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NORMAL PRECIPITATION IN THE REGION OF THE GREAT LAKES.[1]

By ALFRED J. HENRY, Chief of Division.

We present elsewhere a chart[2] of normal annual precipitation of rain and snow in the drainage basins of the Great Lakes. The outlines of the different drainage basins were drawn from the excellent map published in Report of the United States Deep Waterways Commission, House Doc. No. 192, 54th Congress, 2d Session. The precipitation data were obtained from the files of the United States Weather Bureau and the Meteorological Service of the Dominion of Canada.

The distribution of precipitation and its relation to the fluctuations of the surface level of the lakes are subjects of much importance. While we are able to present a fairly accurate chart of the normal distribution of precipitation, and to give figures which show the amount of rain and snow that has fallen in the several drainage basins during the last six months, we should not be too hasty in drawing conclusions therefrom.

The rain that falls on the ground may be disposed of in several ways. A considerable portion, say from 33 to 50 per cent, may run into small streams and rivers, and thence into the Lakes, and it is this portion, called for convenience the runoff, with which hydrographers are chiefly concerned.

The allied questions of rainfall and runoff, in their bearing upon the design and construction of sewerage systems, have received a good deal of attention of recent years from civil and municipal engineers. The National Government, also, in dealing with the reclamation of arid and subarid lands, has investigated to some extent, the amount of runoff in various parts of the country, and a preliminary map of the results has been prepared by Messrs. Gannett and Newell of the U. S. Geological Survey. This map shows the runoff in the Lake region to be rather large, approximating 50 per cent of the total rainfall in the lower peninsula of Michigan. For the entire region, however, it is somewhat less. It does not seem possible with our present knowledge of the surface conditions to estimate the runoff for each basin separately.

The normal annual precipitation of the several basins, giving equal weight to all of the available records, is about as follows:

	Inches.
Lake Superior	28
Lake Michigan	33
Lake Huron	32
Lake St. Clair	35
Lake Erie	36
Lake Ontario	33

These figures agree closely with those used by Professor Abbe, MONTHLY WEATHER REVIEW, April, 1898, except in the case of Lake Superior, for which he uses a value of 31.2 The records, whence my figures were obtained, especially for the Canadian side, are more complete than those consulted by Professor Abbe.

The lakes themselves, with the possible exception of Lake Superior, do not seem to have a very marked influence on the precipitation of moisture on adjacent land areas. Precipitation is greater on the south than on the north side of Superior, Erie, and Ontario—lakes whose longer axes run approximately east and west. The difference in the case of Superior is about 8 inches, the average annual precipitation on the American side being that much greater than on the Canadian side. The average precipitation on the south shores of Lakes Erie and Ontario is about 3 inches greater than on the north shores. Precipitation is greater on the eastern

[1] Reprinted from Meteorological Chart of the Great Lakes, June 3, 1899.
[2] Not reproduced.

shores of Lakes Michigan and Huron than on the western, although the differences are not so strongly marked as between the northern and southern shores of the remaining lakes.

There is a slight diminution in the annual precipitation over the northern peninsula of Michigan as compared with the immediate shore line. The precipitation of the interior of the upper half of the lower peninsula is also considerably less than on the borders of the lakes on either side, a fact which can probably be referred to the influence of the lakes.

Precipitation, in inches and hundredths, November, 1898, *to April,* 1899.

Stations.	November, 1898.	December, 1898.	January, 1899.	February, 1899.	March, 1899.	April, 1899.	Normal annual.
Lake Superior Basin.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Savanne, Ont	2.00	0.60	1.50	1.80	1.00	0.75	.....
Port Arthur, Ont	0.77	0.28	0.50	0.57	0.34	.....	22.66
Schreiber, Ont	1.80	0.70	0.80	1.40	1.80	2.45	.....
Heron Bay, Ont	2.13	1.87	1.80	1.38	2.90	1.90	.....
White River, Ont	2.02	2.09	1.49	1.72	1.58	2.40	23.25
Missanabie, Ont	1.47	1.50	3.00	1.10	3.10	1.77	26.51
Two Harbors, Minn	.....	.....	0.64	0.61	0.69	3.19	.....
Duluth, Minn	0.94	0.19	0.67	0.66	0.82	1.33	31.01
Thomaston, Mich	2.66	2.84	1.80	0.40	2.80	.....	.....
Ewen, Mich	1.10	.....	1.70	0.75	.....	3.47	.....
Calumet, Mich	2.57	3.07	2.61	1.34	1.08	2.49	31.11
Baraga, Mich	.....	.....	1.70	0.82	2.90	1.45	.....
Sidnaw, Mich	.....	0.68	1.94	1.67	2.28	1.64	.....
Ishpeming, Mich	1.53	1.46	2.34	1.01	5.49	2.63	.....
Marquette, Mich	1.79	1.52	1.64	0.53	2.79	2.60	32.37
Lake Michigan Basin.							
Lathrop, Mich	0.75	0.60	1.90	1.00	2.75	1.45	30.69
Florence, Wis	1.12	0.15	1.35	0.35	3.66	4.19	.....
Powers, Mich	.....	0.35	1.57	0.70	2.40	.....	.....
Escanaba, Mich	1.39	0.43	1.48	1.03	2.22	3.26	32.46
Manistique, Mich	1.48	1.07	1.45	0.95	2.72	3.00	.....
St. Ignace, Mich	1.95	0.50	1.63	0.72	1.86	1.54	.....
Wausaukee, Wis	1.10	0.30	0.75	0.60	1.85	.....	.....
Antigo, Wis	.....	.....	0.60	0.80	1.70	.....	.....
Stevens Point, Wis	1.15	0.50	0.90	0.90	1.15	3.86	.....
Showano, Wis	1.23	0.38	1.70	1.20	2.32	2.55	.....
Amherst, Wis	1.70	0.81	1.30	1.10	2.50	2.76	.....
New London, Wis	1.06	0.46	1.04	1.13	2.88	2.89	.....
Oconto, Wis	1.95	0.40	1.45	0.65	2.22	2.53	27.58
Green Bay, Wis	0.87	0.74	0.98	0.96	2.93	3.15	32.30
Menasha, Wis	0.77	0.59	1.07	0.41	1.79	2.98	.....
Chilton, Wis	0.38	0.30	0.90	0.45	1.20	1.90	.....
New Holstein, Wis	.....	0.10	0.70	1.00	2.25	1.05	.....
Manitowoc, Wis	0.65	0.62	0.83	0.98	1.84	1.67	31.09
Oshkosh, Wis	1.75	0.46	0.75	0.55	1.45	3.50	.....
Fond du Lac, Wis	1.29	0.51	0.60	0.97	1.56	.....	.....
West Bend, Wis	.....	.....	T.	T.	.....	1.86	.....
Port Washington, Wis	1.37	1.20	0.40	0.70	2.45	1.68	.....
Waukesha, Wis	0.98	0.50	0.64	0.77	1.47	1.19	.....
Milwaukee, Wis	1.16	0.58	0.45	0.75	1.99	0.68	32.06
Racine, Wis	1.29	0.53	0.35	T.	1.69	0.31	.....
Fort Sheridan, Ill	1.44	0.91	0.52	.....	2.47	0.27	.....
Chicago, Ill	2.25	1.11	0.58	1.60	2.11	0.14	34.76
Glenwood, Ill	2.48	1.79	0.89	1.54	1.65	0.20	.....
Hammond, Ind	1.74	1.38	0.55	0.71	1.09	0.13	.....
Laporte, Ind	2.65	2.29	2.06	1.52	3.37	0.88	.....
Berrien Springs, Mich	3.57	3.55	3.20	2.70	6.72	0.96	.....
South Bend, Ind	3.61	2.25	2.01	2.18	3.81	0.80	.....
Syracuse, Ind	4.21	2.20	2.67	2.85	4.06	1.62	.....
Mottville, Mich	3.53	2.09	2.32	2.27	4.64	0.57	.....
St. Joseph, Mich	2.12	2.75	0.25	2.19	2.26	1.10	.....
Vandalia, Mich	3.94	2.68	2.67	2.86	4.54	1.10	.....
Wasepi, Mich	3.37	2.18	2.80	2.33	4.27	0.60	.....
Coldwater, Mich	4.46	2.00	2.88	1.91	3.73	0.74	.....
Parkville, Mich	3.61	2.44	2.84	2.54	4.53	.....	.....
Kalamazoo, Mich	3.45	2.44	1.61	1.80	4.74	2.03	36.20
Battlecreek, Mich	3.16	2.25	2.72	2.16	3.61	1.33	.....
Hanover, Mich	2.79	1.66	2.12	2.09	2.94	0.84	.....
Somerset, Mich	3.32	2.47	2.06	2.94	2.70	0.55	.....
Hastings, Mich	3.30	2.59	2.27	1.74	3.47	1.84	.....
Jackson, Mich	3.36	1.63	2.11	1.59	3.43	0.69	.....
Lansing, Mich	2.60	1.27	2.05	1.65	3.17	1.93	31.60
Williamston, Mich	3.92	.....	2.00	.....	.....	.....	.....
Grand Haven, Mich	2.81	2.15	2.01	1.13	2.19	2.02	34.27
Grand Rapids, Mich	3.26	3.51	2.56	1.76	3.60	0.77	.....
Muskegon, Mich	2.40	1.14	2.75	1.89	1.75	0.75	.....
Stanton, Mich	4.28	2.58	.....	0.96	1.33	.....	.....
White Cloud, Mich	1.24	1.52	1.12	2.12	.....	1.20	.....
Big Rapids, Mich	3.01	1.20	1.84	2.18	3.84	1.21	.....
Hart, Mich	2.41	2.45	1.65	1.25	1.25	1.70	.....
Fairview, Mich	2.31	1.51	1.51	1.28	3.45	0.16	.....
Ludington, Mich	2.10	1.27	0.92	1.10	2.16	0.65	.....
Baldwin, Mich	3.02	2.08	1.70	1.49	2.70	0.95	.....
Reed City, Mich	1.84	1.00	0.69	0.90	2.68	2.10	.....
Manistee, Mich	2.32	1.26	0.79	.....	.....	.....	33.70
Boon, Mich	3.39	2.58	2.65	1.49	2.72	1.84	.....
Lake City, Mich	.....	1.65	0.50	1.35	2.50	T.	.....
Ivan, Mich	1.99	3.62	1.78	0.50	2.43	1.22	.....
Frankfort, Mich	2.71	.....	0.95	1.81	2.99	T.	.....
Traverse, Mich	1.29	3.20	1.09	0.39	1.52	1.79	.....
Old Mission, Mich	.....	2.35	2.04	0.60	2.31	1.83	.....
Northport, Mich	2.35	3.30	1.60	.....	2.25	1.40	42.13
Mancelona, Mich	2.14	3.50	1.80	0.80	2.80	2.70	.....
Charlevoix, Mich	2.57	2.90	2.11	1.84	3.00	2.51	.....
Petoskey, Mich	2.74	2.17	2.15	1.32	2.32	2.19	.....

Precipitation—Continued.

Stations.	November, 1898.	December, 1898.	January, 1899.	February, 1899.	March, 1899.	April, 1899.	Normal annual.
Lake Huron Basin.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Cockburn Island, Ont	3.63	2.07	2.40	0.40	2.50	2.62	.....
Sudbury, Ont	.....	1.60	1.25	.....	1.80	.....	.....
North Bay, Ont	.....	.....	1.60	0.60	.....	.....	.....
Uplands, Ont	2.64	5.13	7.50	1.50	5.60	1.09	.....
Sprucedale, Ont	2.57	6.06	5.78	1.30	4.61	0.85	.....
Parry Sound, Ont	3.63	6.09	7.28	2.76	4.54	1.25	37.37
Whiteside, Ont	2.21	8.65	6.31	2.86	4.85	1.68	.....
Coldwater, Ont	2.26	6.25	3.55	1.70	4.05	1.36	.....
Orillia, Ont	2.20	3.88	2.79	1.50	4.08	.....	.....
Collingwood, Ont	4.73	.....	.....	.....	4.60	1.10	.....
Barrie, Ont	2.81	2.98	2.05	1.19	4.47	2.15	.....
Durham, Ont	2.85	6.90	4.66	3.20	4.35	1.73	.....
Owen Sound, Ont	2.76	10.50	8.51	2.63	5.54	2.16	.....
Saugeen, Ont	2.12	4.82	3.91	2.65	3.52	1.59	34.57
Point Clark, Ont	0.95	2.37	3.57	1.74	2.42	1.62	33.05
Lucknow, Ont	3.81	3.96	4.70	1.76	3.63	1.30	.....
Sarnia, Ont	1.16	1.77	1.28	2.35	1.50	0.30	.....
Sault Ste. Marie, Mich	2.02	1.26	1.61	1.10	1.44	1.85	29.53
Mackinaw, Mich	1.48	1.08	1.91	0.85	1.83	2.05	.....
Cheboygan, Mich	2.80	1.52	1.48	1.39	3.72	2.22	.....
Rogers, Mich	.....	2.19	0.35	1.30	3.49	0.47	.....
Alpena, Mich	1.09	1.22	0.88	0.47	2.39	2.01	.....
Luzerne, Mich	1.87	2.13	0.82	1.76	3.57	1.68	.....
Grayling, Mich	2.65	2.85	1.15	0.45	4.95	0.50	27.44
West Harrisville, Mich	1.01	1.22	1.11	1.32	.....	.....	.....
Harrisville, Mich	1.38	1.77	1.40	1.38	4.24	0.87	.....
Omer, Mich	1.95	1.15	0.80	1.66	3.80	1.20	.....
Gladwin, Mich	2.20	2.50	1.50	1.90	3.28	1.65	.....
Mount Pleasant, Mich	2.73	0.67	0.98	.....	3.96	1.05	.....
Alma, Mich	3.22	2.03	1.35	1.18	3.55	0.81	.....
Saginaw, Mich	2.82	2.11	1.82	1.38	5.56	0.98	.....
Bay City, Mich	2.59	1.46	1.93	1.10	3.02	1.21	.....
Port Austin, Mich	.....	0.25	0.90	0.99	4.08	0.90	.....
Hayes, Mich	1.09	0.32	0.90	0.70	3.54	.....	.....
Sand Beach, Mich	3.08	0.67	1.41	0.95	2.47	0.88	.....
Carsonville, Mich	2.18	1.89	2.26	0.84	4.05	0.44	.....
Vassar, Mich	1.89	1.23	1.95	1.13	4.80	0.93	.....
Arbela, Mich	2.09	2.47	1.80	1.90	3.91	0.88	.....
Flint, Mich	2.19	1.28	1.84	1.31	3.66	1.00	.....
Owosso, Mich	2.52	1.35	.....	1.60	4.74	.....	.....
Madison, Mich	3.10	2.20	2.33	1.95	3.57	0.48	.....
Lapeer, Mich	1.02	0.35	.....	1.70	3.95	.....	.....
Thornville, Mich	2.88	1.56	3.31	1.71	4.34	0.67	32.66
Howell, Mich	2.14	1.77	2.18	2.38	2.31	.....	.....
Jeddo, Mich	3.33	2.79	2.74	1.11	3.89	0.68	.....
Port Huron, Mich	3.19	3.17	2.02	0.95	2.93	0.77	31.60
Lake St. Clair Basin.							
Strafford, Ont	2.92	4.41	3.05	1.78	3.83	1.33	35.85
St. Marys, Ont	2.88	3.03	2.25	1.10	3.10	.....	.....
London, Ont	3.73	3.65	3.11	2.80	6.01	1.25	38.69
Birnam, Ont	3.36	3.26	2.46	2.13	3.93	0.92	.....
Chatham, Ont	3.17	3.52	1.97	1.86	5.14	0.85	.....
Ridgetown, Ont	3.22	2.77	2.76	.....	4.56	0.33	.....
Cottam, Ont	4.35	2.45	2.14	2.61	5.23	0.51	.....
Windsor, Ont	3.58	2.65	1.74	2.16	4.18	0.66	.....
Detroit, Mich	2.92	2.75	1.75	2.12	4.36	0.53	32.33
Plymouth, Mich	3.22	1.38	1.25	1.83	3.59	0.27	.....
Lake Erie Basin.							
Erasmus, Ont	5.65	4.06	3.12	2.30	4.75	2.18	.....
St. George, Ont	3.06	2.40	2.89	1.40	2.51	1.63	.....
Woodstock, Ont	1.95	1.91	0.85	1.31	3.25	0.02	.....
Port Dover, Ont	3.17	3.19	2.79	1.83	4.31	0.84	34.48
Port Stanley, Ont	3.43	3.47	2.97	1.82	4.90	0.53	34.17
Clinton, Mich	3.45	2.19	1.70	1.64	3.77	0.44	.....
Hillsdale, Mich	4.03	1.89	2.44	2.02	4.01	0.87	.....
Adrian, Mich	2.34	1.85	1.91	2.06	3.87	0.59	.....
Grape, Mich	2.97	3.34	1.98	2.05	3.91	0.40	.....
Angola, Ind	4.66	2.17	3.00	3.17	4.17	0.65	.....
Auburn, Ind	3.08	1.77	2.03	2.01	3.02	0.69	.....
Fort Wayne, Ind	3.56	2.33	2.34	2.35	5.01	0.70	.....
Sylvania, Ohio	3.63	2.61	2.62	.....	4.01	.....	.....
Wauseon, Ohio	3.39	3.28	3.90	4.52	5.47	1.19	37.54
Ridgeville Corners, Ohio	2.96	2.14	2.28	2.21	4.41	0.83	.....
Napoleon, Ohio	2.65	3.06	1.25	2.52	4.39	1.56	.....
Neapolis, Ohio	2.69	3.19	2.49	2.50	3.67	1.77	.....
Hedges, Ohio	2.87	2.50	2.88	1.54	.....	.....	.....
Defiance, Ohio	3.20	2.40	2.08	2.21	3.99	2.49	.....
Leipsic, Ohio	2.52	2.58	2.57	1.82	4.62	0.56	.....
Ottawa, Ohio	2.66	2.48	2.84	1.58	4.52	1.45	.....
Van Wert, Ohio	2.84	2.25	2.25	1.70	4.76	0.44	.....
Benton Ridge, Ohio	2.83	3.51	3.70	1.31	5.18	1.48	.....
Findlay, Ohio	3.13	2.51	3.19	1.50	4.57	1.77	.....
Upper Sandusky, Ohio	3.50	3.14	3.20	2.44	4.48	1.19	.....
Bucyrus, Ohio	.....	1.25	.....	.....	.....	1.33	.....
Tiffin, Ohio	2.97	3.30	3.72	2.20	5.06	2.64	.....
Bowling Green, Ohio	2.70	1.57	2.17	2.39	4.59	1.21	.....
Toledo, Ohio	2.21	1.99	1.97	1.91	3.93	0.92	30.93
Rocky Ridge, Ohio	3.25	2.73	2.53	1.80	4.50	0.46	.....
Sandusky, Ohio	2.37	2.35	3.13	1.62	4.38	1.02	34.91
Vermillion, Ohio	2.90	2.53	3.77	1.64	5.86	1.06	.....
Oberlin, Ohio	2.93	2.89	2.80	1.79	4.67	1.35	.....
Norwalk, Ohio	2.95	1.65	3.63	1.94	5.42	0.77	.....
Wellington, Ohio	3.09	2.82	3.24	1.86	4.84	1.44	.....
Shenandoah, Ohio	3.38	2.59	3.15	1.56	4.02	1.27	.....
Mansfield, Ohio	6.00	4.30	3.61	2.31	5.55	1.75	.....
North Royalton, Ohio	3.44	2.63	2.73	1.53	2.65	1.87	.....
Hudson, Ohio	4.78	.....	2.70	.....	4.05	1.24	.....
Strongsville, Ohio	3.36	6.04	3.65	1.97	4.50	3.11	.....
Bement, Ohio	4.05	1.87	1.73	2.44	5.03	.....	.....
Cleveland, Ohio	2.67	2.13	2.45	1.54	3.64	0.99	36.29
Willoughby, Ohio	.....	3.11	2.78	1.75	4.78	1.30	.....
Hiram, Ohio	4.66	2.68	3.06	1.77	4.63	1.25	.....
Colebrook, Ohio	3.69	1.69	2.60	1.34	3.31	0.64	.....

Precipitation—Continued.

Stations.	November, 1898.	December, 1898.	January, 1899.	February, 1899.	March, 1899.	April, 1899.	Normal annual.
Lake Erie Basin—Continued.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Hillhouse, Ohio	4.32	3.72	2.84	2.82	4.22	1.17	.....
Perry, Ohio	4.30	2.40	2.82	2.51	3.64	1.20	.....
Ashtabula, Ohio	4.15	4.64	3.12	3.30	4.90	.....	.....
Erie, Pa	3.58	2.84	1.50	1.44	3.08	1.08	41.28
Franklin, Pa	3.89	1.31	.....	.....	4.19	1.06	.....
Westfield, N.Y	2.85	3.29	1.23	1.35	2.98	1.01	.....
Arcade, N. Y	3.79	3.15	2.22	1.49	2.41	1.04	.....
Buffalo, N. Y	3.98	3.52	2.88	1.62	3.03	1.02	38.04
Niagara Falls, N. Y	3.00	3.03	1.76	1.40	2.27	.....	.....
Lake Ontario Basin.							
Alton, Ont	2.46	2.80	1.73	1.85	.....	.....	31.05
Hamilton, Ont	2.58	1.56	2.12	1.19	3.74	1.42	.....
Stony Creek, Ont	3.81	3.57	2.97	1.86	6.19	1.24	.....
Niagara, Ont	2.79	2.68	1.81	2.35	3.52	1.23	.....
Welland, Ont	3.38	4.82	2.83	2.26	4.47	1.39	37.18
Toronto, Ont	3.01	2.55	2.87	1.73	4.28	1.62	30.75
Stouffville, Ont	2.72	3.83	3.78	1.79	5.42	2.98	.....
Millbrook, Ont	2.40	2.20	3.50	2.15	3.70	1.50	.....
Port Hope, Ont	2.81	2.23	4.50	1.75	4.05	1.51	.....
Peterboro, Ont	1.65	2.97	4.50	1.47	5.09	1.24	30.93
Lindsay, Ont	1.96	2.65	3.17	1.62	4.15	1.80	.....
Haliburton, Ont	2.34	3.01	3.40	1.15	3.79	1.04	.....
Deseronto, Ont	2.90	2.36	3.61	1.23	2.76	1.79	.....
Bloomfield, Ont	2.24	1.74	2.45	1.69	2.66	1.51	.....
Kingston, Ont	1.26	1.68	2.15	1.22	3.43	1.07	33.94
Ottawa, Ont	1.43	3.13	2.16	0.89	5.68	1.03	33.63
Montreal, Ont	2.15	3.20	4.62	1.63	8.53	1.62	38.81
Ridgeway, N. Y	3.20	2.34	1.52	1.98	2.50	1.25	.....
Rochester, N. Y	3.54	3.01	2.54	2.38	3.47	1.66	34.82
Avon, N. Y	2.72	1.33	0.81	0.80	1.33	1.39	.....
Mount Morris, N. Y	1.74	1.60	1.20	0.65	1.40	.....	.....
Nunda, N. Y	3.63	2.33	1.61	1.98	2.86	2.35	.....
Wedgwood, N. Y	2.73	1.98	1.72	2.07	2.80	1.03	.....
Ithaca, N. Y	3.15	2.22	1.67	1.48	2.46	1.45	32.72
Penn Yan, N. Y	2.63	2.15	1.70	1.29	2.33	1.27	28.70
Romulus, N. Y	4.48	2.01	1.24	1.00	2.35	0.59	.....
Fleming, N. Y	2.21	1.80	0.40	.....	.....	1.04	.....
Sherwood, N. Y	3.48	1.87	1.04	1.21	2.14	.....	.....
Auburn, N. Y	3.65	2.50	1.30	1.61	3.20	1.70	.....
Lyons, N. Y	3.00	1.94	0.92	1.26	3.24	1.46	.....
Baldwinsville, N. Y	3.31	3.13	1.33	1.67	4.40	1.90	.....
Skaneateles, N. Y	3.95	3.12	1.20	1.36	3.65	1.82	.....
Fayetteville, N. Y	3.25	2.15	0.98	1.62	3.62	.....	.....
Phenix, N. Y	3.80	3.20	1.52	3.41	5.08	2.09	.....
Fulton, N. Y	3.06	1.33	1.28	1.80	3.64	1.79	.....
Oswego, N. Y	3.33	3.25	2.73	2.74	4.56	1.69	35.02
Palermo, N. Y	3.25	2.25	1.58	1.44	2.38	1.32	.....
Adams, N. Y	3.14	4.04	3.58	1.95	4.61	1.26	.....
Lowville, N. Y	3.41	4.54	3.64	2.30	5.11	2.01	.....
Madison Barracks, N. Y	.....	2.40	1.60	0.70	2.70	.....	.....
Watertown, N. Y	3.02	5.65	3.36	2.31	5.21	2.76	.....
Number Four, N. Y	3.49	7.44	4.53	2.70	5.45	2.15	.....

OBSERVATIONS AT RIVAS, NICARAGUA.

The records contributed for many years by Dr. Earl Flint, at Rivas, Nicaragua, include barometric readings. His present station is at 11° 26′ N., 85° 47′ W. The observations at 7:17 a. m., local time, are simultaneous with Greenwich 1 p. m. The altitude of his barometer is 36 meters above sea level, but until the barometer has been compared with a standard it seems hardly necessary to publish the daily readings. The wind force is recorded on the Beaufort scale, 0–12. When cloudiness is less than $\frac{1}{10}$, the letter "F," or "Few," is recorded.

This station is situated on the western shore of Lake Nicaragua, not far from the eastern end of the western division of the Nicaragua Canal. The volcano Ometepe, on an island in Lake Nicaragua, is about 10 miles northeast of the station. Mr. Flint's records occasionally mention the presence of clouds on the summit of this mountain.

Observations at Rivas, Nicaragua, March, 1899.

OBSERVATIONS AT 7:17 A. M. LOCAL (8 A. M. EASTERN STANDARD) TIME.

Date.	Temperature.		Wind.		Upper clouds.			Lower clouds.			Daily rainfall.
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
	°	°									
1	76	73	ne.	1	.....	.....	.....	k.	9	ne.	T.
2	74	67	ne.	1	.....	.....	.....	k.*	Few	ne.	0.00
3	76	71	ne.	2	.....	.....	.....	k.	10	ne.	0.00

Observations at Rivas, Nicaragua, March, 1899—Continued.

OBSERVATIONS AT 7:17 A. M. LOCAL (8 A. M. EASTERN STANDARD) TIME.

Date.	Temperature.		Wind.		Upper clouds.			Lower Clouds.			Daily rainfall.
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
	°	°									
4	75	69	e.	1	.....	.....	.....	k.	1	e.	T.
5	75	71	e.	2	.....	.....	.....	k.	Few	e.	0.00
6	76	71	ne.	2	.....	.....	.....	ak.	9	ne.	T.
7	75	70	ne.	3-4	.....	.....	.....	k.	Few	ne.	0.05
8	74	68	ne.	8-9	.....	.....	.....	f.k.	2	ne.	T.
9	74.5	68	ne.	3-5	.....	.....	.....	f.k.	3	ne.	0.00
10	74.5	67	ne.	4	as.	1	sw.	k.	9	ne.	0.00
11	75.5	68	ne.	4	.....	.....	.....	k.*	Few	ne.	0.00
12	76	70	ne.	3	.....	.....	.....	ks.	10	ne.	0.00
13	78	72	ne.	3	.....	.....	.....	k.	4	ne.	0.00
14	77	72	ne.	3	.....	.....	.....	k.	1	ne.	0.00
15	77	73	ne.	2	.....	.....	.....	k.	5	ne.	0.00
16	78	72	ne.	4	.....	.....	.....	k.	Few	ne.	0.00
17	77	72	ne.	2	.....	.....	.....	k.	Few	ne.	0.00
18	76	70	ne.	3	.....	.....	.....	f.k.	5	ne.	0.00
19	74	71	sw.	0	.....	.....	.....	ak.	3	sw.	0.00
20	77	73	ne.	0	ck.	10	sw.	.....	.....	.....	0.00
21	77	70	ne.	1	cs.	1	se.	k.	4	ne.	0.00
22	78	72	ne.	5	cs.	1	.....	k.	2	sw.	0.00
23	76.5	70	ne.	1	.....	.....	.....	k.*	Few	ne.	0.00
24	77	71	ne.	1	.....	.....	.....	k.	3	ne.	0.00
25	77.5	71	ne.	1	cs.	9	sw.	k.	1	ne.	0.00
26	77	70	e.	3	cs.	1	sw.	k.	9	e.	0.00
27	77.5	72	ne.	2	.....	.....	.....	k.	10	ne.	0.00
28	78.5	71	e.	2	.....	.....	.....	k.	1	e.	0.00
29	77.5	72	ne.	2	.....	.....	.....	k.	10	ne.	0.00
30	79	73	e.	2	.....	.....	.....	k.	7	e.	0.09
31	79.5	72	ne.	3	.....	.....	.....	ak.	10	ne.	0.51
Sums	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.65
Means	76.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*On Ometepe.

OBSERVATIONS AT 8 P. M. SEVENTY-FIFTH (8:17 P. M. LOCAL) TIME.

Date.	Temperature.		Wind.		Upper clouds.			Lower clouds.		
	Air.	Dew-point.	Direction.	Force.	Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.
	°	°								
1	78	72	se.	1	.....	0	.....	.....	0	.....
2	78	71	ne.	2	.....	0	.....	k.	Few	.....
3	77	72	se.	2	.....	0	.....	.....	0	.....
4	79.5	72	se.	0	.....	0	.....	.....	0	.....
5	79	72	se.	2	.....	.....	.....	k.	Few	se.
6	77	70	se.	3	.....	.....	.....	kn.	10	se.
7	76	70	e.	3	.....	.....	.....	kn.	5	e.
8	75.5	68	ne.	5-6	ck.	Few	ne.	k.	Few	ne.
9	78	71	ne.	3-4	ck.	Few	sw.	k.	Few	ne.
10	77.5	70	ne.	3	ck.	Few	sw.	.....	0	.....
11	78.5	71	ne.	3	ck.	Few	sw.	.....	0	.....
12	78	71	ne.	3	c.	.....	s.	.....	0	.....
13	78	72	e.	2	.....	0	.....	k.*	Few	.....
14	80	72	ne.	3-4	.....	.....	.....	f.k.	Few	.....
15	81	74	ne.	3	.....	.....	.....	f.k.	8	ne.
16	80.5	73	ne.	4	.....	0	.....	.....	0	.....
17	79.5	72	e.	2	.....	.....	.....	f.k.	10	.....
18	80	73	e.	3	.....	0	.....	f.k,	Few	e.
19	77	73	sw.	1	ck.	10	sw.	.....	.....	.....
20	80.5	73	ne.	3	ck.	.....	se.	f.k.	3	ne.
21	80.5	72	ne.	2	ck.	.....	sw.	k.	8	ne.
22	80	73	ne.	2	ck.	.....	sw.	f.k.	4	ne.
23	80	72	ne.	4	.....	0	.....	k.*	0	.....
24	80.5	72	ne.	3	ck.	.....	sw.	cap*	0	.....
25	81	73	se.	2	ck.	.....	.....	f.k.	2	se.
26	80	73	e.	3	cs.,ck.	3	e.	.....	.....	.....
27	81.5	73	ne.	4	.....	.....	.....	ak.	2	ne.
28	80	74	ne.	4	ck.,cs.	10	ne.	.....	.....	.....
29	82	75	se.	2	ck.	2	se.	.....	.....	.....
30	81	76	se.	1	.....	.....	.....	k.	5	se.
31	77.5	73	e.	2	.....	.....	.....	k.	10	e.
Means	79.1	.....	.....	.....	.....	.....	.....	.....	.....	.....

*On Ometepe.

6th, 8 p. m., wind increasing; 7th, gale after 9 p. m.; 8th, barometer at 29.86, gale continues; sprinkling 3 p. m.; 8th, p. m. coffee injured; 9th, 2 a. m., gale moderating; 12th, earthquake 4:18:47 a. m., northwest to southeast, occurred at Leon, Managua, Granda, and San Juan del Sur.