

WEATHER, FORECASTS, AND WARNINGS FOR THE MONTH.

By EDWARD H. BOWIE, in charge of Forecast Division.

Drought which set in over large areas west of the Mississippi River and in the upper Mississippi Valley and the upper Lake region during the month of June continued and became very pronounced in these regions during July; and toward the close of the month droughty conditions prevailed in the Middle Atlantic and the New England States. The rainfall was generally in excess of the normal in the Ohio Valley and the east Gulf and South Atlantic States, and over local areas in the Rocky Mountain region. Temperatures were above the normal for the month over practically the entire country, and they were excessively high the greater part of the month in the Plains States, the Northwest, and the Mississippi Valley.

There were no storms of violence during the month, and no storm warnings were ordered, although advisory warnings were distributed on three occasions for disturbances of moderate intensity that passed eastwardly over the Great Lakes, attended by squalls and thunderstorms. Special forecasts were issued regularly each week during the month, and special attention was given in press reports and the daily forecasts to the beginning and the ending of periods of extremely high temperature.

The month opened with an area of low barometric pressure over the Mississippi Valley, and, under its influence, local showers and thunderstorms occurred quite generally during the first three days of the month in the Gulf and South Atlantic States and the Ohio Valley.

The weekly forecast issued on Sunday, July 3, follows:

A moderation of the warm wave that prevails in the Middle Atlantic and New England States, the Lake region, and the Mississippi and Ohio valleys will set in during Sunday night and Monday and be followed by several days of moderate temperature in these regions. A reaction to higher temperature is indicated for the Lake region and the Ohio and Mississippi valleys Wednesday, and the Middle Atlantic and New England States the latter part of the week. Warm weather will continue throughout the week in the Southern States, the Plains States, and the Rocky Mountain and Plateau regions. There will be showers Monday in the Ohio Valley and the Eastern States, and showers will occur at frequent intervals during the week in the South Atlantic and Gulf States. The week, as a whole, will be one of generally fair weather in all northern and western districts.

The Mississippi Valley disturbance moved eastward and reached New England on the 4th, attended by local rains and thunderstorms in the Middle Atlantic and New England States on the 3d and 4th. High pressure that developed in the rear of this disturbance on the 3d, moved southeastwardly from the Lake region and terminated a warm wave of moderate intensity that had prevailed, with excessive humidity, for several days in the Mississippi and Ohio valleys, the Lake region, and the Middle Atlantic and New England States. The warm wave announced for the eastern districts set in as forecast, and on the 8th and 9th the warmest weather of the season prevailed in the Eastern States. The weather remained generally fair over the northern and western districts, except that there were widely scattered showers near the close of the week in the Plains States, the Rocky Mountain region, the upper Mississippi Valley, and the upper Lake region, attending a disturbance of moderate intensity that moved eastward over these regions. Showers occurred almost daily in the South Atlantic and east Gulf States. High temperatures were general during the week in the Rocky Mountain and Plateau regions and in the interior of the Pacific States.

The weekly forecast, issued Sunday, July 10, follows:

A reaction to lower temperature is indicated for Monday in the lower Lake region and the Ohio Valley, and by Monday night and Tuesday in the Middle Atlantic and New England States, following which nearly normal temperatures will prevail in these regions during the remainder of the week beginning July 11. Moderately high temperatures will prevail during the week in the South Atlantic and Gulf States and warm weather will continue in the region west of the Rocky Mountains. In the upper

Lake region, the upper Mississippi Valley and the Plains States, and the Northwest, temperatures near or below the normal will prevail during the next several days. There will be local rains at the beginning of the week in the Atlantic States and by the middle of the week there will be scattered showers in the Mississippi Valley and the Northwest. Fair weather will prevail during the greater part of the week in the Rocky Mountain and Plateau regions and the Pacific States. Local rains will continue in the Southern States.

The week beginning July 11 opened with high pressure off the south Atlantic coast, and a disturbance of moderate intensity over the Great Lakes. This disturbance moved thence, attended by showers and thunderstorms, over all eastern districts during the first part of the week, and it was followed by a reaction to lower temperature throughout the Lake region, the Ohio Valley, and the Middle Atlantic and New England States, dissipating the warm wave that had prevailed in these regions since July 8. Advisory warnings of thunderstorms and squalls were distributed to points on the Great Lakes in connection with this storm, on the morning of July 10, and again on the 12th, for thunderstorms that attended a secondary disturbance that developed over Lake Michigan during the night of the 11th.

Showers continued during the week in the Southern States, and by the middle of the week showers set in over the Plains States and the upper Mississippi Valley, attending an area of low barometric pressure that occupied the extreme Northwest on the 13th. This disturbance moved eastward across the Northern States to New England, attended by local showers and thunderstorms in nearly all parts of the country.

The week was unusually warm over the Rocky Mountain and Plateau regions and in the interior of the Pacific States, a condition which has been observed to occur in the summer season when the pressure is above the normal over the North Pacific Ocean. The warm wave spread eastward from the Rocky Mountain region and covered the Plains States and the Northwest on the 14th, when temperatures above 100° were recorded in Kansas, North Dakota, South Dakota, Montana, and Wyoming, and at the close of the week it had become general in the Middle West and the Eastern States.

At the time of the warm wave in the Eastern States, Mr. C. J. Glidden ascending in a balloon near Andover, Mass., found that the atmosphere was excessively warm to a height of 2,100 feet. Much distress and many prostrations and deaths were caused by the excessive heat and high humidity in the larger cities of the Middle West and the Eastern States.

High pressure over the Atlantic Ocean in middle latitudes gave generally fair weather during the middle of the month over Europe, following a period of unusually heavy rains extending through several weeks.

The weekly forecast, issued Sunday, July 17, follows:

Temperatures below the normal and generally fair weather are indicated for the first half of the week in the Middle Atlantic and New England States, the Lake region and the Ohio Valley, and temperature somewhat lower than that of the preceding week is indicated for the Southeastern States. The week will open with high temperatures in the Plains States and the Northwest, and warmer weather will prevail in the Mississippi Valley during the middle of the week and over the eastern half of the country beginning Wednesday. There will be a reaction to somewhat lower temperature in the extreme Northwest by Monday night or Tuesday and in the northern Plains States by Wednesday. High temperatures are indicated for the Southwest. A disturbance will form over the western Plateau region Monday and move eastward, attended by showers in the Middle West by Wednesday and in the eastern half of the country during the latter part of the week. Showers are also indicated for the first half of the week in the South Atlantic and East Gulf States and Tennessee. The weather will be generally fair during the week in the Northwestern States, the Plateau region, and the Pacific States.

The disturbance previously referred to as having occupied the Northwest on the 14th moved to the north Atlantic coast on the

17th, and was followed by an extensive area of high barometric pressure from the region north of the Great Lakes; this area of high pressure with cool northerly winds terminated the excessively warm weather over the eastern half of the country during the 17th and 18th.

It is worthy of note that the high barometric pressure that terminated the warm wave in the eastern districts apparently had its origin over eastern Siberia 15 days previously to its appearance over the Great Lakes, and with low and falling barometer over the middle latitudes of the Atlantic Ocean it was effective in dispersing the warm weather in the eastern half of the country.

Cool weather continued in the Eastern States until after Wednesday, the 20th, when a gradual change to higher temperature overspread the eastern districts. The temperature continued abnormally high during the week in the Southwestern States, the Plains States, and the Northwest, where temperatures above 100° and "hot" winds occurred on several days. The latter part of the week was marked by a change to lower temperature and local rains in the Northwestern States, attending an extensive disturbance that apparently developed over the North Pacific Ocean on the 21st and moved thence to the Northwestern States at the close of the week. A disturbance of minor intensity moved eastward from the region of the Great Lakes during Thursday and Friday, attended by scattered showers and thunderstorms in the Lake region, New York, and New England. The usual summer rains continued during the week in the South Atlantic and Gulf States. There were no rains of consequence during the week in the greater part of the country west of the Mississippi River, excepting local showers at its close in the Northwest and the lower Missouri Valley.

A disturbance of considerable intensity passed over the British Isles during the 21st and 22d; apparently the same disturbance that passed eastwardly from the north Atlantic coast on the 17th. It caused rains and strong winds during its passage across the north Atlantic Ocean and northern Europe.

The weekly forecast, issued Sunday, July 24, follows:

The general pressure distribution over the North American Continent and the adjacent oceans is such as to indicate that the coming week will be one of high temperature over the greater part of the country east of the Rocky Mountains and in the Southwest. A disturbance that is over the Great Lakes will move eastward and cause local showers and thunderstorms

Sunday night and Monday in the lower Lake region, northern New York and northern New England. Another disturbance will appear in the Northwest on Monday or Tuesday and move eastward along the northern border and reach the St. Lawrence Valley by the 29th. It will be attended by local rains. There are no indications of general rains during the week, and such as may occur will be confined mostly to the Northern States, from the Missouri Valley to New England and the Southeastern States.

Advisory storm warnings were issued the morning of the 24th, for squalls and thunderstorms over the lower Lakes attending an area of low barometric pressure that was then central over upper Michigan. The conditions occurred as forecast. This disturbance disappeared over the Canadian Maritime Provinces on the 25th. Following the disappearance of this low area, the pressure remained high off the south Atlantic coast and low in the Plains States and the Northwest, a condition that developed a disturbance in the Northwest on the 26th. This disturbance moved eastward, following about the same track as that which immediately preceded it and reached the Atlantic States on the 28th. It was attended by local rains over the Mississippi Valley, the Lake region and the Eastern States, and heavy local rains occurred in the Rocky Mountains region. Throughout the week the temperature remained above the normal over practically all parts of the country east of the Rocky Mountains, and the heat wave continued in the Middle West and the Southwest until the close of the month, when a pronounced area of high barometric pressure moved southeastwardly from the Northwest, and dispelled the warm wave in all parts of the country except the extreme Southwest. The breaking of this hot wave did not occur until five or six days after the pressure had fallen to below the normal over the middle latitudes of the Atlantic Ocean.

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Cleveland, Ohio.....	27	54	n.	Mount Tamalpais, Cal..	2	64	nw.
Columbia, Mo.....	9	53	n.	Do.....	3	63	sw.
Do.....	17	52	n.	Do.....	14	50	sw.
Detroit, Mich.....	24	60	w.	Port Huron, Mich.....	24	50	nw.
Lincoln, Nebr.....	2	50	ne.	St. Louis, Mo.....	25	55	nw.
Modena, Utah.....	3	56	sw.	Stoux City, Iowa.....	7	54	s.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
New England.....	12	70.4	+ 1.6	+14.4	+ 2.1
Middle Atlantic.....	15	75.4	+ 0.9	+ 9.8	+ 1.4
South Atlantic.....	10	78.6	- 0.5	+ 2.7	+ 0.4
Florida Peninsula*.....	8	80.6	- 0.6	- 2.3	- 0.3
East Gulf.....	11	79.0	- 1.3	- 2.0	- 0.3
West Gulf.....	10	81.8	0.0	+ 2.4	+ 0.3
Ohio Valley and Tennessee.....	13	76.3	- 0.6	- 0.3	0.0
Lower Lakes.....	10	72.1	+ 0.6	+ 7.2	+ 1.0
Upper Lakes.....	12	69.8	+ 2.0	+18.6	+ 2.7
North Dakota*.....	9	69.4	+ 1.4	+27.2	+ 3.9
Upper Mississippi Valley.....	14	75.8	+ 0.4	+10.0	+ 1.4
Missouri Valley.....	12	76.3	+ 0.6	+16.1	+ 2.3
Northern slope.....	9	70.2	+ 2.1	+33.0	+ 3.3
Middle slope.....	6	75.6	+ 1.9	+15.8	+ 2.3
Southern slope*.....	7	83.3	+ 2.7	+ 9.0	+ 1.3
Southern Plateau*.....	10	79.9	+ 0.2	+10.3	+ 1.5
Middle Plateau*.....	10	72.2	+ 1.2	+10.5	+ 1.5
Northern Plateau*.....	10	71.1	+ 2.2	+12.1	+ 1.7
North Pacific.....	7	60.6	- 0.6	+ 0.5	+ 0.1
Middle Pacific.....	5	66.2	- 0.7	- 0.4	- 0.1
South Pacific.....	4	7.09	+ 1.0	+ 8.1	+ 1.2

*Regular Weather Bureau and selected cooperative stations.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		Inches.	Inches.
New England.....	11	2.19	61	- 1.4	- 2.1
Middle Atlantic.....	15	2.57	60	- 1.7	- 2.0
South Atlantic.....	11	5.13	85	- 0.9	- 6.4
Florida Peninsula*.....	8	6.06	90	- 0.7	- 5.6
East Gulf.....	11	6.89	130	+ 1.6	+ 3.2
West Gulf.....	10	2.62	81	+ 0.6	+ 4.4
Ohio Valley and Tennessee.....	13	5.09	124	+ 1.0	+ 4.4
Lower Lakes.....	10	2.84	83	- 0.6	- 1.4
Upper Lakes.....	12	2.37	74	- 0.7	- 5.1
North Dakota*.....	9	1.16	42	- 1.6	- 5.6
Upper Mississippi Valley.....	15	2.58	72	- 1.0	- 6.4
Missouri Valley.....	12	2.76	72	- 1.1	- 5.8
Northern slope.....	9	1.42	88	- 0.2	- 2.4
Middle slope.....	6	1.83	60	- 1.2	- 5.6
Southern slope*.....	7	1.91	63	- 1.1	- 7.8
Southern Plateau*.....	10	1.26	96	- 0.1	- 1.8
Middle Plateau*.....	11	0.90	180	+ 0.4	+ 3.8
Northern Plateau*.....	10	0.24	38	- 0.4	- 2.4
North Pacific.....	7	0.04	5	- 0.7	- 2.4
Middle Pacific.....	7	T.	100	0.0	- 5.8
South Pacific.....	4	0.01	100	0.0	- 4.9

*Regular Weather Bureau and selected cooperative stations.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	4.7	- 0.4	Missouri Valley.....	3.8	- 0.4
Middle Atlantic.....	4.6	- 0.3	Northern slope.....	4.0	+ 0.3
South Atlantic.....	5.8	+ 0.6	Middle slope.....	4.0	- 0.1
Florida Peninsula.....	5.3	+ 0.3	Southern slope.....	3.0	- 1.5
East Gulf.....	6.3	+ 0.9	Southern Plateau.....	3.3	0.0
West Gulf.....	3.5	- 0.6	Middle Plateau.....	4.0	+ 0.9
Ohio Valley and Tennessee.....	5.7	+ 1.1	Northern Plateau.....	2.8	+ 0.1
Lower Lakes.....	4.0	- 0.5	North Pacific.....	4.1	- 0.5
Upper Lakes.....	4.3	- 0.3	Middle Pacific.....	4.8	+ 1.3
North Dakota.....	3.3	- 1.1	South Pacific.....	2.9	+ 0.1
Upper Mississippi Valley.....	4.4	+ 0.1			

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England.....	75	- 5	Missouri Valley.....	62	- 4
Middle Atlantic.....	72	- 2	Northern slope.....	50	- 2
South Atlantic.....	82	+ 2	Middle slope.....	54	- 6
Florida Peninsula.....	80	0	Southern slope.....	50	- 9
East Gulf.....	82	+ 4	Southern Plateau.....	43	+ 5
West Gulf.....	72	- 2	Middle Plateau.....	40	+ 8
Ohio Valley and Tennessee.....	76	+ 7	Northern Plateau.....	34	- 4
Lower Lakes.....	69	0	North Pacific.....	73	+ 8
Upper Lakes.....	67	- 5	Middle Pacific.....	60	- 6
North Dakota.....	55	- 8	South Pacific.....	64	0
Upper Mississippi Valley.....	66	- 2			

RIVERS AND FLOODS.

By Prof. H. C. FRANKENFIELD, in charge River and Flood Division.

It is to be expected that a season of marked deficiency in precipitation will be followed by low stages of water in the rivers affected, but in the upper Mississippi River, during the month of July, good stages can reasonably be assured from the ebb of the spring rise, supplemented by summer showers during the preceding month. During the present month, however, owing to deficient precipitation, the Mississippi River, above the mouth of the Missouri, together with some of the tributaries, was abnormally low, and at a number of places the stages were the lowest of record for the month. At Red Wing, Minn., on the Mississippi River, the stage of -0.6 foot from July 29 to 31, inclusive, was the lowest recorded stage for any month, and a low-water record of -0.8 foot was established also at Chippewa Falls, Wis., on the Wisconsin River, on July 24. Low water prevailed also at other places in the country, notably in the Snake River in Idaho and its tributaries, and in portions of the Arkansas River, between Wichita, Kans., and Tulsa, Okla. The low water in Idaho seriously interfered with placer mining and irrigation interests. That in the Arkansas River was not of consequence, except that as a matter of record it should be stated that the stages of -3.8 feet from July 26 to 31, inclusive, at Wichita, and of 1 foot from July 29 to 31, inclusive, at Tulsa, were the lowest of record.

The stages in the Missouri River, in the Mississippi below the mouth of the Missouri, and in the Ohio were seasonable.

The rivers, as a rule, were free from floods, but there were torrential rains in several localities that caused the smaller tributaries to overflow with great resulting damage, much greater, in fact, than frequently follows a severe flood in a large river, as they occurred at the height of the crop season. During the night of July 15 one of these cloudbursts occurred over northwestern Kentucky, southwestern Indiana, and southeastern Illinois, and it is reported that crops, consisting principally of tobacco in Kentucky, and property, to the com-

bined value of at least \$2,000,000 were destroyed. The White and lower Wabash rivers rose rapidly and flood stages were reached in the west fork of the White River from July 17 to 20, inclusive, but the major portion of the damage fell upon the State of Kentucky.

On July 22 a severe rainstorm visited the mining town of Bisbee in southeastern Arizona, and the torrents from the mountains resulted in the loss of several lives and caused damage to the amount of about \$150,000. Another cloudburst on the morning of July 29 caused the waters of Bear Creek to overflow at Hannibal, Mo., with resulting damage of the usual character to the amount of about \$75,000, and on the same day rains of a similar character in eastern Colorado did still more damage, mainly to railroads. Large sections of track were completely washed away over the territory bounded by Colorado Springs, Trinidad, Salida, and La Junta, and traffic was necessarily suspended for some time. The greater portion of the water came down the Fountain River to Pueblo.

The continuous rains of the first decade of the month over Georgia, Alabama, and Mississippi were followed by decided rises in the rivers, but not to flood stages, except in the upper Yazoo River. At Swanlake, Miss., this river was above the flood stage of 24 feet from July 19 to 31, inclusive, and crop damage to the amount of about \$8,000 was reported. Warnings were issued for several of these rises, and along the Alabama River they were of great benefit as the farmers were enabled to remove their cattle from the lowland pastures to places of safety.

Hydrographs for typical points on several principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

SPECIAL PAPERS ON GENERAL METEOROLOGY.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

C. FITZBUGH TALMAN, Librarian.

The following have been selected from among the titles of books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Anonymous publications are indicated by a —.

Ångström, A. Knutsson.

Une simple méthode pour déterminer la radiation nocturne, proposée par K[nut] Ångström, publiée par A. Knutsson Ångström. Upsala. 6 p. f°. (Nova acta reg. soc. sci. Upsala. s. 4. v. 2. n:o 8.)

British balneological and climatological society.

Journal of balneology and climatology. v. 13, 1909-10, with indices to the 13 volumes London. 1909-10. xii, 238p. 8°.

Budig [Wilhelm Heinrich] Walter.

Die durch Niederschläge hervorgerufenen Störungen des Luftpfelektrischen Feldes in Potsdam. Auf Grund 4-jähriger Registrierungen mit besondere Berücksichtigung von Böen. [Berlin.] 33, xviii p. 8°. (Inaug.-Dis.-Berlin.)

Charcot, [Jean]-B[aptiste].

Rapports préliminaires sur les travaux exécutés dans l'antaretique par la mission commandée par J.-B. Charcot de 1908 à 1910. Paris. 1910. ix, 103 p. 4°. (Académie des sciences.)

Dove, Karl, & Frankenhäuser.

Deutsche Klimatik. Grundriss der Lehre von den Luftkuren... unter besonderer Berücksichtigung Deutschlands. Mit Tabellen und 4 Karten. Berlin. 1910. xii, 290p. 8°.

Ebert, H., & Kurz, K.

Registrierungen der luftpfelektrischen Zerstreuungen in unmittelbarer Nähe des Erdbodens. München. 1909. 68p. 4°. (Abhdlgn. k. bay. Akad. Wiss., math.-phys. Kl., 25. Bd. 2. Abhdl.)