

## STORMS AND WEATHER WARNINGS.

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There were issued regularly during the month, the daily forecasts of weather, temperature, and winds for the various State forecast units, winds and weather for the water areas off the Atlantic and Pacific coasts and for the Great Lakes, the Gulf of Mexico, and the western part of the Caribbean Sea, aviation forecasts for the several zones and for the Army airways; and in addition to these daily issues, warnings of frost and freezing temperatures for the States were disseminated as required. Moreover, storm warnings for the coastal regions and the Great Lakes and special advices concerning weather and temperature changes for the continent were issued as required.

The month of April was not particularly abnormal from a forecasting standpoint, except as to the frequency of frost warnings and the occurrence of late frosts. Forecasts of snows in the Northern States were also more numerous than is usual in the month of April.

## WASHINGTON FORECAST DISTRICT.

In the Washington Forecast District frost warnings were issued on a number of days, the more important being on the 5th for Tennessee and the extreme north portions of Alabama and Mississippi; on the 8th for freezing temperature or frost for the lower Great Lakes region, the Ohio Valley, the Middle Atlantic States, Tennessee, and the north portions of the east Gulf States; on the 9th for nearly the same areas and the north portions of Georgia and South Carolina; on the 16th for the Atlantic States as far south as western North Carolina and the Ohio Valley and northern Tennessee; on the 17th for the Middle Atlantic States, the Ohio Valley, Tennessee, and the north portions of Alabama and Mississippi; on the 18th for nearly all parts of the Washington Forecast District, the South Atlantic and Gulf coasts excepted; on the 24th and 25th for the lower Great Lakes region, the Upper Ohio Valley, and the Middle Atlantic States; and on the 30th for the upper Ohio Valley, the lower Great Lakes region, and the North Atlantic States.

Warnings of winds more or less dangerous to navigation on coastal waters were issued as follows during the month: On the 9th at 9:30 p. m., southwest storm warning were displayed on the Atlantic coast at and between the Virginia Capes and Eastport, Me.; on the 11th, an advisory warning of strong winds was issued for the North Atlantic coast; on the 12th, small craft warnings were displayed over the Mobile and Pensacola storm-warning sections; and on the 13th and 14th storm warnings were displayed on the Middle Atlantic and southern New England coasts and on the 15th the display was extended northward to Eastport, Me.; on the 20th, the small-craft warning was displayed on the east Gulf coast west of Tampa; on the 23d, northwest storm warnings were displayed on the Atlantic coast at and between New London, Conn., and Provincetown, Mass.; on the 28th, small-craft warnings were displayed on the Atlantic coast at and north of Cape Hatteras and at 9:30 p. m. of the same day the warnings were changed to southeast storm on the New England coast; on the 29th, small-craft warnings were displayed on the South Atlantic coast at and between Wilmington, N. C., and Jacksonville, Fla.

## CHICAGO FORECAST DISTRICT.

Over most of the district the month was cooler than usual, but not markedly so except in the eastern portion of Upper Michigan, where the temperature averaged 5° below the normal. A feature of the temperature conditions was the rapid alternations from day to day during the first half of the month. The precipitation was deficient in most sections, especially in the middle Mississippi Valley, but more than the normal amount occurred in Montana, the western portions of North Dakota and Kansas, northwestern Iowa, northern Lower Michigan, and the extreme southern portions of Illinois and Indiana.

So far as the occurrence of conditions calling for special warnings is concerned the month was rather uneventful.

*Cold-wave warnings.*—The only cold-wave warnings issued were those on the 6th for Upper Michigan and extreme northern Lower Michigan. In the main, these warnings were verified, but the cold wave was of little importance. On the 7th a decided fall in temperature occurred over most of the Central Plains States and middle Mississippi Valley, the fall attaining the proportions of a cold wave in portions of eastern Kansas and a small area in northwestern Missouri.

*Live-stock warnings.*—Live-stock warnings were issued on the 6th for southeastern Wyoming and the western portions of South Dakota and Nebraska, and again on the 22d for western Nebraska. In neither case, however, did the ensuing conditions become severe.

*Frost warnings.*—Owing to the lateness of the season the advance of vegetation was decidedly backward and the frosts of the month were of little economic importance. At the opening of the month frost warnings were required only in southeastern Kansas, but as the month advanced this area spread slowly northward, so that by the close Kansas, Nebraska, Missouri, and most of Iowa, Illinois, and Indiana were included. Warnings of frost or freezing temperature were issued on the following dates: 5th, 7th, 8th, 9th, 11th, 13th, 14th, 15th, 16th, 17th, 20th, 21st, 23d, 24th, and 26th.

*Storm warnings.*—The storm-warning season on the Great Lakes was opened on the 21st except in the case of Lake Superior, where the opening date was deferred to May 1. These dates are later than usual as a result of the severe character of the latter part of the winter, together with the backwardness of the spring season. Generally speaking, the accumulation of ice in the Great Lakes was the heaviest in years.

Preceding the opening of the storm-warning season advisory warnings were issued for Lake Michigan on the 1st, 7th, 11th, 13th, 15th, 19th, and 20th. The disturbance of the 7th–8th attained some intensity, and moderate gales occurred over most of the Lake. Farther east on the lower Lakes the storm became more severe, fresh to strong gales being reported. On the morning of the 20th a trough of low pressure of considerable depth was advancing eastward across the Plains States, and an advisory warning for strong southerly winds was issued for Lake Michigan. By the following morning the disturbance had developed still further, with a definite center over Iowa and a barometer reading of 29.24 inches. Accordingly, southwest storm warnings were issued for Lakes Michigan, Huron, and Erie, and later,

at 4 p. m., extended to Lake Ontario. The center of the disturbance moved slowly northeastward, but by the morning of the 22d the storm had almost lost its identity and appeared to be dissipating over northern Michigan. Verifying velocities were attained over extreme southern Lakes Michigan and Huron and over portions of Lakes Erie and Ontario. The remainder of the month was without any storm activity that required the issuance of warnings.—*C. A. Donnel.*

#### NEW ORLEANS FORECAST DISTRICT.

Small-craft warnings were displayed on the Texas and Louisiana coasts on the 12th for a disturbance of moderate intensity, which moved northeastward from the lower Rio Grande Valley and was attended by shifting winds which reached moderate gale force at times.

On the 19th a V-shaped trough of low pressure extended into west Texas and northern Mexico and was advancing eastward. Southeast storm warnings were ordered displayed on the Texas coast at 8:40 p. m. Winds of verifying velocity occurred during the night. Small-craft warnings were displayed on the Louisiana coast on the 20th and were justified.

Small-craft warnings, displayed on the Texas coast on the 23d, were justified.

On the 30th, with conditions generally similar to those of the 19th but with smaller barometric gradient, southeast storm warnings were ordered displayed on the Texas coast at 8:40 p. m. A 40-mile wind from the southeast was reported the next morning from Galveston, Tex.

Frost forecasts for the northern portion of the district, or some part thereof, were issued on the 5th, 7th, and 8th and were justified. Forecasts of frost, issued on the 14th, 15th, and 24th, were not so successful, the temperatures not being quite low enough for frost.—*R. A. Dyke.*

#### DENVER FORECAST DISTRICT.

Low-pressure areas occupied some portion of the Denver Forecast District on 26 days during April. Four anticyclonic areas appeared on the northeastern slope of the Rocky Mountains during the month, and one of these, during the latter part of the month, persisted for nearly a week.

A moderate cold-wave warning was issued for extreme northeastern Colorado on the evening of the 5th, an anticyclonic area having appeared on the northeastern slope, with a sharp rise in pressure in western Montana and over the Dakotas. The temperature fell 28° at North Platte on the evening of the 6th and temperatures as low as 26° occurred along the eastern border of Colorado the following morning. On the morning of the 7th low-pressure areas of marked intensity were central in Iowa and southwestern Colorado, with moderately high barometric readings in Montana accompanied by temperatures ranging from 6° to 20° above zero. A cold wave occurred at Modena, without warnings, following the passage of a secondary depression over that locality. Freezing-temperature warnings were issued for Utah, Colorado, northern Arizona and northern New Mexico, with a moderate cold wave in central Colorado and possibly frost in southern Arizona. Freezing temperatures occurred throughout the area for which these warnings were issued, but the cold-wave warning for central Colorado was not verified as the HIGH moved southeastward to Kansas and the temperature fall in southern Arizona was not sufficient

for the formation of frost. Low pressure prevailed on the southeastern slope on the morning of the 13th, with an extensive high-pressure area over the North Pacific states. Warnings of freezing temperature were issued for northeastern Arizona and frost or freezing temperatures for Colorado, Utah, and northern New Mexico. Frost or freezing temperatures occurred in the greater part of the area. The HIGH occupied the northern Rocky Mountain region and the eastern slope on the 14th and warnings of frost in northern and eastern New Mexico and local frost in Colorado were issued. Frost was reported in the greater part of the area, with frost temperatures as far south as the Mexican border. As the HIGH still occupied the Rocky Mountain region on the 15th local frost warnings were repeated for Colorado and northern New Mexico. Frosts were again reported in Colorado, but the development of a LOW in the Southwest was attended by cloudiness in New Mexico.

On the morning of the 20th low-pressure areas of marked intensity occupied Manitoba and the Texas Panhandle, with relatively high pressure in the middle Plateau region. Warnings of freezing temperature were issued for Colorado and New Mexico. Freezing temperature occurred in eastern Colorado and frost temperatures in parts of New Mexico. At 8 a. m. on the 22d a LOW of marked intensity was central in northeastern Arizona, with an anticyclonic area on the northeastern slope. Live-stock warnings were issued for Utah and northern and western Colorado, freezing-temperature warnings for northern New Mexico and northeastern Arizona and possibly frost in southern Arizona. Freezing temperatures occurred accompanied by heavy precipitation in parts of Colorado. Frost was reported at Phoenix, a temperature of 46° at Yuma and a killing frost at Santa Fe. Freezing-temperature and frost warnings were issued on the morning of the 23d for Colorado, New Mexico, Utah, and northern Arizona and frost in southern Arizona as the pressure was increasing throughout the district. Freezing temperature or frost prevailed, except in New Mexico, where cloudiness developed with rising temperature owing to relatively low pressure in southern Arizona. Frost or freezing-temperature warnings were repeated on the morning of the 24th for Colorado, Utah, and eastern New Mexico. Owing to the development of the southwestern LOW the temperature rose and freezing weather was reported only in localities in Utah and Colorado. On the morning of the 30th an area of low pressure of marked intensity, that had its inception in the Plateau region, was central in Colorado, followed by rising pressure in the Plateau region. Warnings of freezing temperature or frost were issued for eastern and southern Utah, freezing temperature in western Colorado, northern New Mexico, and northeastern Arizona, and possibly frost in southern Arizona. The warnings were justified, except in southern Arizona, where the fall in temperature was small owing to a slight barometric depression in southwestern Arizona.—*Frederick W. Brist.*

#### SAN FRANCISCO FORECAST DISTRICT.

Following a protracted dry spell in March, the month of April was ushered in with good rains that lasted intermittently till the 10th. Another rainy spell began on the 17th and continued until the 21st, after which fair weather generally prevailed. The low-pressure areas causing the early rains came from the ocean;