

The mean temperature in the same month was largely in excess of the normal over the whole of the North American Continent from latitude 30° to near the Arctic Circle, and the same appears to hold for corresponding latitudes in Europe.

In the remaining dry months the deviation from the March, 1910, type was mostly in the occurrence of low mean pressure over the western part of the North Atlantic, as evidenced by the reports from the Canadian Maritime Provinces, just the opposite of March, 1910. In the United States pressure was high in the South and West in all of the months considered, thus indicating a preponderance of anticyclonic movement from the Northwest and West and naturally a deficient rainfall. The pressure type associated with deficient precipitation in the United States is conceived to be therefore low in the North and high in the South, or, in terms of anticyclonic movement, a drift to the southeast west of the Great Lakes. Concurrently therewith cyclones appear to move

along the northern circuit but without pronounced ridges of high pressure separating them, and thus pressure on the mean of the month is below the normal. The precipitation under such conditions is generally light.

For the current month pressure was in excess of the normal in the region of the Great Lakes and thence eastward to the Atlantic. (See inset on Chart I of this Review and also the paths of anticyclones on that chart.) The abnormality of temperature is shown on Chart III and that of precipitation by the inset on Chart IV. On the latter it may be seen that several small areas of precipitation above the normal appear, in some of which the contrast between rather closely situated stations, as for example, Washington and Baltimore, is pronounced. This is due in that instance, and perhaps in others, to the occurrence of a single intense rainfall at the beginning of the drought, a feature that has been previously noted; in other words, drought is at times ushered in by an exceptionally heavy fall of rain.

RECORDS OF TORNADES IN TENNESSEE, 1808-1921.

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[Weather Bureau, Nashville, Tenn., September 2, 1922.]

A paper on the subject of tornadoes, especially those that have occurred in Tennessee, was given before the Tennessee Academy of Science, November 25, 1921. For that paper the records of tornadoes in Tennessee for the period 1889-1921, only, were used, the data for these years being considered as more complete than for the earlier years. But it may be well to include all available records in the present discussion, and mention will therefore be made of the data collected and studied by Lieut. John P. Finley, of the Signal Corps, which cover the period 1808-1888.

It should be borne in mind that tornado statistics for the earliest years of record must necessarily be incomplete. Even at the present time a tornado may occur without being recorded. Tornadoes always have narrow paths and frequently the path is only a few miles in length. It is therefore conceivable that even now, when the population is much more dense than it was 100 or even 50, years ago, a tornado might strike a thinly populated area and escape notice, or, at least, fail to be placed on record.

Prior to 1871 the records for Tennessee are very scattering and doubtless incomplete, for Finley was able to report only nine tornadoes for the period 1808-1870; and of these nine there were three in the year 1830. Beginning about 1871, when the old Signal Corps (predecessor of the Weather Bureau) began its meteorological work, tornado records are much more complete, as indicated by Finley's statistics, which show 9 tornadoes for the period 1871-1878 and 23 for the 10-year period of 1879-1888.

An average annual frequency obtained from Finley's data for the period 1871-1888 is slightly greater than the average obtained from the data for the period 1889-1921. If we combine the two periods, making one period of 51 years, with 79 tornadoes, we get an average frequency of 1.5 tornadoes per year in Tennessee, which is probably very nearly correct. This is a low frequency as compared with the frequency in the principal tornado regions; for example, the annual average frequency for Kansas is 8.8. (See article by S. P. Peterson in the MONTHLY WEATHER REVIEW for May, 1922.)

Tornadoes occur more frequently in the spring than any other part of the year. In Tennessee during the last 33 years April has a greater number of tornado dates than

any other month, viz., 6; then comes March, with 5, May with 4, January with 2, and February, July, August, September, October, November, and December with 1 each; while June has no tornado accredited to it during these years. On some occasions as many as 4 different tornadoes occurred almost simultaneously, traveling in nearly parallel paths; so that, with a total of 24 different dates for the last 33 years, we have a total of 47 tornadoes.

There is no regularity whatever in the occurrence of tornadoes. There were none in 1896, 1897, and 1898, and only one in 1899, but in 1900 came the very unusual visitation of November 20, when 39 people were killed and much property destroyed, principally at Columbia. There was a remarkable absence of tornadoes in the State during the period 1901-1908; but this was followed by that most memorable tornado year, 1909, with four destructive storms on April 29, killing 60 people in the State, and three storms on October 14, killing 9 people. The years 1910, 1911, and 1912, were free from tornadoes, but in 1913 there were four, all on March 13, causing 21 deaths. The years 1914 and 1918 were without tornadoes in this State, but they were frequent in 1917, 1920, and 1921, though not very destructive. In 1921 the frequency with which they occurred in Maury, Marshall, and Bedford Counties was quite notable.

The geographical distribution of tornadoes in Tennessee is shown in figure 1A. As indicated by the arrows, a large majority of them move toward the northeast. The eastern half of the State, which is elevated and mountainous, has very few tornadoes, and if one occurs its path is quite short.

The Highland Rim of middle Tennessee doubtless has some effect in the way of weakening or breaking up tornadoes that originate in Mississippi and Alabama and move northeastward, but they frequently go over the highlands and move across the Central Basin. They also originate within the Central Basin. No tornado of much consequence has struck Nashville, but the storm of February 12, 1880, was probably a light tornado. It passed over the city about midnight and damaged the Federal Building, according to the report, "moving several blocks of granite and tearing down a gable end."

Figures 1B and 1C show the paths of the most noteworthy tornadoes during the period 1900 to 1921, inclusive. In figure 1B one of the longest tornado paths of record anywhere is shown. This tornado entered the State in Shelby County about 7:30 p. m. of April 29, 1909, and moved northeastward to Scott County and

bringing the total number of deaths in the State up to 60 on that day. April 29, 1909, therefore, marks the most disastrous tornado date in Tennessee's history. In the same year, on October 14, three tornadoes occurred, killing nine people. These October storms moved from northwest to southeast. (See Fig. 1B.)

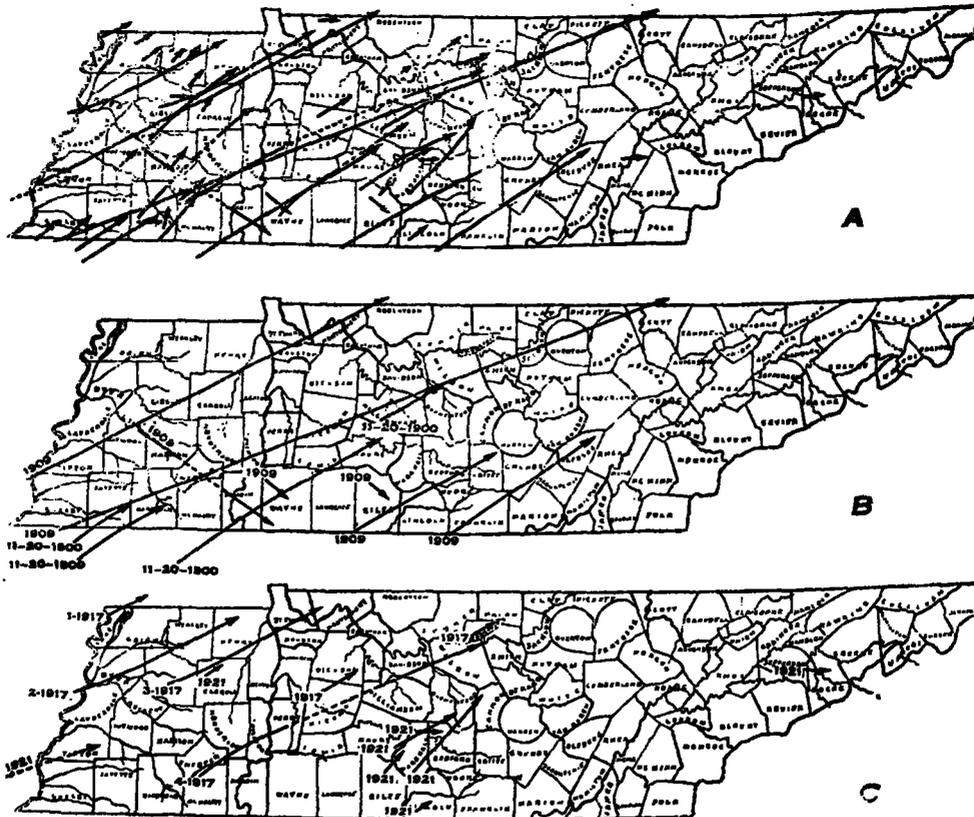


FIG. 1A.—Paths of all tornadoes recorded in Tennessee, 1880-1921, inclusive; 47 tornadoes in 33 years.
 FIG. 1B.—Paths of tornadoes of Nov. 30, 1900 (one of the principal tornado dates in Tennessee records), and paths of tornadoes, year 1909. These were the most destructive on record in Tennessee. Those having a north-easterly direction occurred on Apr. 29; those moving from the northwest occurred on Oct. 14.
 FIG. 1C.—Paths of tornadoes, years 1917 and 1921. The series (marked 1-1917, 2-1917, etc.) occurred on May 27; Marshall County had four tornadoes within two months, one on Mar. 24, 1921, two on Apr. 16, and one on May 10.

apparently died out soon after entering the adjoining county in Kentucky about 2 a. m. of April 30, making a path at least 320 miles long. The width of the path varied from a few hundred yards to about 1 mile. The tornado did not strike any large towns, but killed 23 people and destroyed property to the amount of about \$425,000. Three other nearly parallel storms, with much shorter tracks, occurred the same day, between 2 p. m. and midnight, all of which were destructive,

As stated in the beginning, tornado frequency in Tennessee is comparatively low, and only a small percentage of those that occur assume disastrous proportions. Lightning causes many times more damage and kills many more people than tornadoes, taking the United States as a whole, and the same rule probably holds true in Tennessee, though exact statistics are not available.