

WEATHER IN THE UNITED STATES

THE WEATHER ELEMENTS

By P. C. DAY

GENERAL CONDITIONS

The leading feature of November weather in 1928 was the heavy precipitation, especially about the middle of the month, over the central portions of the country. The mildness of October preceding continued over considerable areas in November, but the region of most notable temperature excess in November was the north-central portion.

PRESSURE AND WINDS

At the beginning of November a low-pressure center covered the southern plains, with rain and snow falling over a considerable area, especially to the northwestward of the center. This storm advanced in a northeasterly course, reaching central Quebec by the 4th, after causing large falls, principally rain, over much of the central and southern plains and the central valleys, also a few areas farther east. As this proceeded eastward a well-marked area of high pressure crossed the country, moving south-eastward, bringing low temperatures to most central districts and to the east Gulf region.

Another storm, from the 5th to the 9th, crossed the country not far from the parallel of 40° latitude, but the precipitation connected with it was mostly of little account. On the 10th a storm of small consequence was noted east of the Florida Peninsula, but this developed rapidly as it moved northeastward, the center on the morning of the 11th being at a considerable distance east of the Middle Atlantic coast.

Just before the middle of the month a storm from the central Plateau region advanced eastward and then northeastward to the vicinity of Lake Superior, with mainly moderate precipitation. This was immediately followed by a more important storm which crossed the north Pacific coast early on the 14th and traveled rapidly to the Texas Panhandle by the morning of the 16th. Thence the storm turned northeastward to the Lake region, accompanied by heavy falls of snow or rain over the southern Plains, the central valleys, and the southwestern part of the Lake region, Kansas City measuring 6.42 inches of rain within 48 hours on the 15-17th.

Still another storm moved northeastward between the 18th and the 20th from Alabama to the Gulf of St. Lawrence, causing widespread, but mainly moderate precipitation in most districts east of the Mississippi River, snow falling in the northern and eastern portions of the Ohio drainage area and to the northward.

The first days of the final decade brought further precipitation to northeastern districts, but fair weather prevailed elsewhere. On the 24th a marked area of high pressure, moving southeastward from the Canadian Northwest, reached the northern Plains, whence it advanced to the South Atlantic States by the 27th, bringing the lowest temperature marks of the month to nearly all central and eastern stations.

The last few days of the month saw the movement of a well-marked storm from the middle Plateau to the Texas Panhandle and thence to the Lake region with considerable precipitation over most Central and Southern States and over the Lake region and the Northeast.

In the far West the chief precipitation period was the 8th to 15th, but the northern portions received amounts of less importance during the first four days of the month and again during the final few days.

The average sea-level pressure for the month was above normal in most portions, especially in the Rocky Mountain, Plains, and Gulf States. The pressure averaged less than normal in New England and most of the Lake region and Middle Atlantic States.

The general distribution of the average pressure and the variations from the means of the preceding month, also the prevailing directions of the winds are shown on the charts which follow. Details of severe wind and other storms appear in the table at the end of this section.

TEMPERATURE

The first week of November was generally cooler than normal, except in the northeastern and far western States. The temperatures were abnormally low for the season between the Mississippi River and the Rocky Mountains, where they averaged from 2° to 13° below the normal, while in the far West they were generally from 1° to 5° above and from Virginia northward from 1° to 2° above. In the East the freezing line extended to southwestern Virginia and in the West to Oklahoma and northwestern Texas, while in the Mississippi Valley it did not extend as far south as St. Louis.

During the second week the weather was moderately cool generally east of the Mississippi River, except in the upper Lake region, and it was abnormally warm for the season from the upper Lake region to central Texas and to the westward. In the Great Plains and central and northern Rocky Mountain States, temperatures averaged from 3° to 10° above the normal. In most eastern States they were from 1° to 4° below the normal, while light frosts occurred as far south as northern Florida. However, temperatures below freezing were not reported farther south than southern Virginia and the mountains of North Carolina. West of the Mississippi River they extended only to southern Iowa, the southwestern portion of Kansas, and the Panhandle of Texas.

The third week was unusually warm east of the Rocky Mountains and much below the average over the Great Basin and far Southwest. Temperatures were abnormally high for the season in the Ohio Valley, lake region, and North Atlantic States, where they averaged from 6° to 15° above the normal, while in the Mississippi and Missouri Valleys they were from 2° to 11° above. On the other hand, in much of the Great Basin, Arizona, and New Mexico they averaged from 3° to 6° below. In the East the freezing line extended to western North Carolina, while west of the Mississippi River it extended to central Arkansas and southwestern Texas.

The last week was unusually cold for the season east of the Mississippi River and in much of the Southwest, but was abnormally warm in the Northwestern States. It was unseasonably cold from Virginia, West Virginia, and Kentucky southward, the mean temperatures ranging from 4° to 12° below normal; on the other hand, in the northern Great Plains they averaged from 4° to 12° above, while west of the Rocky Mountains they were generally a little above the normal.

The month as a whole was mild. It was abnormally warm from the upper Lake region to the northern Great Plains, where the temperatures averaged from 3° to 6° above the normal. It was likewise from 2° to 4° above in southern New England, the Middle Atlantic States, and the lower Lake region. From the Ohio Valley to the Great Plains and southward, and also from the Rocky Mountains westward, the temperatures for the month ranged from 1° or 2° above to 1° or 2° below the normal.

As a whole, the month was warmer than normal, with temperatures 90° or above at a few points in Arizona, California, Florida, and Texas. On the other hand, sub-zero temperatures were recorded at many places in the Rocky Mountain, Great Basin, and most northern border States, chiefly during the latter half of the month.

PRECIPITATION

The precipitation for the month was very unevenly distributed over the United States. Most of the lake region and Ohio Valley received more than the normal amount, while heavy to excessive falls, ranging in some cases from four to six times the normal, were received in parts of the southern Great Plains and lower Missouri Valley; the greatest November fall of record being measured at Kansas City and St. Joseph, Mo., Keokuk, Iowa, and Milwaukee, Wis. On the other hand, in the South the amounts were below the normal, except in the southern portions of Louisiana and Texas, where they were somewhat above, as also they were in most of California. Throughout the interior of the Atlantic States, the northwestern portion of the Great Plains, the northern Rocky Mountain region, and from the central portion of the Great Basin westward, except most of California, the precipitation was markedly deficient, many sections receiving less than 25 per cent

of the normal, while in portions of the northwestern Great Plains and of southwestern Arizona no precipitation whatever was received.

SNOWFALL

No heavy snows occurred in the northern border States, but in the western mountains rather heavy falls were received in Colorado and portions of Nebraska, Wyoming, Utah, and New Mexico, and also in the eastern portion of California, while in portions of the Texas Panhandle unusually heavy falls for the season occurred about the middle of the month.

But little snow remained on the ground at the end of the month, except in the mountains of the West, the upper lake region, and northern portions of the New England States.

RELATIVE HUMIDITY

Over all interior and most western portions of the country the relative humidity was above the normal for the month, the values over the central Great Plains and Rocky Mountain regions being particularly high. Over the Atlantic and East Gulf States the average relative humidity was mainly less than normal and similar conditions prevailed along the immediate Pacific coast.

SEVERE LOCAL STORMS, NOVEMBER, 1928

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A more complete statement will appear in the Annual Report of the Chief of Bureau]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks	Authority
Floyd County, Iowa (Rock Grove Township).	14	4 p. m.			\$2,000	Tornado	Character of damage not reported.	Official, U. S. Weather Bureau.
Vinton, Benton County, to Silver Creek, Delaware County, Iowa.	14	4:30-5:15 p. m.		1	200,000	do.	Scores of farmsteads demolished or damaged; much livestock killed; trees and telephone poles leveled; 9 injured.	Official, U. S. Weather Bureau; the Journal (Stout City, Iowa).
Chester, Iowa.	14	5:30 p. m.			3,000	do.	Several buildings damaged; 2 persons injured.	Official, U. S. Weather Bureau.
Wisconsin (eastern and southeastern).	14-15				10,000	High winds	Damage chiefly to overhead-wire systems, small farm buildings, windows, etc.	Do.
Orlando, Okla.	15	7 p. m.	220	2	10,000	Tornado	Several homes and barns wrecked; path 2 miles.	Do.
Michigan (Thumb district).	15			1	25,000	Heavy gales.	Farm buildings blown down; orchards uprooted.	Do.
Iowa (central and north-eastern).	17					Snow and sleet.	Overhead wires broken; poles snapped off; trees damaged.	Do.
Cumberland County, Pa.	19	2:30 p. m.				Wind.	Considerable property damage reported.	Do.
Chemung, Tioga, and Broome Counties, N. Y.	19	4-5 p. m.			120,000	do.	Houses and barns unroofed; several barns demolished; livestock killed; heavy damage to manufacturing plant.	Do.
Wilkes-Barre, Pa., and vicinity.	19	4:30 p. m.			500,000	Probably tornado.	Heavy damage to buildings, trees, etc.	Do.
Montour and Columbia Counties, Pa.	19	P. m.				Wind.	Scores of homes unroofed; communication cut off; highways blocked.	Do.
Rutland, Vt.	19	do.				do.	Wire communication interrupted; 2 automobiles demolished; poles blown down.	Daily News (Burlington, Vt.).

RIVERS AND FLOODS

By H. C. FRANKENFIELD

On the evening of November 15, 1928, a disturbance of apparent North Pacific origin was central over New Mexico. For the ensuing 36 hours it moved northeastward, and during this period it was attended by excessive rains over eastern Kansas, Missouri, eastern Iowa and northern Illinois, and the southern upper Lake region. Floods were, of course, inevitable, especially in the rivers of eastern Kansas and Missouri. They were especially severe in the Osage, Cottonwood, and Neosho Rivers of Kansas, and the following description thereof was prepared by Mr. S. D. Flora, meteorologist in charge of the Weather Bureau office at Topeka, Kans.:

Disastrous floods occurred along the Marais des Cygnes (Osage), Cottonwood, and Neosho Rivers as the result of downpours of 7 to 10 inches of rain that began during the night of November

15-16 and lasted approximately 36 hours. Such heavy rains were without precedent in Kansas so late in the year.

The total property damage in the basins of the three rivers was estimated at \$1,948,000. Eight lives were lost—six in Franklin County, one in Miami County, and one in Labette County.

The greatest damage occurred in and near Ottawa, where the Marais des Cygnes reached a record breaking stage of 37.6 feet 13.6 feet above bankful, at 2 p. m. of the 17th. Fifty blocks of the city were covered by the flood waters. Seven hundred buildings were damaged, 30 houses washed away, and 40 others washed from their foundations. The municipal power plant and water-works pumping plant were entirely disabled, leaving the city in darkness for several nights and without drinking water. Altogether, the water reached approximately 150 acres of land within the city limits. The damage in the city, exclusive to railways, was estimated at \$200,000 by representatives of the United States Engineer Corps. On the same authority the total damage in Franklin County, of which Ottawa is the county seat, was estimated at \$750,000, with an additional \$200,000 damage to railways in and near Ottawa. Damage in Miami County was estimated at \$400,000.

Damage to other counties in the basins of the three rivers was fairly well distributed and was mostly to bridges, highways, and