

THE WEATHER ELEMENTS.

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PRESSURE AND WINDS.

July, 1922, was, on the whole, free from notable atmospheric disturbances, and pressure conditions were remarkably uniform. The monthly averages were everywhere above normal, though not by any large values, and, compared with the preceding month of June, they were likewise higher by substantial amounts in all districts.

As is usual in the summer months, the pressure was highest over the South Atlantic and North Pacific coasts, but the mid-continent depression, common to the summer season, was less pronounced than usual.

The cyclonic disturbances were mainly weak, and, while discernible on the daily weather maps, only occasionally and for short periods assumed definite and important proportions. Likewise, anticyclones were usually weak and seldom pursued other than the more northerly courses in their eastward progress across the country.

On account of the slight filling up of the interior low area as compared with the normal, the barometric gradient between this and the normally high pressure during the summer months over the Southeastern States was less than usual. As a result, the tendency to southerly winds over the districts east of the Rocky Mountains was less pronounced than normal. On the whole, though, these winds were usually dominant in the districts referred to above, save along the immediate northern border, where they were mainly from the north. In the far Western States, the wind directions, though modified greatly, as usual, by topography, were nevertheless controlled by the high pressure over the Washington and Oregon coasts, giving them a trend from the northwest over the adjacent States, while in the Colorado Valley low pressure induced the usual circulatory winds over adjacent regions.

Along the central California coast, where strong northwest winds usually prevail during July, there was a notable absence of such winds during the current month, and light south to southwest winds prevailed for unusually long periods.

Local high winds, mostly associated with thunderstorms, occurred on numerous dates and in many localities, but few covered extensive areas. A list of the more important of these follows at the end of this section.

TEMPERATURE.

There were few marked features attending the temperature conditions existing during the month, save possibly the usually small extent of the daily fluctuations above or below the normal. The principal exception to this was in connection with the cool wave that extended over the central and southern districts during the 4th to 6th, at which time there were sharp falls in temperature and minimum readings as low as, and in a few cases lower than, previously observed in July were reported.

The first few days of the month were, on the whole, warmer than normal in the far West and over most eastern districts, and generally cooler than usual over the central districts. The period from the 5th to 11th, inclusive, was mainly cool from the Rocky Mountains eastward, particularly over the northern Great Plains, but there was continued warmth in the far West.

For the period 12th to 18th, inclusive, temperatures continued mainly higher than normal in the far West, attaining the highest values of the month about the 14th and 15th, when a temperature of 126° was observed in the desert region of California, and temperatures as high as ever observed in July were reported from southwestern Utah. From the lower Mississippi Valley northwestward to Montana and the Dakotas this period continued cooler than normal, while over the eastern and southern districts moderate temperatures were the rule.

The last decade of the month had no great departures from normal, but it was mostly cool in the far West, warm in the Rocky Mountain region, and variable in the districts to the eastward.

For the month as a whole, the average temperatures were below normal throughout the Great Central Valleys, most eastern districts, and over the middle Gulf States. They were well above normal over Texas and the far Southwest, the central valleys of California, and the central and eastern portions of Washington and Oregon. There were also small areas of the South Atlantic States and portions of New England and the adjacent Canadian Provinces that had averages for the month slightly above normal.

The warmest periods of the month were not confined to particular dates for extensive areas, and occurred in all parts of the month. The highest observed temperature was 126°, in southern California, and temperatures of 100° or slightly higher were reported from all except the Northern States. The lowest temperatures of the month were confined to a few periods, mainly from the 3d to 7th over most central and southern districts, and during the last decade in the far West, and over the Northern States.

Minimum temperatures of 32° or lower were observed in most of the mountain States, and in portions of the upper Lake region, damaging frosts being reported from extreme northern Michigan in the early part of the month.

PRECIPITATION.

Rainfall was frequent, and in many instances heavy, over most districts from the Rocky Mountains eastward during the first two decades of the month, and there were local heavy falls during the last decade in portions of the South Atlantic States and the lower Missouri Valley.

As is usually expected in a summer month, precipitation was mostly from thunderstorms, and the daily and monthly totals varied greatly over adjacent regions.

In the main, precipitation was sufficient for current needs over all regions where rainfall may be expected in July, and the amounts were mostly above normal over the interior States from the Rocky Mountains eastward and along the Atlantic coast from South Carolina to New Jersey. There were also liberal falls in Montana and portions of the Plateau regions. In portions of the central valleys, and locally elsewhere, the precipitation was extraordinarily heavy, notably in northwestern Missouri, where amounts in excess of 10 inches fell in less than 24 hours on the 10th and 11th, and in portions of Kansas, Michigan, and Virginia, where the month's falls were the greatest of record for July. On the other hand, a few localities, where liberal rains may be expected in July, had far less than normal, notably at Burlington, Vt., where the month was the driest known for July, and

at Corpus Christi, Tex., where no appreciable rain fell from the 1st to the 28th, inclusive, and in the far Northwest, notably in the State of Washington, where severe drought has persisted for an unusually long period. There was somewhat less than the normal rainfall over the Gulf States, but this was probably more beneficial than otherwise. There was a general deficiency from Ohio and West Virginia northeastward to New England, and generally over the Southwest, where the rainy period set in at the usual time, but the falls were much lighter than expected.

RELATIVE HUMIDITY.

The relative amount of moisture in the atmosphere was not materially different from the normal condition, although in the main the regions with an excess of precipitation had likewise higher than average relative humidity and the areas of most deficient precipitation had less, though there were marked exceptions in both cases. In general, the greatest excess was in the Missouri Valley, where it ranged up to 10 or 12 per cent, and the greatest deficiency in the far Northwest, where in some cases it was about the same.

SEVERE LOCAL STORMS.

[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.
Bristow, Okla.	1-2			2		Thunderstorm	Battery of 30 or 40 oil tanks struck by lightning.	Dallas Morning News (Tex.). Official, U. S. Weather Bureau.
Baltimore, Md.	2	P. m.			\$4,800,000	Electrical	Fires started by lightning burn 2 grain elevators and 2 piers of the Baltimore & Ohio R. R. Co.	Official, U. S. Weather Bureau.
Logan and Union Counties, Ill.	2					Wind	Trees, corn, and poles blown down.	Do.
Ardmore, Okla.	2					Thunder and wind.	Valuable shade and fruit trees uprooted, and buildings heavily damaged.	Dallas Morning News (Tex.).
Pittsburgh, Pa.	2					Thunderstorm	Streets and cellars flooded; car service interrupted by accumulation of debris.	Official, U. S. Weather Bureau.
Washington, D. C.	3	P. m.				Wind	Minor damage done by falling trees.	Evening Star (D. C.).
Harlem, Mont.	4	4 p. m.			20,000	Tornado and hail	Damage to business houses, residences, and crops; small live stock killed.	Harlem News (Mont.).
Heath Springs, S. C.	4				2,000	Electrical	Warehouse and contents destroyed by lightning.	Official, U. S. Weather Bureau.
Pueblo, Colo., and vicinity.	6	P. m.				Wind	Buildings, trees, and overhead wires damaged by wind.	Pueblo Chieftain (Colo.).
Dodge City, Kans.	6	5:15 p. m.				do.	Damage to uncut wheat, farm buildings and implements, plate glass windows, and trees; heavy loss sustained by telephone and power companies; 1 person injured.	Official, U. S. Weather Bureau.
Greeley County, Kans. (SW. quarter of).	7					Hail	All crops destroyed.	Do.
Lake Andes, S. Dak. (shores of).	8	P. m.		1	775,000-800,000	Tornado	Summer resorts on shores heaviest losers; village of St. Charles practically destroyed; many persons seriously injured.	Press and Dakotan (Yankton, S. Dak.).
Bonetrail and Squires, N. Dak.	8	P. m.				Rain and hail	Total and part losses reported by large number of farmers.	Williams County Farmers Press (Williston, N. Dak.).
New York, N. Y., and vicinity.	8	P. m.				Thunderstorm	Trees and poles blown down; number of cellars flooded in Jersey City.	Herald (New York).
Gregory and Charlesmix Counties, S. Dak., and Knox County, Nebr.	8-10			3	3,000,000	Thunderstorms and tornadoes.	Severe general damage; heavy loss in live stock; many persons injured.	Daily Journal and Evening Post (Chicago, Ill.).
Stoughton, Wis., and vicinity	9					Wind	A score of tobacco sheds blown down, trees damaged, and the electric light line out of commission.	Capital Times (Madison, Wis.).
Carroll and Rockland Counties, Ill., and Scott County, Iowa.	9					Electrical, wind, and rain.	Heavy damage to street car and telephone lines; crops also severely damaged; streets and country roads flooded. Damage in Davenport estimated at \$4,000. In Carroll crops were damaged to the extent of \$50,000 to \$100,000. In Moline the damage is thousands of dollars.	Official, U. S. Weather Bureau; Moline Dispatch (Ill.).
Lone Star, S. C.	9				25,000	Electrical	Warehouse and contents damaged by lightning.	Official, U. S. Weather Bureau.
Menominee County, Mich., and Marinette, Wis.	9					Wind	Severe damage to crops, farm buildings, and machinery; damage estimated at thousands of dollars.	Menominee Herald Leader (Mich.).
Toledo, Ohio.	10	P. m.		2	25,000	Wind and rain	Damage to wires, trees, and crops; several persons injured.	Official, U. S. Weather Bureau.
Napoleon, Ohio.	10	P. m.		1		Wind	Thousands of dollars damage to crops and trees; child killed by falling limb.	Times (Toledo, Ohio).
Fort Wayne, Ind.	10	P. m.				Wind and rain	Overhead wires, trees, etc., heavily damaged.	Official, U. S. Weather Bureau.
Muncie, Ind.	10					Electrical	Some property damage; one man injured by lightning.	Indianapolis Star (Ind.).
Warsaw, Ind.	10	P. m.				Wind and rain	Three houses unroofed, trees blown down, and streets and basements flooded.	Do.
Waterloo, Ind.	10	3 p. m.				Wind	Several barns destroyed, trees and wires blown down, and windows broken.	Do.
Livingston, Ford, and Iroquois Counties, Ill.	10				71,000	do.	Much damage to crops and property.	Official, U. S. Weather Bureau.
Kansas City, Mo.	10	P. m.			35,000	Thunderstorm	More than 8,000 telephone and electric light poles down, 25 street cars stalled, streets and basements flooded.	Do.
Swansea, S. C. (near Newton, Kans., and adjacent territory.	10				2,000	Electrical	Barn and contents damaged by lightning.	Do.
Wichita, Kans., and vicinity.	10	P. m.				Wind, rain, and hail.	Heavy damage in oil fields; some property damaged; \$500,000 in oil fields.	Wichita Beacon (Kans.).
Wichita, Kans., and vicinity.	10	P. m.				Wind and rain	Minor damage to property, trees, wires, and orchards.	Do.
El Dorado, Kans.	10	P. m.				do.	Oil companies heaviest losers, 650 rigs leveled; lines of communication out of commission and crops damaged.	Do.
Chicago, Ill.	11	A. m.				Rain	Subways, basements, and streets flooded; car service crippled.	Evening Post (Chicago, Ill.); Official, U. S. Weather Bureau.
Salem, Ohio.	12			2		Electrical	Minor property damage.	Plain Dealer (Cleveland, Ohio).