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U. S. DEPARTMENT OF AGRICULTURE.

REPORT FOR DECEMBER, 1899.

MARYLAND AND DELAWARE SECTION

OF THE

CLIMATE AND CROP SERVICE

OF THE

WEATHER BUREAU.

IN COOPERATION WITH THE

MARYLAND STATE WEATHER SERVICE.

(Prof. Wm. B. Clark, Director; Prof. Milton Whitney, Secretary and Treasurer.)

PREPARED UNDER DIRECTION OF
WILLIS L. MOORE,
CHIEF OF WEATHER BUREAU.

BY

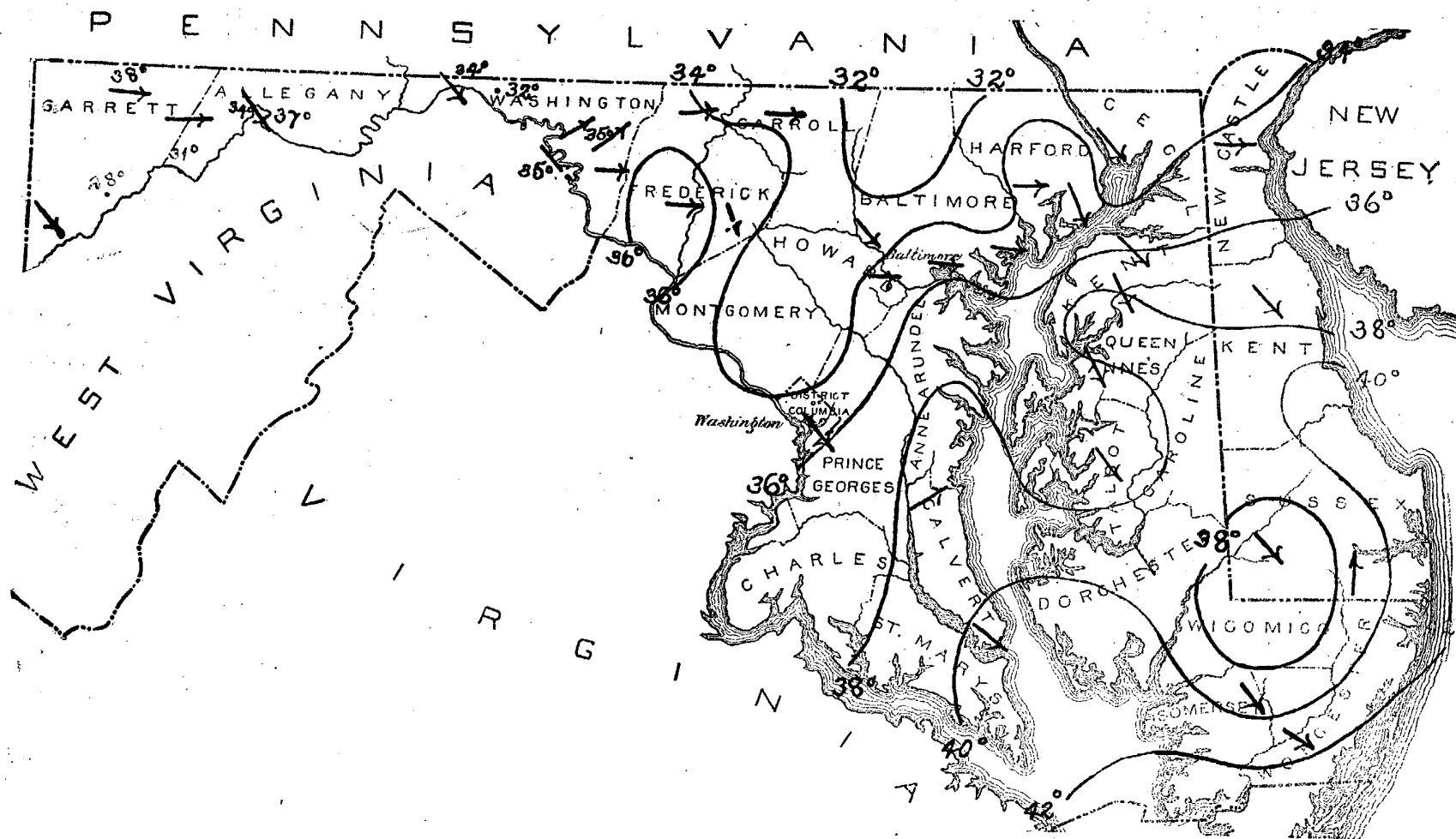
F. J. WALZ,
SECTION DIRECTOR.



BALTIMORE, MD.:
WEATHER BUREAU OFFICE.
JOHNS HOPKINS UNIVERSITY.

1899.

MONTHLY MEAN ISOTHERMS AND PREVAILING WINDS, DECEMBER, 1899.



U. S. DEPARTMENT OF AGRICULTURE,

CLIMATE AND CROP SERVICE

OF THE

WEATHER BUREAU.

CENTRAL OFFICE: WASHINGTON, D. C.

BALTIMORE, MD.

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BALTIMORE, MD.

No. 12.

TYPES OF MARCH WEATHER IN THE MIDDLE ATLANTIC STATES.¹

In the past twenty years, several researches of great importance have appeared in which the field of investigation comprised large portions of the northern hemisphere, some of them indeed including both hemispheres. The results of these investigations show that the weather of a given locality is intimately associated with atmospheric conditions very far removed from the immediate locality under consideration. For example, Hoffmeyer and Teisserenc de Bort have shown that certain conditions of pressure over the North Atlantic Ocean have a direct bearing upon the weather of Central Europe. Blandford and Eliot have demonstrated that certain marked phases of Indian weather find their explanation in pressure conditions in Central Asia and over the Indian Ocean. There are a few well-defined and persistent areas of high and low pressure of great extent in both hemispheres which control very largely the weather conditions of the globe. Recent researches tend to show that the so-called *permanent* high and low areas deserve more attention from investigators. The extensive areas of high pressure found upon any chart showing the mean monthly pressure conditions over the globe are real forces in controlling the weather over wide areas. Any marked displacement of these areas from their normal or average position, or any unusual variation in the intensity of their gradients, is associated with unusual conditions of wind direction, temperature, and rainfall in their vicinity. The daily weather chart has made us all familiar with the kind of weather associated with the transient areas of high and low pressure which pass across the country every few days: with the clear skies and light variable winds of a high area, the rainy unsettled weather near the center of low pressure. In interpreting the average weather conditions associated with the large persistent areas of average high or low pressure we find that the same rules apply as in the case of the transient areas based on synchronous observations.

In view of the slow movements of these areas of high and low pressure, their vastly greater extent and greater persistence, we have, for purposes of weather forecasting, an evident advantage over the method of following up the quickly moving cyclones and anti-cyclones of smaller extent, which may enable us to foresee the general character of the weather, for longer periods than we are now able to do.

Pressure conditions over the United States were charted

for the month of March for all years from 1877 to 1899; where observations were available, isobars were drawn for the entire northern hemisphere. Having drawn the isobars, the departures from normal temperature and rainfall in the United States were entered upon the same charts. The months were then classified according to the departures from the normal temperature, in order to learn what relations existed between the distribution of monthly mean pressure and monthly mean temperature departures.

The mean temperature of March was found to be decidedly above the normal during the years 1878, 1882, 1894, and 1898 in the Middle Atlantic States.

The mean distribution of pressure during these months was such as to bring the Middle Atlantic States well within the control of southerly winds from the persistent area of high pressure in the North Atlantic Ocean. There was either a marked development of the western edge of this area, or a weak development of the persistent March area of high pressure in the region of Manitoba and northward.

The mean temperatures of March were found to be decidedly below normal during the years 1883, 1885, 1888, and 1891, in the Middle Atlantic States.

A characteristic feature of the pressure distribution during these months was a marked development of the Manitoba persistent high area of pressure, or a weak development or absence of the persistent Atlantic high area in the neighborhood of the Middle Atlantic States. Both these conditions of pressure naturally produce winds prevailing from a northwesterly direction, which bring with them the low temperatures of the interior of the continent.

During the periods of normal March pressure distribution in the Middle Atlantic States this region is alternately under the control of the high area in the Northwest and that over the Atlantic Ocean, resulting in the changeable weather and strong contrasts in temperature so characteristic of March weather in the Middle Atlantic States.

Some interesting relations between rainfall and mean pressure conditions have come to light in this investigation. The decidedly cold, as well as the decidedly warm months, were deficient in rainfall. In each case, in the Middle Atlantic States, "high area" weather prevailed, the region being either well within the Canadian high area or well within the Atlantic high area.

The extent and persistence of these areas of high pressure over any region define the geographic limits and the duration of a drought. Should we be enabled, by further study of the problem, to learn the law of movement of these high areas, it will become a comparatively easy problem to forecast periods of drought and of abundant rains in the United States. A similar method is already practiced in India, with a fair measure of success, in forecasting the summer and winter monsoon rains.

During months having rainfall above the normal in the Middle Atlantic States, this region was almost always within a trough of average low pressure, or near the western or northern edge of the Atlantic high area.

Some interesting and suggestive points are brought out by charting storm tracks in connection with the mean pressure

¹Extract from a paper in the Amer. Jour. of Science for November, 1899, on Types of March Weather in the United States, etc. By OLIVER L. FASSIG, Ph. D., Section Director, U. S. Weather Bureau.

distribution during the month, and comparing the results with the normal distribution of pressure and storm paths. The paths of storms lie within the trough between the two persistent high areas over the Atlantic Ocean and over Manitoba. When the trough is wide the storm paths are widely scattered from the Lakes to the Gulf. As the high areas approach one another the storm paths are contracted within narrower limits.

In order to learn whether the path of a West Indian hurricane is to any extent controlled by the prevailing pressure over the Atlantic Ocean during the time of passage of a hurricane, I have selected from Bulletin A of the United States Weather Bureau the path of a hurricane which extended very far inland, and plotted it in connection with the mean September position of the Atlantic high area, together with the position of the area during September, 1886, the month of the hurricane selected. This West Indian hurricane occupied about eleven days in its passage from the West Indies through the Gulf of Mexico, up the Mississippi Valley and across the Lake Region. The Atlantic high area extended far to the west of its usual position. Similarly the conditions for September, 1888, were charted, during which a West Indian hurricane took a path farther to the eastward than usual. The Atlantic high area was well to the east of its usual position. In both cases the path of the hurricane was along the western edge of the Atlantic high area.

These two instances, taken at random, seem to show a direct relationship between the Atlantic high area and the path of the hurricanes. It is quite probable that by charting the pressure conditions over the Atlantic Ocean at the origin and during the slow progress of a hurricane, we may be enabled to forecast more definitely its probable path across the United States.

* * *

CLIMATOLOGY OF THE MONTH.

ATMOSPHERIC PRESSURE—IN INCHES AND HUNDREDTHS.

Monthly mean at Washington, D. C., 30.13; at Baltimore, 30.10; average, 30.12; highest, 30.64 at Washington, D. C., on the 16th; lowest, 29.16 at Baltimore, on the 24th.

TEMPERATURE—IN DEGREES FAHRENHEIT.

The monthly mean (entire territory), 36.0, is 0.6 below the normal.

The highest monthly mean was 41.9, at Pocomoke City.

The lowest monthly mean was 25.8, at Grantsville.

The highest temperature recorded during the month was 69, at Cumberland, on the 8th.

The lowest temperature recorded during the month was -6, at Sunnyside, on the 31st.

The greatest local monthly range was 70, at Princess Anne.

The least local monthly range was 52, at Westernport.

The greatest daily range was 43, at Sunnyside, on the 7th, and at Sandy Point, on the 27th.

The least daily range was 1, at Chestertown, on the 5th and 11th.

PRECIPITATION—IN INCHES AND HUNDREDTHS.

The monthly average (entire territory) 1.80, was 1.02 below the normal.

The greatest amount was 4.63, at Sunnyside.

The least amount was 0.80, at Pocomoke City.

The greatest amount in twenty-four hours was 1.60, at Smithsburg, on the 24th.

The average number of rainy days, 7.

WIND.

The prevailing direction was from the northwest.

The total movement was 4,036 miles, at Baltimore, and 5,326 miles, at Washington, D. C.

The maximum wind velocity was 36 miles per hour from the northwest, at Washington, D. C., on the 15th.

MISCELLANEOUS.

The following are dates on which miscellaneous phenomena occurred:

Snow.—Annapolis, 27, 31; Bachman's Valley, 4, 27; Baltimore, 4, 27, 28; Boettcherville, 24; Boonsboro, 27; Cambridge, 27; Chase, 28; Chestertown, 27, 31; Clear Spring, 4, 25, 28; Coleman, 27; Cumberland, 25; Darlington, 27; Deer Park, 4, 5, 15, 24, 27, 29; Easton, 27; Fallston, 4, 27, 28; Frederick, 27; Frostburg, 4, 15, 24, 27, 29; Grantsville, 4, 5, 6, 15, 24, 25; Great Falls, 28; Green Spring Furnace, 27; Hagerstown, 23, 28; Harney, 4, 27, 30; Jewell, 27; Laurel, 27; Mardela Springs, 29; Md. Agricultural College, 27, 30; McDonogh, 27; Milford, Del., 27; Millsboro, Del., 27; Mt. St. Mary's, 4, 28; Newark, Del., 27; New Market, 4, 27; Pocomoke City, 27; Princess Anne, 4, 25, 27, 28; Queenstown, 27, 31; Rock Hall, 27; Sandy Point, 27; Seaford, Del., 27; Sharpsburg, 4, 24, 27; Smithsburg, 1, 25, 27, 28; Solomons, 25, 27; St. Charles College, 27, 28, 29; Sunnyside, 4, 5, 15, 19, 24, 25, 26, 27, 28, 29; Sudlersville, 27; Taneytown, 27; Van Bibber, 27, 31; Washington, D. C., 4, 27, 28; Western Md. College, 27; Westernport, 4, 23, 24, 29; Woodstock, 4, 27, 31; Wyoming, Del., 28.

* * *

ERRATA.

NOVEMBER, 1899, REPORT: Page 5.—Mean temperature at St. Charles College, 44.8°, *should read 45.0°*. Page 6.—Maximum temperature, blank, at St. Charles College on the 12th, *should read 65°*, and mean monthly maximum, 56.4, at St. Charles College, *should read 55.8°*.

* * *

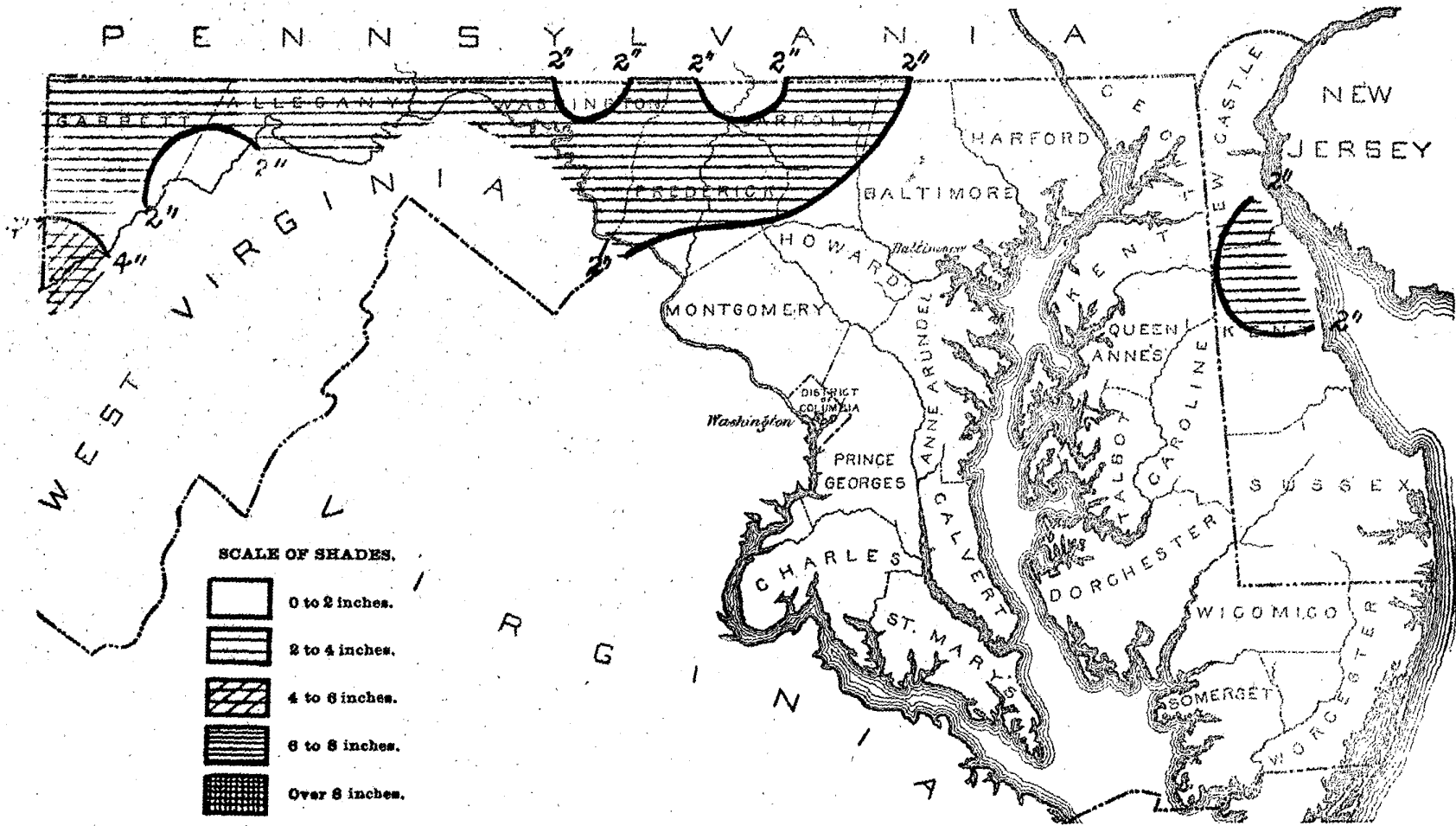
Prof. Robert DeCourcy Ward, instructor in climatology in Harvard University, is the author of a new meteorological work, entitled "Practical Exercises in Elementary Meteorology," issued by the well-known publishing house of Ginn & Co., Boston, Mass. This book is intended as a laboratory manual for use as a guide in elementary observational and inductive studies in meteorology, and will prove of special value and interest to teachers, colleges, and schools.

Climatological data for Maryland and Delaware, December, 1899.

Table with columns: Stations, Counties, Elevation, Length of record, Temperature (Mean, Departure from normal, Highest, Date, Lowest, Date, Greatest daily range), Precipitation (Total, Departure from normal, Greatest in 24 hours, Total snowfall, Number rainy days), Sky (Number of clear days, Number partly cloudy days, Number cloudy days), Prevailing direction of wind, Observers.

Note.—All records are used in determining State or district means, but State and district departures are determined by comparison of current data of only such stations as have normals. Superior letters of the alphabet indicate the number of days missing. † Mean of 7 a. m. + 2 p. m. + 2. † Incomplete record.

TOTAL PRECIPITATION, DECEMBER, 1899.



Daily precipitation for Maryland and Delaware, December, 1899.

Stations.	Day of month.																															Total.			
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.				
WESTERN MARYLAND.																																			
Boettsherville.....	.14								.05		1.09		.20						.05					.65										2.18	
Boonsboro a.....	.07								.02		.54								.27					1.06			†							1.96	
Boonsboro b.....																																		2.26	
Chewsville.....	.09								.03		.33								.39					1.42										2.35	
Clear Spring.....		.15									.44										.15			1.45	.14									2.25	
Cumberland.....		.06									1.10				.10	.15								.53	.15									2.09	
Deer Park.....				.20	.30						1.10												.33	.40			.20		.10					2.73	
Frostburg.....	.09	.06		.12					.04	.03	.17				.24								.17	.40			.05		.05	.08				2.88	
Grantsville.....				.20	.20	.05	1.00		.05	1.00					.10								.45	.60	.20									2.85	
Green Spring Furnace.....	.11			†					.02		.30				†								.30	1.32			.01							2.15	
Hagerstown.....	.11								†	.02	.35												†	1.17				.05						2.24	
Hancock.....	.12								†		.86			.04									.13											2.04	
Sharpsburg.....		.12		†					†		.45												.25											2.05	
Smithsburg.....	.13			†					†	†	.37												.34				†		.02					2.46	
Sunnyside.....	.34			.40	.20				†	.11	.01	.05											.83											4.63	
Westernport.....	.08			.01					†	1.18					.14								.07		.20	.05			†					1.72	
NORTHERN-CENTRAL MARYLAND.																																			
Bachman's Valley.....	.21			.17							.65												.48				.10							2.80	
Baltimore.....	.02	.02		.04					†	†	.40				.69								.16				.07	†						1.40	
Baltimore, Johns Hopkins Hospital.....		.08		.06							.18	.05									.23			.55	.15			.10						1.40	
Chase.....	.11			.08											.50								.36											1.15	
Darlington Academy.....	.09			.09							.57																							1.59	
Fallston School.....		.04		.04							.46												.34	†		.75		†	.07					1.70	
Frederick School.....	.12			.02					.02	.03	.53												.29											2.20	
Great Falls.....		.05		.30							.55																							1.45	
Harney.....	.20			†							†												†	.35			.05			†				1.62	
McDonogh.....																																			
Mt. St. Mary's College.....				†						.05	.45												.25				.05							2.05	
New Market.....		.10		†					†		.30												.35											1.98	
St. Charles College.....					.05						.34														.17	.73		.05	.07	.07	.06	.05		1.59	
Takoma Park.....																																			2.43
Tanertown.....		.19								.03		.50												.21											2.43
Van Bibber.....	.06		.07							†	.01	.37													.54	.21								1.11	1.85
Western Maryland College.....																																			
Woodstock College.....	.13			†						†		.31																							1.51
SOUTHERN MARYLAND.																																			
Annapolis.....	.10		.10									.30													.90			.10						1.60	
Charlotte Hall School.....																																			
Distributing Reservoir, D. C.....				.05						.02	.38	.04																							1.52
Jewell.....	.30			.09							.30													.05											1.62
Laurel.....	.08			.06							.40													.18											1.72
Maryland Agricultural College.....	.10		.06								.40																								1.62
Receiving Reservoir, D. C.....											.49																								1.60
Solomon's.....	.19			.07						†	.38													.09	.13										1.48
Washington, D. C.....	.01	.05		.08					†	†	.02	.46												.13											1.68
EASTERN MARYLAND.																																			
Cambridge.....	.25		.20								.55													.70										1.70	
Chestertown.....	.14										.38														.18										1.28
Coleman.....		.11		.15							.45			.02											.37										1.70
Denton.....																																			
Easton.....		.15		.13							.32			†											.08										1.42
Mardela Springs.....			.19							.12		.22																							0.83
Pocomoke City.....		.06		.04							.40																								0.80
Port Deposit.....																																			
Princess Anne.....		.18		.06							.49																								1.39
Queenstown.....	.13		.08							†	.08	.16		.17										.10		.36	.12		.14					.09	1.43
Rock Hall a.....											.22																								
Rock Hall b.....		.10		.08							.45														.15		.43		.05						1.03
Sandy Point.....											.45																								1.10
Sudlersville.....	.12			.13							.53																								1.59
DELAWARE.																																			
Milford.....		.16		.10							.66													.58			.28		.04					1.82	
Millsboro.....		.15		.09							.67				.10										.14				.15						1.79
Newark (Delaware College).....	.10			.09							.56	.03													.27										1.92
Seaford.....	.15		.10								.55														.08			.26		.15					1.29
Wyoming.....			.71								1.35																								2.51

† Trace, when precipitation is less than 0.01 inch.

‡ Incomplete record.