

MONTHLY WEATHER REVIEW.

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The MONTHLY WEATHER REVIEW is based on data from about 3500 land stations and many ocean reports from vessels taking the international simultaneous observation at Greenwich noon.

Special acknowledgment is made of the data furnished by the kindness of cooperative observers, and by R. F. Stupart, Esq., Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. I. S. Kimball, General Superintendent of the United States Life-Saving Service; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Director Meteorological

Office, London; Maxwell Hall, Esq., Government Meteorologist, Kingston, Jamaica; Rev. L. Gangóiti, Director of the Meteorological Observatory of Belen College, Havana, Cuba.

As far as practicable the time of the seventy-fifth meridian is used in the text of the MONTHLY WEATHER REVIEW.

Barometric pressures, both at land stations and on ocean vessels, whether station pressures or sea-level pressures, are reduced, or assumed to be reduced, to standard gravity, as well as corrected for all instrumental peculiarities, so that they express pressure in the standard international system of measures, namely, by the height of an equivalent column of mercury at 32° Fahrenheit, under the standard force, i. e., apparent gravity at sea level and latitude 45°.

FORECASTS AND WARNINGS.

By Prof. ALFRED J. HENRY, temporarily in charge of Forecast Division.

IN GENERAL.

Barometric pressure over the British Isles was low during the first and third decades of the month and high during the second decade. The weather, on the whole, was cool and rainy, except during the anticyclonic condition which prevailed from the 11th to the 20th. Over the Atlantic in the vicinity of the Azores pressure was uniformly high from the 1st to the 13th, and again from the 16th to the 20th. The last-named period was one of high pressure over the whole of western Europe, including Iceland, and from the Azores westward to the United States. On the 17th a rise of pressure occurred simultaneously over the Azores, Bermuda, the West Indies, and the eastern portion of the United States, the rise amounting to as much as a tenth of an inch at two of the West Indian stations. This great high maintained itself only about two days; on the 18th it was separated into several portions by an area of falling pressure that advanced from the westward.

In the United States the movement of highs and lows, of which there was about the usual number, was uniformly along the northern boundary, as may be seen by reference to Charts Nos. II and III. As a result, the lower layers of the air did not become unduly heated for periods of more than a day or two at a time, and no unusually high maxima were registered, except in Washington and Oregon, during the closing days of the month. In connection with the high temperatures experienced on the Pacific coast, a case of sunstroke was reported at Bellingham on the 31st.

During the eastward movement of high pressure area No. I unusually low temperatures were recorded in the Lake region, the Ohio Valley, and the Middle Atlantic States. Light frost was reported in southeastern Michigan and northern Ohio on the morning of the 3d; no general damage was done, altho potato vines were killed in localities.

The rainfall was about normal, except in Texas and the Southwest, New England, and New York, where more or less droughty conditions prevailed.

Severe local storms occurred on a number of dates and in various localities. In Wisconsin a series of small tornadoes swept over the counties of Jackson, Monroe, Wood, and Fond du Lac on the night of the 3d. Twenty-six people were reported killed, about twenty were injured, and the damage to property was estimated at \$100,000. A small tornado also struck Williston, N. Dak., on the 20th and demolished a num-

ber of dwellings, one person being killed in the wreckage. A tornado occurred near Mount Vernon, S. Dak., on the 13th; one life was lost. Severe thunderstorms, attended by high winds and torrential rains, were the cause of much damage to growing crops in various localities. Bridges were washed away, telegraph and telephone lines were prostrated, and the movement of trains was interrupted by the severity of the elements. Some of the most severe storms occurred on the following dates: 3d, 4th, and 5th, in Wisconsin and adjoining territory; 5th, in Ohio; 9th, in the Ohio Valley, especially at Louisville, Ky.; 10th, in Iowa, Illinois, and Indiana, two persons being killed in Indiana; 14th, heavy rains in northeastern Kansas and southeastern Nebraska occasioned an estimated loss of half a million dollars; 18th, heavy rains and severe electric storms occurred thruout West Virginia and portions of Maryland, being particularly severe at Baltimore; 21st, a severe storm in southern Wisconsin, especially at La Crosse, caused an estimated loss of \$500,000; 22d, severe electric storm at Parkersburg, W. Va.; 24th and 25th, severe electric and rainstorms in Ohio, West Virginia, and western Pennsylvania; 29th and 30th, damage by wind, hail, and lightning sustained in Vermont.

Two very destructive hailstorms were reported, the first in Mills County, Iowa, where the local newspapers estimated that the crops over 80,000 acres of land were completely destroyed, entailing a loss of about \$1,000,000. The second storm occurred in the southern portion of Brown and Spink counties, South Dakota, where it is reported 160 square miles was swept by the storm.

BOSTON FORECAST DISTRICT.

The weather of the month was marked by generally high temperatures, abundant sunshine, and severe local storms in some sections. The precipitation was normal to excessive in northwestern Maine, and the extreme northern sections of New Hampshire and Vermont, and below the average in nearly all other sections of the district. The greatest deficiencies in the monthly amounts occurred in eastern Massachusetts and in Connecticut, and ranged from 2 to over 3 inches below the July average. General rains fell on the 12th, 20th, and the 26th, but otherwise the precipitation of the month was from local showers. The temperatures ranged near the seasonal average thruout the district. The maximum temperatures were generally on the 17th or 18th, and the minimum temperatures, with a few exceptions, occurred on the 4th. July, as a whole, was a very pleasant month

No storm warnings were issued during July, and there were no storms without warnings.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

The temperature was above the normal over the greater portion of the district during the month. There was a period of showers from the 9th to the 13th, inclusive, but for the month as a whole the rainfall was considerably below the normal. No general storm occurred along the west Gulf coast, and no warnings were issued.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.

The main features of the month were two periods of excessive heat, which prevailed from the 5th to the 10th and from the 15th to the 25th, inclusive. These prolonged heat waves were due to the persistence of high pressure areas over the southwestern quarter of the United States, and caused much suffering and many prostrations. The rest of the month, however, was quite cool, and thunderstorms were quite frequent after the 8th, especially in Kentucky. Occasional thundershowers gave temporary relief locally even during the heated periods, except previous to the 9th when it was not only hot but very dry.

Three or four general storms past over the Ohio Valley during the month, spreading general showers and some locally excessive rains.

A severe thundersquall past over the city of Louisville the afternoon of the 9th which unroofed many houses, destroyed hundreds of trees and spread destruction generally to the amount of many thousands of dollars. One man was killed and some twenty persons injured, also some twenty or more horses were killed by falling trees or live electric wires.

No special warnings were issued during the month, and none was called for.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.

The frequency of showers and thunderstorms generally thruout the north-central and northwestern States was a feature of the month.

Temperatures averaged high. Periods of excessive heat were, however, of short duration.

Severe gales were not experienced on the upper Lakes. Squalls calculated to imperil vessels were forecast. Storm warnings ordered on the 15th of the month for indicated dangerous squalls on Lake Michigan were not verified by wind velocities reported at stations of observation.

Frost was not reported in the agricultural districts.—*E. B. Garritt, Professor of Meteorology.*

DENVER FORECAST DISTRICT.

Temperatures during the month were slightly below normal to the west of the Continental Divide, and practically normal on the eastern slope. Rainfall was in excess over Arizona, southern Utah, and the eastern plains region in Colorado and Wyoming, and much below normal in New Mexico.

Special warnings were issued for the rise in the Arkansas river that followed the excessive rain of the 26th. No other warnings were issued or required.—*P. McDonough, Local Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

Light showers occurred in California on July 2 in connection with a moderate depression, apparently of the secondary order, which developed suddenly over Oregon. The usual summer low over the valley of the Colorado was in evidence early during the month, and thunderstorms with showers in the mountains of southeastern California and Arizona were frequent.

There were no storm nor frost warnings issued during the month.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

Near the close of the month a short hot spell of unusual severity prevailed west of the Cascade Mountains, and temperatures of 100° or more were common in many localities.

There were more than the usual number of thunderstorms, and the rainfall averaged above the normal, except along the southern border of the district, where it was slightly less than usual.

There were no damaging winds or frosts during the month, and no warnings were issued.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The only flood of consequence occurred about the middle of the month in the Des Moines and Illinois valleys and in that portion of the Mississippi Valley between the mouths of the Des Moines and the Missouri rivers. It was caused by the heavy rains that fell on the 9th and 10th and from the 14th to the 21st inclusive, especially on the 14th and 15th. While flood stages were not general there was a great amount of damage done, chiefly to growing corn, vegetables, and unthrashed wheat. Some portions of the city of Des Moines, Iowa, were flooded, as was also a great portion of the unprotected bottom lands. All levees remained intact, and none was at any time considered in danger. Stock and other portable property were removed, as the Weather Bureau warnings were issued in ample time to permit this.

Damage of the same character was done along the rivers of eastern Kansas and along the Missouri River from St. Joseph southward, and stages from 1 to 3 feet above the flood stage were general. Warnings were issued for these floods at the proper time.

A moderate flood in the Trinity River of Texas from the 12th to the 15th, inclusive, was also well forecast on the 11th, a stage of 30.3 feet, 5.3 feet above the flood stage, occurring at Dallas, Tex., on the 13th and 14th.

In addition to these floods in the larger rivers, there were numerous floods in the smaller streams at the same time. It was impracticable to issue warnings for these floods, except along the Tygarts Valley River of West Virginia, where a warning from the local office of the Weather Bureau at Elkins, W. Va., proved to be of much benefit, altho great damage was done to houses, roads, and bridges of all kinds, and to growing crops.

The Willamette River at Portland, Oreg., fell below the flood stage of 15.0 feet on the 16th, marking the end of the rise in the Columbia River for the year 1907. An account of this rise follows:

The 1907 annual rise in the Columbia River, by Mr. E. A. Beals, in charge of local office, United States Weather Bureau, Portland, Oreg.

The annual rise of the Columbia River is due almost wholly to the melting of the winter's snow in the mountains and foothills within the drainage area of the river, and there are two conditions governing the height of the flood crests in the lower stretches of the stream.

First. If the weather is sunny and a protracted hot spell occurs in May, high water is almost certain in the lower Columbia River; but if there is more than the usual amount of cloudiness during May and the temperatures are below normal, the snow melts slowly and the flood crest in the lower stream is never very high. There is seldom a year that there is not enough snow in the mountains to cause a serious flood if it melts quickly, therefore it is the manner in which the snow melts, rather than its amount, that ordinarily determines the height of the spring water in the Columbia River.

Second. Should the crest coming down the Snake River join that coming down the upper Columbia River, the lower stream will reach a higher stage than will be the case if the crest in one of these streams passes the junction of the two rivers before the arrival of the other. The Snake River crest usually passes into the Columbia River before the crest from the upper Columbia River reaches the junction point. This is due to