57.510		56.740		47.835	

1885.		1886.		1887.		1888.		1889.		1890.	
Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
3.928	24.60	8.030	6.40	5.320	23.80	2.862	25.80	4.041	3.5	1.480	24.80
1.820	32.70	2.162	16.89	4.633	21.02	5.304	9.80	4.931	12.5	2.946	16.99
1.640	22.40	1.837	21.90	2.539	19.10	3.770	5.40	1.576	4.7	8.543	13.46
3.470	0.50	0.413	3.80	5.838	05.58	2.455	12.2	6.510	8.93	2.598	3.60
3.282	.....	8.819	.....	2.126	.....	2.857	.20	3.871	.....	3.970	.....
2.749	.....	2.708	.....	2.121	.....	4.939	.....	3.755	.....	3.440	.....
5.817	.....	6.525	.....	2.045	.....	5.001	.....	2.668	.....	2.141	.....
3.001	.....	4.526	.....	8.351	.....	7.000	.....	2.663	.....	7.042	.....
2.497	.....	4.459	.....	3.308	.....	5.331	.....	1.399	.....	4.534	.....
6.280	.....	2.105	0.30	3.058	.....	6.859	.....	4.179	.....	6.603	.....
5.383	0.40	5.204	0.80	6.718	T	6.772	30	6.995	1.5	3.596	1.20
7.393	13.00	4.149	13.20	3.618	5.02	7.764	.10	2.708	2.8	6.082	11.20
47.269	93.6	50.967	63.20	49.631	74.52	60.914	53.80	45.266	33.93	52.978	71.25
56.629		57.287		57.133		66.294		48.659		60.103	

1896.		1897.		1898.		1899.		1900.		1901.	
Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
0.260	14.60	3.433	24.63	2.370	16.90	3.943	1.40	7.582	9.5	3.503	32.4
1.852	23.47	0.744	21.54	2.444	19.78	1.333	22.80	4.677	6.0	.060	9.0
7.238	15.48	3.832	16.18	2.718	13.50	5.445	17.33	5.345	5.7	3.043	5.3
1.108	3.05	5.443	7.68	6.752	5.94	2.908	3.70	3.289	5.3	6.235	.8
2.532	.....	4.591	0.22	2.366	.....	3.657	0.20	4.234	.....	5.556	.....
4.671	.....	6.070	.....	5.598	.....	3.875	.....	2.6.6	.....	6.959	.....
8.729	.....	3.661	.....	3.652	.....	5.717	.....	1.872	.....	1.585	.....
3.037	.....	5.185	.....	5.051	.....	1.542	.....	3.993	.....	3.656	.....
12.092	.....	1.169	.....	4.158	.....	3.201	.....	5.043	.....	6.872	.....
15.039	.....	0.746	.....	4.845	.....	6.191	.....	7.365	.....	4.884	.....
3.439	9.57	5.961	0.90	9.881	3.67	4.460	1.70	6.370	4.1	2.558	.....
2.618	6.30	3.336	1.86	2.329	17.37	3.166	18.72	1.276	19.8	5.483	30.9
62.615	72.47	44.221	73.01	52.764	77.16	45.468	75.45	53.702	50.4	50.394	78.4
69.862		51.522		60.480		53.013		59.697		58.096	

PRECIPITATION AT HALIFAX, N. S., 1869-1905—*Continued.*

YEAR.	1902.		1903.		1904.		1905.	
	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.	Rain.	Snow.
January	2.055	11.3	3.432	13.7	3.518	23.80	3.630	46.60
February	1.290	11.5	2.022	16.9	2.278	31.50	1.586	37.40
March	7.757	.....	6.474	6.1	4.602	9.60	1.644	11.60
April	2.487	5.8	5.403	.8	4.992	15.20	1.240	.....
May	3.725	.....	.676	.....	3.315	.....	.....	.....
June	4.908	.....	3.493	.....	2.668	.....	.....	.....
July	1.651	.....	4.313	.....	2.332	.....	.....	.....
August	4.707	.....	4.247	.....	6.520	.....	.....	.....
September	4.657	.....	4.237	.....	4.502	.....	.....	.....
October	4.252	.....	6.368	.....	5.031	.....	.....	.....
November	3.813	.....	9.228	3.7	5.007	1.09	.....	.....
December	4.853	21.3	3.210	13.8	1.859	27.30	.....	.....
Totals	46.215	49.9	53.103	55.0	46.654	108.40	.....	.....
Total Precipitation	51.916		59.125		57.494		.....

NOTE.—In the preceding tables "T" indicates *Trace*.

SNOWFALL AT HALIFAX DURING EACH WINTER, 1869-1905.

WINTER OF	October.	November.	December.	January.	February.	March.	April.	May.	Total Snowfall.
1869-70	2.3	3.5	4.8	14.9	29.6	14.4	0.8	T	70.30
1870-71	0.8	7.7	10.7	14.7	19.3	15.1	13.4	T	81.70
1871-72		10.0	24.8	13.1	19.3	43.0	0.8	T	111.00
1872-73		4.4	32.3	26.6	10.7	15.5	6.5	7.4	103.40
1873-74		5.8	18.9	15.7	29.9	3.7	26.5	0.1	100.60
1874-75		2.1	11.0	28.71	29.68	14.02	4.2	....	89.71
1875-76		3.9	7.3	21.1	33.23	5.60	9.95	0.9	81.98
1876-77	0.01	T	25.58	33.10	7.90	12.30	1.70	....	80.59
1877-78	0.90	....	14.40	5.35	7.20	7.95	0.26	....	36.06
1878-79		0.56	8.38	43.30	23.70	11.20	11.90	....	99.04
1879-80	T	18.26	18.50	23.40	18.80	23.50	7.00	....	109.46
1880-81		3.60	11.80	8.70	23.90	6.40	2.60	....	57.00
1881-82		13.00	4.60	36.80	42.77	16.10	11.45	....	124.72
1882-83		5.60	21.40	25.30	14.32	13.00	7.70	....	87.32
1883-84		8.50	26.70	7.90	14.60	32.20	3.18	....	93.08
1884-85	0.10	3.40	17.08	24.60	32.70	22.40	0.50	....	100.78
1885-86		0.40	13.00	6.40	16.80	21.90	3.80	....	62.30
1886-87	0.30	0.89	13.20	23.80	21.02	19.10	5.58	....	83.80
1887-88		T	5.02	25.50	9.90	5.40	12.20	0.20	58.42
1888-89		0.30	0.10	3.50	12.50	4.70	8.93	....	30.03
1889-90		1.50	2.80	24.80	16.99	13.46	3.60	....	63.15
1890-91		1.20	11.20	22.84	18.00	11.18	4.82	....	69.24
1891-92	0.05	....	0.92	9.82	17.60	15.53	1.73	....	45.65
1892-93		....	7.01	16.80	37.60	5.60	5.80	....	72.81
1893-94		1.50	20.10	53.90	7.00	19.00	22.26	....	123.76
1894-95		3.63	6.62	28.10	33.82	19.68	0.60	....	92.45
1895-96	1.90	....	2.97	14.60	23.47	15.48	3.05	....	61.47
1896-97		9.57	6.30	24.63	21.54	16.18	7.68	0.22	86.12
1897-98		0.90	1.86	16.90	19.78	13.50	5.94	....	58.88
1898-99		3.67	17.37	11.40	22.80	17.33	3.70	0.20	76.47
1899-00		1.30	18.72	9.50	6.00	5.70	5.30	....	46.52
1900-01		4.10	19.80	32.40	9.00	5.30	0.80	....	71.40
1901-02		....	30.90	11.30	11.50	....	5.80	....	59.50
1902-03		....	21.30	13.70	16.90	6.10	0.80	....	58.80
1903-04		3.70	13.80	23.80	31.50	9.60	15.20	....	97.60
1904-05		1.00	27.30	46.60	37.40	11.60	0.02	....	123.92

COMPARISON OF SNOWFALL AT HALIFAX, N. S.
(36 years).

MONTH.	Maximum.		Minimum.		Mean	1904-5.	REMARKS.	
	Inches.	Year.	Inches	Year.	Inches.			
October	2.30	1869	0.010	1876	0.18	.....	Fall in nine years only.	
November	13.00	1881	0.300	1888	3.44	1.0	In 6 years no fall recorded.	
December	32.30	1872	0.100	1888	13.85	27.3		
January	53.90	1894	3.500	1889	21.22	46.6		
February	42.77	1882	6.000	1900	20.80	37.4		
March	43.00	1872	3.700	1874	13.68	11.6	No fall in 1902.	
April	26.50	1874	0.260	1878	6.28	0.02	Fall recorded in every year.	
May	7.40	1873	0.100	1874	0.25	.....	Fall in nine years only.	
Maximum snowfall in one year ..							134.12	in 1882.
Minimum " " ..							29.70	in 1878.
Mean " 36 years ..							78.53.	
Mean " one winter ..							79.70.	
Maximum " one winter ..							1881-2	124.72—56% above mean.
							1904-5, 123.92—55%	"
							1893-4, 123.76—55%	"
							1871-2, 111.00—39%	"
Minimum " one winter ..							1888-9, 30.03—38%	"
Maximum " two winters.							1903-5, 221.52	aver 110.76—39% above mean
							1893-5 216.21	" 108.11—36% "
							1871-3, 214.40	" 107.20—35% "
							1881-3, 212.04	" 106.02—33% "
Maximum " three winters.							1871-4, 315.00	" 105.00—32% "
							1881-4, 305.12	" 101.70—28% "
							1892-5, 289.02	" 96.34—20% "
							1902-5, 280.32	" 93.44—16% "

RAINFALL (*only*) AT HALIFAX, N. S., DURING WINTERS OF GREATEST SNOWFALL.

WINTER	December.	January.	February.	March.	April.	Total for Dec., Jan., Feb., March, Apl.	Total for Jan., Feb., March, Apl.
1871-2..	1.88	2.58	2.4	0.76	2.77	10.39	8.51
1881-2..	6.574	3.16	1.672	5.458	3.679	20.543	13.969
1893-4..	8.15	1.732	2.871	1.723	3.4.2	17.898	9.748
1904-5..	1.859	3.63	1.586	1.644	1.24	9.959	8.100