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THE RELATION OF THE WEATHER SERVICE TO THE FARMERS OF TENNESSEE

BY

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KNOXVILLE, TENNESSEE

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OF THE UNIVERSITY OF TENNESSEE

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Bulletins of this Station will be sent, upon application, free of charge, to any farmer in the State.

THE RELATION OF THE WEATHER SERVICE TO THE FARMERS OF TENNESSEE

INTRODUCTION

A large number of meteorological facts have been compiled and published in one form or another, and many farmers have been benefited by their use; but the great majority of those who till the soil for a living either never see these publications or, seeing them, do not know how to make practical use of the data they contain. It is not the purpose of this bulletin to deal exhaustively with the relation of the Weather Service to agriculture, but rather to show by means of a few simple charts and diagrams how the farmer may use the data collected by the Weather Bureau to his advantage. The elements to be considered are temperature and rainfall Under "temperature" we will consider the dates of the last killing frosts in the spring and of the first killing frosts in the fall; also the extreme minimum temperatures. Under "rainfall" we will consider the annual rainfall and its distribution through the year.

Probably the best way to study the various meteorological elements is by the use of charts. The data for these charts were obtained from the records of the United States Weather Bureau. Data were used from between fifty and sixty stations, distributed uniformly over the State of Tennessee. The observers at these stations are supplied with standard instruments and have been carefully instructed as to their use by Weather Bureau officials. The records in most cases cover a period of thirteen years. A few of them are for a somewhat shorter period and several a much longer—notably those of the Weather Bureau stations at Memphis, Nashville, Chattanooga, and Knoxville.

The data from which Charts I to V were made may be found in the tables on page 22.

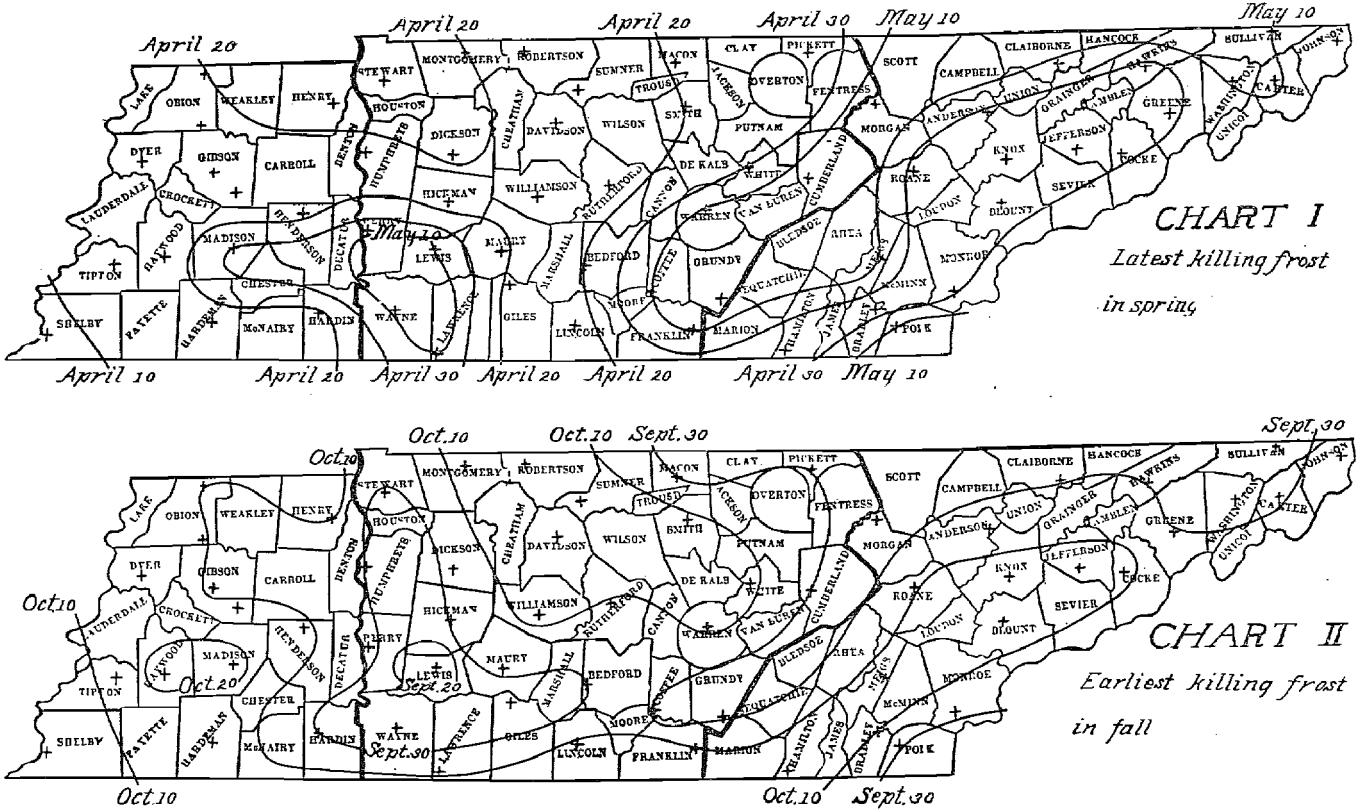

April 20
April 20
April 20
April 30
May 10
May 10
CHART I
Latest killing frost
in spring
April 10
April 20
April 30
April 20
April 20
April 30
May 10
Oct. 10
Oct. 10
Oct. 20
Sept. 30
Sept. 30
CHART II
Earliest killing frost
in fall
Oct. 10
Oct. 20
Sept. 20
Sept. 30
Oct. 10
Oct. 10
Sept. 30
STEWART
MONTGOMERY
ROBERTSON
SUMNER
MACON
CLAY
PICKETT
SCOTT
CAMPBELL
CLAIBORNE
HANCOCK
SULLIVAN
LAKE
OBION
WEAKLEY
HENRY
HOUSTON
DICKSON
CHEATHAM
DAVIDSON
WILSON
SMITH
TROUSDALE
JACKSON
OVERTON
FENTRESS
MORGAN
UNION
GRAINGER
HAWKINS
DYER
GIBSON
CARROLL
HUMPHREYS
WILLIAMSON
RUTHERFORD
PUTNAM
DE KALB
WHITE
CUMBERLAND
ANDERSON
JEFFERSON
GREENE
WASHINGTON
UNICOI
CARTER
LAUDERDALE
CROCKETT
HICKMAN
CANNON
WARREN
VAN BUREN
ROANE
KNOX
SEVIER
LOUDON
BLOUNT
MADISON
BENTON
DECATUR
LEWIS
MAURY
MARSHALL
BEDFORD
COFFEE
GRUNDY
BLEDSOE
RHEA
MONROE
TIPTON
HARDEMAN
CHESTER
WAYNE
GILES
MOORE
FRANKLIN
MARION
HAMILTON
MCMINN
POLK
SHELBY
FAYETTE
MCNAIRY
HARDIN
LAWRENCE
LINCOLN
JAMES
GRADY

CHART I—LATEST KILLING FROST IN SPRING

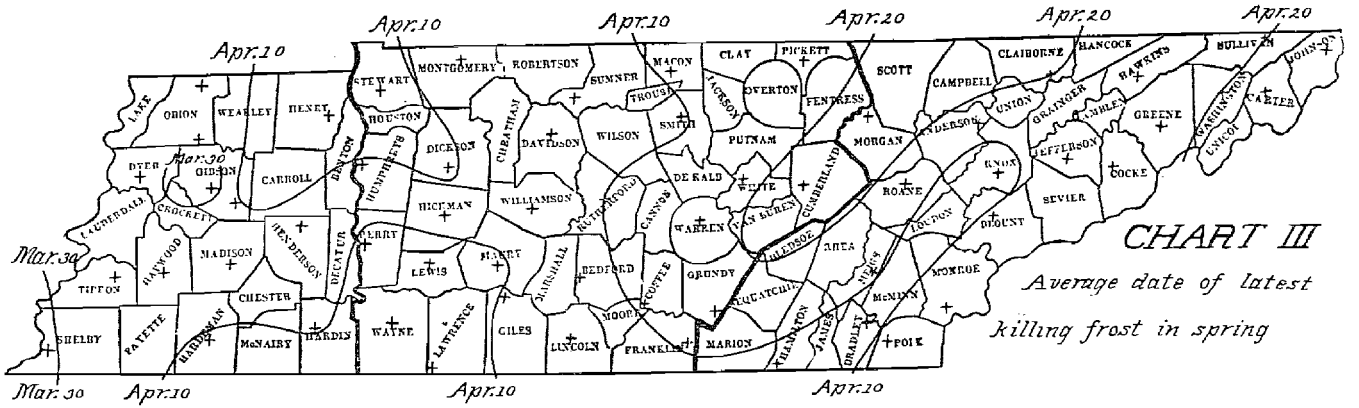
Chart I shows the latest date on which killing frost has occurred in the spring since careful records were begun. The crosses on this chart and on all following charts represent the stations at which the observations were made. The curved lines with dates at each end are drawn through all points that have had their latest killing frost in spring on the same date, as April 20, or April 30. The date of the latest killing frost for points not on one of these lines may be determined as follows: Take Haywood County, for example. On one side we have a line dated April 10 and on the other side a line dated April 20, and we see at once that the latest killing frost in that county occurred between April 10 and April 20. Or look at Williamson County. Here we have lines dated April 20 on all sides, but looking outside the April 20 lines we find April 30 lines, which are later. Therefore the latest frost in Williamson County, which is inside the April 20 line, must have been earlier than April 20. In the same way the date of the latest killing frost in the spring for any point in the State may be determined approximately by means of the chart.

All of our crops may be placed in one of two classes. One class will withstand a given amount of frost, while the other class will be destroyed by freezing temperature. Crops of the first class may be planted or sown as early as the soil can be properly prepared, but crops of the second class can not be planted with absolute safety until after the date of the latest killing frost in spring as shown, roughly, on this chart.

CHART II—EARLIEST KILLING FROST IN FALL

Chart II was made in the same manner as Chart I. The lines in this case show the dates of earliest killing frosts in fall since careful records were begun.

This chart will help us to decide the proper time to sow late forage crops that are not able to resist the frost. Knowing the length of time any crop needs to reach maturity, we can with the assistance of this chart determine when to sow in order to be perfectly safe from early frosts in the fall. A crop sown early enough to get out of the way of the earliest frost on record will be practically safe.


Apr.10
Apr.10
Apr.10
Apr.20
Apr.20
Apr.20
Mar.30
Mar.30
Mar.30
Apr.10
Apr.10
Apr.20
CHART III
Average date of latest
killing frost in spring

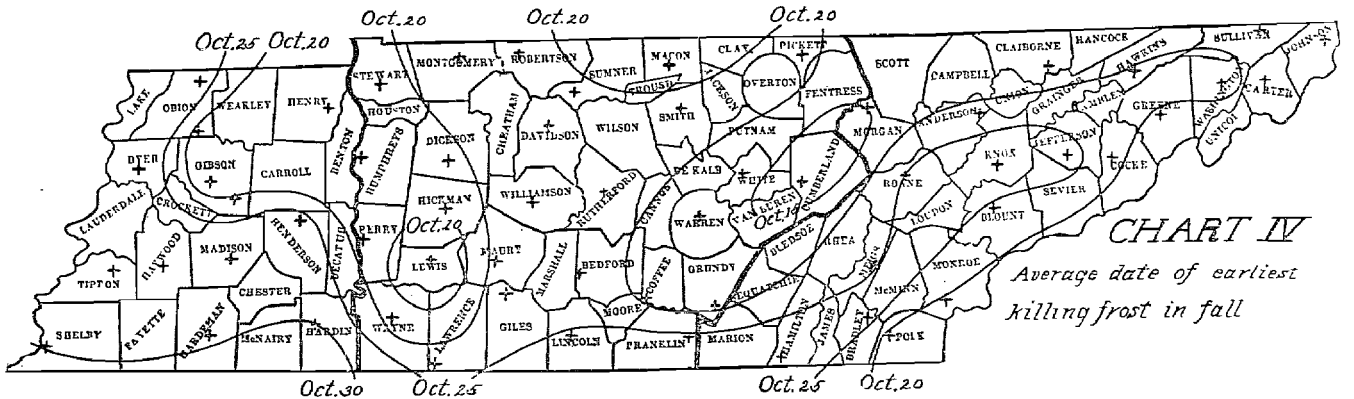

Oct.20
Oct.20
Oct.20
Oct.25
Oct.20
Oct.10
Oct.10
Oct.30
Oct.25
Oct.25
Oct.20
CHART IV
Average date of earliest
killing frost in fall

CHART III—AVERAGE DATE OF LATEST KILLING FROST IN SPRING

Chart III shows the average date of the latest killing frost in the spring as determined from the table on page 22.

Many crops that will not endure frost are many times more valuable if marketed early than if marketed only a week or two later. This being true, we are willing to take chances of losing a crop occasionally by frost in order to reach the market as early as possible. Having before us the average date of the latest killing frost in spring, and knowing the difference in the price of our product that a few days will make, we can easily calculate what will be the best time to plant. For example, a crop starting on the average date of the latest killing frost will in the long run be killed one year out of two. If, however, the crop planted at that date will be worth more than twice as much in the market as the one planted a few days later we can afford to take the risk. If the early crop is worth ten times as much as the late one we can profitably plant still earlier, while if it is worth but little more we must wait until danger from frost is practically past. Each farmer should know for his own locality what is the average date of the latest killing frost in spring. If it has not already been worked out he should begin keeping a record at once and get an average as soon as possible.

CHART IV—AVERAGE DATE OF EARLIEST KILLING FROST IN FALL

Chart IV shows the average date of the earliest killing frost in the fall and can be used in the same manner as Chart III.

If in a given locality the average date of the earliest killing frost is October 20, and if also some crop, as green corn, peas, or tomatoes, is much more valuable after that date than before it, because of scarcity, we can afford to take chances and plant late in order that if a frost does not come we may have a crop after our neighbors' crops are harvested.

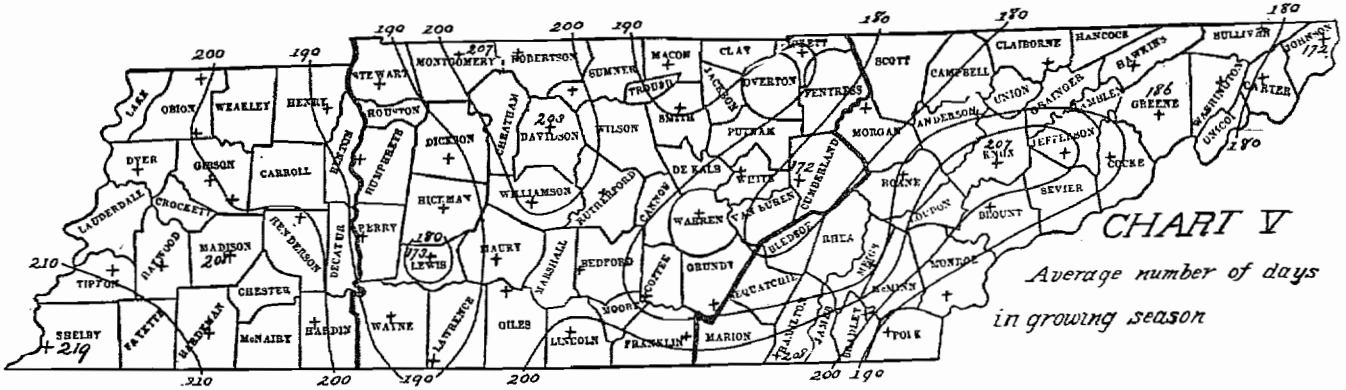


CHART V
Average number of days
in growing season

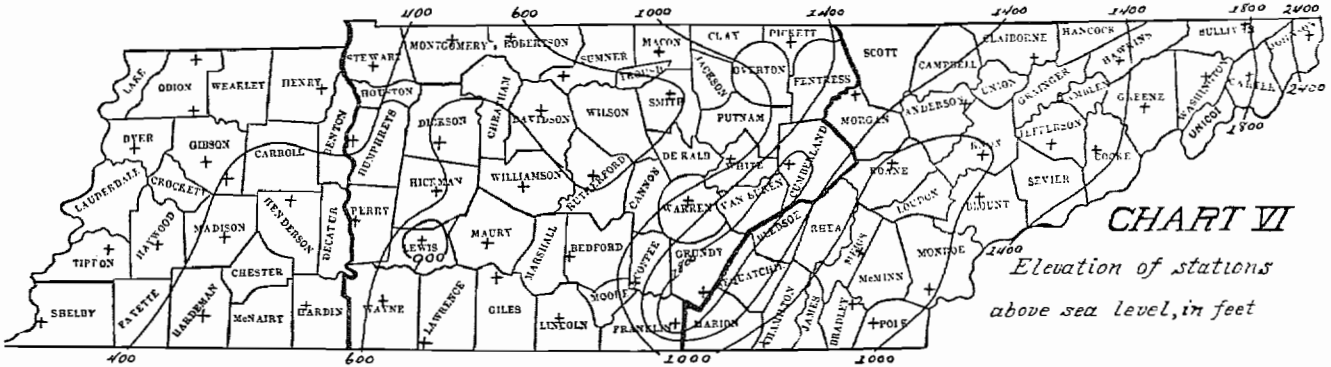


CHART VI
Elevation of stations
above sea level, in feet

CHART V—AVERAGE NUMBER OF DAYS IN GROWING SEASON

Chart V is obtained from Charts III and IV and shows the average number of days without killing frost, or the length of the growing season. We naturally expect to find a longer growing season in the South than the North and the chart shows this to be true in a general way. There are, however, great irregularities in the lines as compared with lines of latitude. We also expect the growing season to shorten with elevation above sea level, and comparing Chart V with Chart VI we find this is true and that most of the irregularities noted above are accounted for by differences in elevation.

There is, however, still one important disagreement between the lines on these two charts that must be accounted for in some other way. The point of difference is this: Stations west of the Cumberland Mountains having an elevation of 1000 feet have a growing season of about 180 days, while stations with a similar elevation east of the Cumberland Mountains have a growing season of over 200 days. The difference must be due to the protection afforded to the eastern portion of the State by the Cumberland Mountains.

Knowing the time it takes a given crop to mature, and the average length of the growing season in the particular locality, the farmer can see at once whether he ought to sow that crop or not. For example, in the case of Irish potatoes the grower can tell from this chart whether or not he can grow two crops in one season, though it may never have been tried in his locality.

CHART VI—ELEVATION OF STATIONS ABOVE SEA LEVEL

In Chart VI the lines represent elevation above sea level. It is of interest to study this chart in connection with each of the others, as it shows the effect which elevation has on the temperature and rainfall of a place. Valleys are found to be warmer than highlands, and valleys on the east of a mountain range are less subject to late frosts than those on the west. Precipitation is heavier on western than it is on eastern slopes.

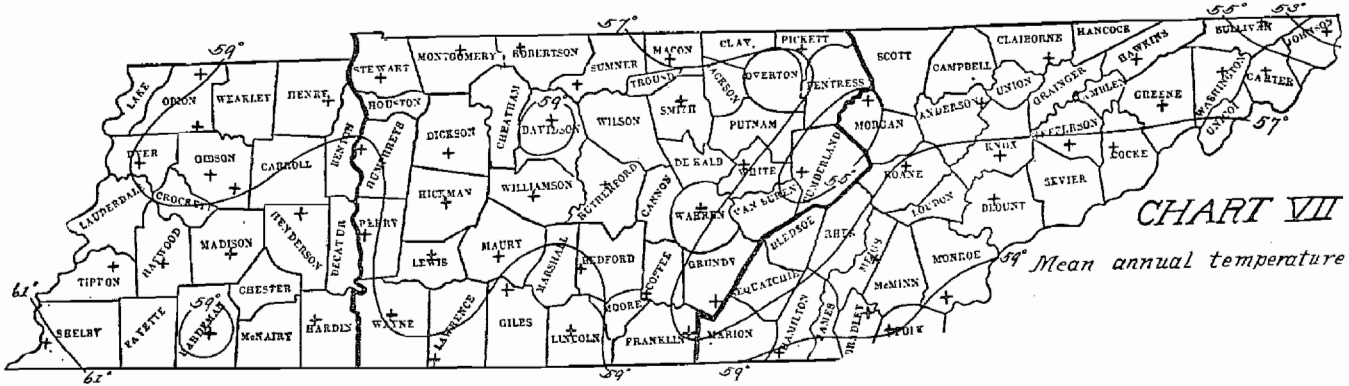


CHART VII
Mean annual temperature
59°
57°
55°
61°
LAKE
OBION
WEAKLEY
HENRY
STEWART
MONTGOMERY
ROBERTSON
SUMNER
MACON
CLAY
PICKETT
SCOTT
CAMPBELL
CLAIBORNE
HANCOCK
HAWKINS
SULLIVAN
DYER
GIBSON
CARROLL
BENTON
HUMPHREYS
DICKSON
CHEATHAM
DAVIDSON
WILSON
TROUSDALE
JACKSON
OVERTON
FENTRESS
MORGAN
ANDERSON
UNION
GRAINGER
HANCOCK
GREENE
WASHINGTON
CARTER
JOHNSON
LAUDERDALE
CROCKETT
HAYWOOD
MADISON
HENDERSON
DECATUR
PERRY
HICKMAN
WILLIAMSON
RUTHERFORD
CANNON
DE KALB
WHITE
CUMBERLAND
KNOX
JEFFERSON
COCKE
TIPTON
CHESTER
LEWIS
MAURY
MARSHALL
BEDFORD
COFFEE
WARREN
VAN BUREN
SEVIER
BLOUNT
LOUDON
ROANE
SHELBY
FAYETTE
HARDEMAN
MCNAIRY
HARDIN
WAYNE
LAWRENCE
GILES
LINCOLN
MOORE
FRANKLIN
GRUNDY
SEQUATCHIE
BLEDSOE
RHEA
MARION
HAMILTON
MONROE
MCMINN
MEIGS
RHEA
JAMES
BRADLEY
POLK

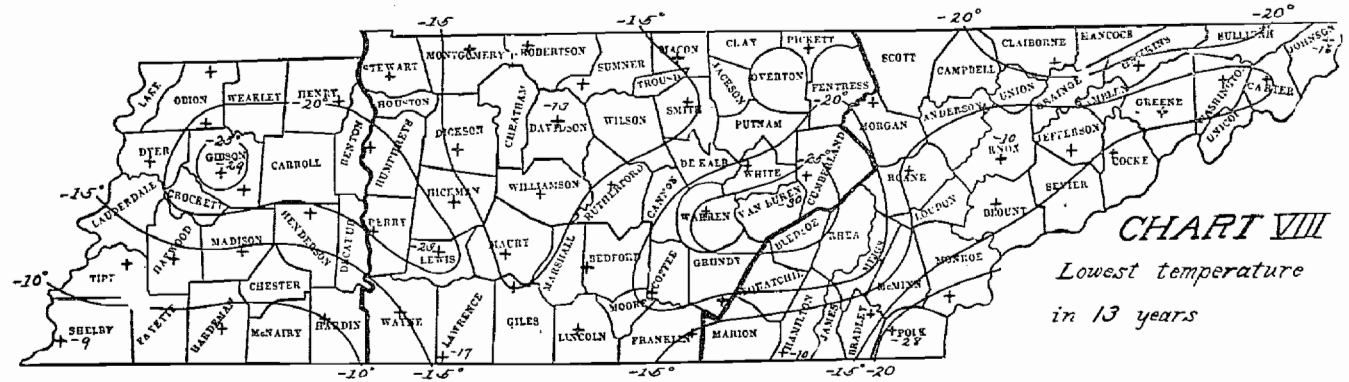


CHART VIII
Lowest temperature
in 13 years
-15°
-20°
LAKE
OBION
WEAKLEY
HENRY
STEWART
MONTGOMERY
ROBERTSON
SUMNER
MACON
CLAY
PICKETT
SCOTT
CAMPBELL
CLAIBORNE
HANCOCK
HAWKINS
SULLIVAN
DYER
GIBSON
CARROLL
BENTON
HUMPHREYS
DICKSON
CHEATHAM
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UNION
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WASHINGTON
CARTER
JOHNSON
LAUDERDALE
CROCKETT
HAYWOOD
MADISON
HENDERSON
DECATUR
PERRY
HICKMAN
WILLIAMSON
RUTHERFORD
CANNON
DE KALB
WHITE
CUMBERLAND
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CHESTER
LEWIS
MAURY
MARSHALL
BEDFORD
COFFEE
WARREN
VAN BUREN
SEVIER
BLOUNT
LOUDON
ROANE
SHELBY
FAYETTE
HARDEMAN
MCNAIRY
HARDIN
WAYNE
LAWRENCE
GILES
LINCOLN
MOORE
FRANKLIN
GRUNDY
SEQUATCHIE
BLEDSOE
RHEA
MARION
HAMILTON
MONROE
MCMINN
MEIGS
RHEA
JAMES
BRADLEY
POLK

CHART VII—MEAN ANNUAL TEMPERATURE

Chart VII, showing the mean annual temperature, is of value to the farmer because it assists him in determining the sections best suited for crops requiring high temperature, as cotton, or those requiring lower temperature, as fall apples and cabbage. This chart conforms much more closely to the chart showing the elevations than any of the others. As would be expected, we find the lowest temperatures at the highest altitudes, while the highest temperatures are observed in the lowest portions.

CHART VIII—LOWEST TEMPERATURE IN THIRTEEN YEARS

Chart VIII, showing the lowest temperature for thirteen years, should be considered before locating an orchard or a crop of any kind that is liable to be winterkilled. The orchardist would not wish to plant a tender variety of peaches in a place where a temperature of 20 degrees below zero is likely to occur.

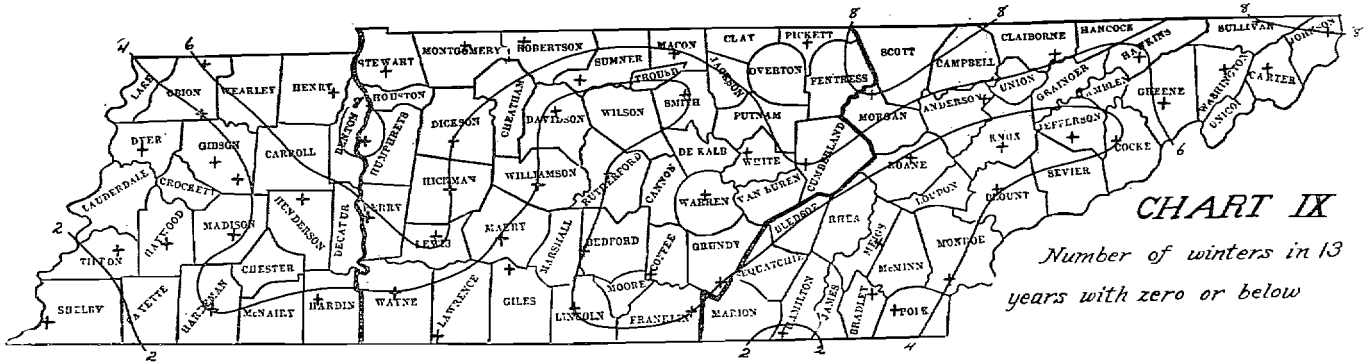


CHART IX

Number of winters in 13 years with zero or below

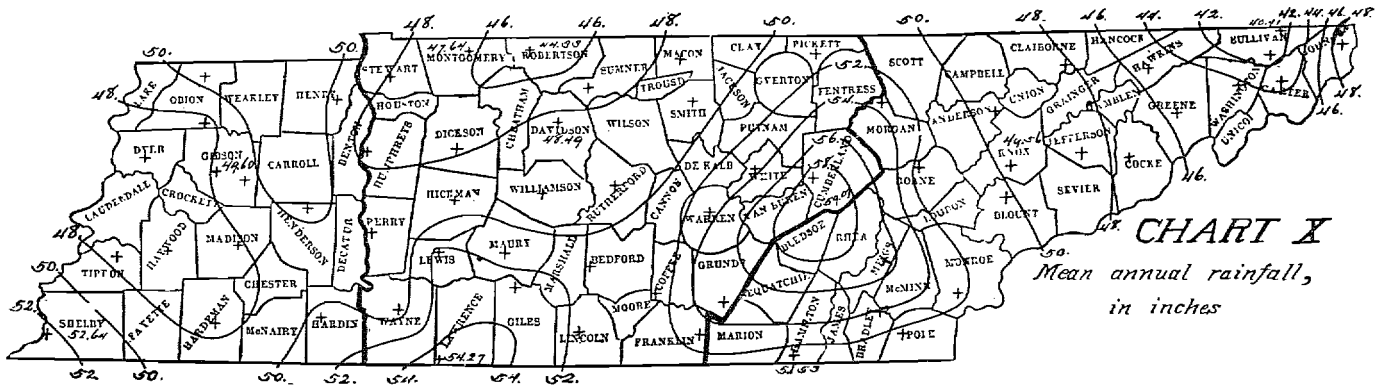


CHART X

Mean annual rainfall, in inches

CHART IX—NUMBER OF WINTERS IN THIRTEEN YEARS WITH ZERO OR BELOW

Chart IX shows the number of times in thirteen years that the temperature has been zero or below. It should be of value to those who are trying to carry either animals or tender crops through the winter, as from it a good general idea of the frequency of winters with severe weather can be obtained.

CHART X—MEAN ANNUAL RAINFALL, IN INCHES

Chart X shows the annual precipitation for the entire time of observation at each station. This chart also conforms to a limited extent with the chart of elevation. The heavier rainfall is found on the western slopes of the mountains and the lighter rainfall on the eastern slopes. The heaviest rainfall for the State (over 59 inches) was measured on the Cumberland Plateau, while the lowest annual rainfall occurs at Bristol.

In considering the mean monthly or annual rainfall we must bear in mind that the mean, or average, rainfall is not the rainfall which is most likely to occur. This we can easily see by considering that in a month in which the normal rainfall is 5 inches the greatest possible deficiency is only 5 inches, while on the other hand the excess may be 10 or 15 inches or more. Thus one month having a rainfall of 15 inches would raise the normal twice as far as one month with no rainfall would lower it.

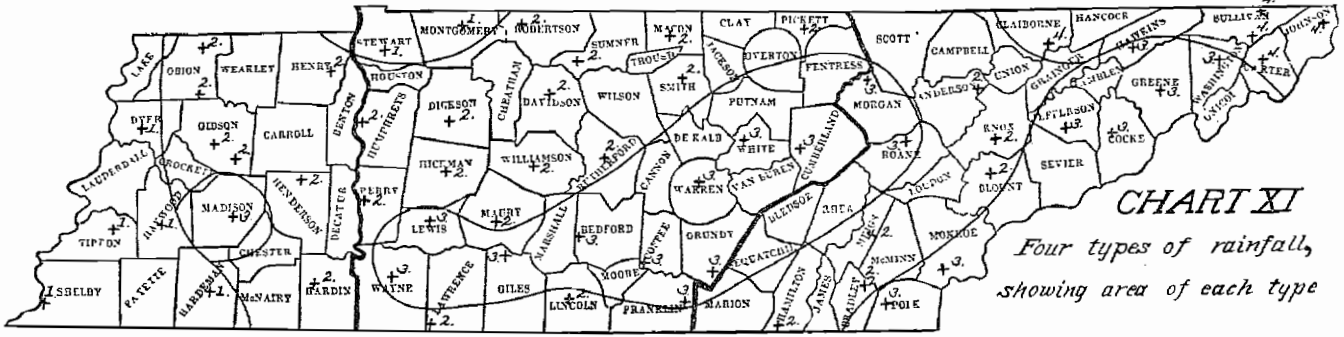


CHART XI

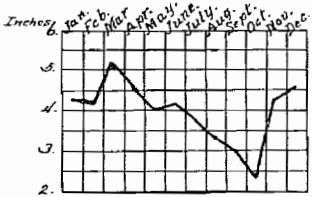
Four types of rainfall, showing area of each type

CHART XII

Annual distribution of rainfall. Four types.

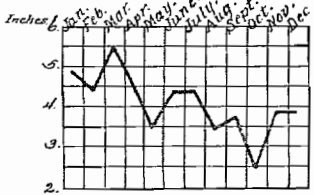
Type 1.

Clarksville. 47.64 inches.



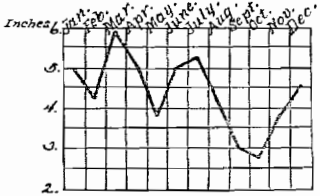
Type 2.

Nashville. 48.49 inches.



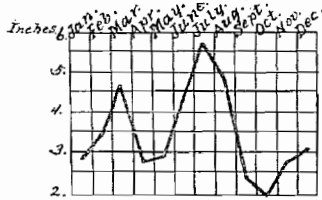
Type 3.

McMinnville. 52.60 inches.



Type 4.

Bristol. 40.73 inches.



MONTHLY DISTRIBUTION OF RAINFALL

In Charts XI and XII an effort has been made to show the monthly distribution of rainfall during the year at the different stations. A diagram was made for each station similar to the diagram of Chart XII, and it was found that the stations could be divided into four fairly definite groups, or types.

Type 1, represented by Clarksville on Chart XII and by stations numbered 1 on Chart XI, has a maximum rainfall in March, with a steady decline throughout the summer season and until October, followed by a sharp rise.

Type 2, represented by Nashville on Chart XII and by stations numbered 2 on Chart XI, is similar, except that there are decided increases during June and July.

Type 3, represented by McMinnville on Chart XII and by stations numbered 3 on Chart XI, shows a still greater increase during the summer than that shown in Type 2.

Type 4, represented by Bristol on Chart XII and by stations numbered 4 on Chart XI, has the principal maximum in July instead of in winter as in the other types.

All the different types are found to occupy fairly definite regions, as shown on Chart XI. Type 1 occupies the lower portion along the Mississippi River and a small area where the Tennessee and Cumberland Rivers pass out of the State. Type 2 occupies the East Tennessee Valley, the Central Basin, and the larger part of West Tennessee. Type 3 is found on higher ground, as on the Cumberland Plateau, the Highland Rim, and the western slope of the Smoky Mountains. Type 4 occupies a small area in the extreme northeastern portion of the State.

In the discussion of rainfall in this bulletin, means, or averages, were used for the different stations. While the use of averages is entirely proper in comparing one station with another, it is necessary to go into the subject a little deeper to get definite information that will be most valuable to the farmer.

CHART XIII

Monthly rainfall at Knoxville for 99 years

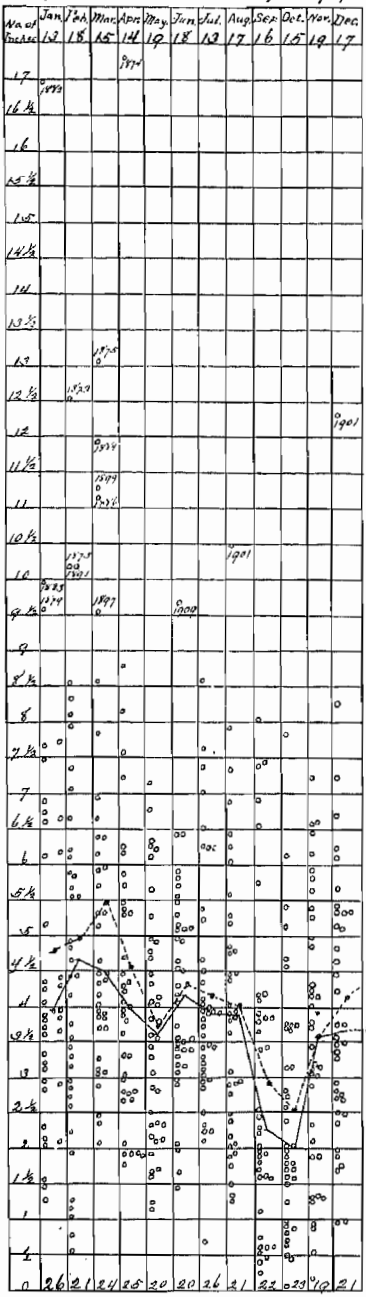


Chart XIII is introduced here as one step in this direction, and may be explained as follows: Each column represents a month as shown by the heading. The horizontal lines represent inches of rainfall, as indicated by the figures on the left. Each small circle represents the rainfall for a given month and year. For example, the lowest rainfall ever observed in January at Knoxville was 1.25 inch. In the column headed January there is a circle at the proper point to represent this amount. The greatest rainfall for the month of January was almost 17 inches, which is indicated by a circle near the top of the January column. In this manner a circle was drawn for each of the thirty-nine Januaries for which we have records, and also for each of the other months. This gives us a picture of the rainfall at Knoxville for each month for the past thirty-eight and one-half years, showing its distribution.

A point very important to the farmer is clearly to be seen. The monthly rainfall is as a rule just about right for the farmers' needs, but not *always*. For the whole year we find nearly 300 circles between the lines representing 2 inches and 6 inches. This means that two months out of three, on the average, have had a rainfall of between 2 and 6 inches. Of the other third, one-half of them, or one-sixth of the whole, have had less than 2 inches, while the other sixth have had over 6 inches. Similar charts made for several other stations scattered throughout the State vary from this one only in minor details and emphasize the fact that while the rainfall in Tennessee is usually sufficient there are, on the average, two months during each year when the rainfall is not sufficient. As it is not possible at present to tell when these dry months are coming, and as they may come at any season of the year, the farmer can not afford at any time to leave his land without some moisture-conserving device, as a cover crop or a dust mulch. On the other hand, we are sure to have a month occasionally with very heavy, washing rains. Months with more than 10 inches have occurred once in every three or four years and as much as 17 inches was once recorded in one month. This being true, the farmer must not only be prepared for dry periods but must also be ready for washing rains continued through a period of several weeks. Whenever possible steep fields or soils likely to wash should be kept in grass or pasture. When this can not be done the soil should be kept as well supplied with humus as possible and never left without a cover crop. The farmer who is always ready for the dry spell or the wet spell, which is absolutely sure to come, and that without warning, will not only save money when the bad weather comes but will be doubly prosperous when the weather is favorable, for his farm will be in the best possible condition for the production of a big crop.

Another point brought out by the study of this chart is that

the average rainfall is not the most probable rainfall. Or, in other words, the average rainfall is not the rainfall most likely to occur. A large black dot was made in each column at the proper point to represent the average rainfall for each month, and these dots were connected by a broken line. In each column the circles above the average were counted and the number was entered at the top of the column. The circles below the average were also counted and the number was entered at the bottom of the column. For each month except November we find more years below the average than we find above. Though there is a considerable difference between different months, it is probable that with a longer record, or say 200 or 300 years, they would be much more nearly uniform. With the present data we can only make a rough approximation and say that the probabilities are that there will be about seven years with rainfall below the average against five years with rainfall above the average. This is necessarily true because the range is so much wider above the average than it is below that a very wet year will more than offset a very dry one. For example, take the month of April having an average of 4.50 inches. It is possible to fall below the average 4.50 inches and no more, while in one year when the rainfall for the month was 17.50 inches we had an excess above the average of 13.00 inches, or almost enough to offset three years with no rainfall whatever.

Since the average rainfall can not be the most probable we will now try to locate a line that will represent roughly the most probable rainfall. The circles were counted again and the middle one in each column was selected and these were connected by a solid line. Since for each month half of the years had more and half of them less rainfall than this line represents it may be taken as the line of most probable rainfall. A combination of several similar charts indicates that if we had a long record this line would probably be about the same distance below the average for each month. In the study of average rainfall, therefore, it is safe to assume that the most probable rainfall is from 6 to 10 per cent lower than the average.

PRACTICAL VALUE TO THE FARMER

These data can be of great value to the farmer, fruit grower, or truck gardener in many different ways, three of which will be considered:

LOCATION OF CROPS

First, in determining the location for growing a particular fruit or crop. Any grower desiring to establish a peach orchard could learn from the temperature charts what sections had the least severe winters and the fewest winters with temperature low enough to injure

his trees. He could also learn where there was the least danger from late frosts in the spring. The truck gardener could get information regarding late frosts in the spring which would assist him in determining the location of his gardens. The farmer desiring to raise a particular crop that requires a long season—190 to 200 days—would not locate where the average length of the growing season is only 175 or 180 days.

TIME OF PLANTING

Second, in determining the time of planting. The farmer desiring to sow late forage crops, such as cowpeas, that are more or less easily damaged by frost could avoid serious losses by not sowing so late that they would not have time to mature before the first killing frost in the fall. For example, knowing that the average date of the first killing frost in the fall was October 15, he would sow a variety of cowpeas that requires 90 days to mature not later than July 15.

The rainfall records may be used in a similar manner. For example, the farmer would not plant a crop that requires a great deal of moisture just before a season which is normally dry, and, on the other hand, he would not plant a crop which flourishes best in dry weather at a time when the records show that it is normally wet.

The distribution of rainfall is also an important matter to be considered when planning the time for plowing, in order that the farmer may arrange his crops so that plowing time will come at a season when conditions are most likely to be favorable.

CHOICE OF CROPS

Third, in determining what crops to plant. Many important crops in Tennessee are grown in only very limited areas. There are three principal factors that must be present to make any crop profitable—proper soil, proper tillage, and suitable climatic conditions. As the first two factors are outside the scope of this bulletin, it remains to consider the distribution of some of the crops of Tennessee with reference to climatic conditions and to find whether climate is a factor in determining where they may be grown.

Cotton is an important crop in Shelby and Fayette Counties, in the extreme southwest, and is grown to some extent in a dozen or more counties in that section and in a small area in the southeast portion. Rainfall evidently has no effect in limiting the area of the cotton crop, as nearly half of the State has practically the same rainfall and the same distribution through the year. Temperature, on the other hand, is evidently a limiting factor, as we find no cotton grown where the mean annual temperature is below 59 degrees F.

Wheat is grown more especially in a few rather restricted areas, but these are scattered throughout the State. It is grown to a small

extent in almost every county and probably has no climatic limit in Tennessee, unless, possibly, it is too warm for best results in the extreme southwest portion.

The principal corn counties are Obion, Gibson, Rutherford, Maury, and Giles, but all counties grow corn. There is no climatic condition in those four counties that could possibly give them an advantage over the rest of the State in corn raising.

Tobacco is grown chiefly in Weakly, Montgomery, Robertson, and adjoining counties in the northwest portion, and in Greene in the northeast portion. Temperature and rainfall conditions found in these sections can be duplicated almost anywhere in the Central Basin or in the East Tennessee Valley. There is plainly no climatic limit to the tobacco area in Tennessee.

Peanut growing is practically confined to two counties, Humphreys and Perry, where the rainfall and temperature conditions are very near the average for the State. Again, we find no climatic limit to the area over which the crop may be grown.

Irish potatoes are grown on a commercial scale in two very small sections. One is a long, narrow strip extending from Sumner to Giles County and the other is a similar strip extending from Shelby to Gibson County. In these strips we find every gradation of rainfall and temperature conditions to be found in the State except on the Cumberland Plateau and in the extreme northeast portion, where only one crop of potatoes a year is grown. There is therefore no climatic barrier against Irish potato growing in any part of the State.

Early apples are grown commercially in Sumner, Haywood, Maury and Williamson Counties, and again we find conditions common to all but the most elevated portions. Winter apples, however, are plainly limited by temperature. The long, warm summer in the greater part of the State matures the fruit so early that it does not keep well beyond early winter. In the Smoky Mountains, however, on the extreme eastern border, suitable climatic conditions for winter apples may be found.

Peaches are grown principally in Bradley, Hamilton, Rhea and Gibson Counties, and are successful only on the more elevated lands with good air drainage. There are, however, large sections in West, Middle, and East Tennessee that are fully as well situated as far as climatic conditions are concerned as the counties mentioned. The peach crop is more or less uncertain throughout the State because a mild period in the winter or early spring is apt to start the buds too soon and a freeze a little later kill them. Damage of this kind could usually be prevented, or at least largely reduced, by proper steps to protect from the late frosts. Occasionally there is a freeze so severe as to kill the buds before they have started, but this is rather unusual.

The principal cantaloupe counties are Lawrence, Lewis, Hickman, Coffee, and Franklin. In these counties the rainfall is somewhat above the average for the State, while the mean temperature is just about the average and the growing season is short. There are large areas around the Cumberland Plateau and on the Highland Rim where these conditions can be duplicated.

Early cabbages can probably be grown most profitably in Gibson County and vicinity, as the season is slightly earlier there. On the other hand, as the cabbage is a cold-weather vegetable, late cabbages will probably do best in Johnson County, in the extreme northeast, as the mean temperature is lower there than in any other part of the State.

Tomatoes are grown chiefly in Gibson, Crockett and Weakley Counties but could be grown equally well in almost any part of the State so far as climate is concerned.

Strawberries, now grown principally in Gibson, Crockett, Hamilton, and Rhea Counties, could also be grown in nearly every county.

The list might be extended almost indefinitely but enough examples have been given to illustrate the way in which a study of climatic conditions may be of aid to the farmer in deciding what crops are suited to his conditions.

DATE OF LAST KILLING FROST IN SPRING

	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908
Andersonville	Apr. 1	Apr. 10	Apr. 8	Apr. 17	Apr. 7	Apr. 24	Apr. 12	Apr. 24	Apr. 24	Apr. 17	Apr. 22	--------	--------
Benton	Apr. 3	Apr. 16	Apr. 5	Apr. 9	Apr. 14	Apr. 9	Apr. 9	Apr. 24	--------	Apr. 18	May 10	Apr. 20	May 1
Bristol	Apr. 8	Apr. 17	Apr. 22	Apr. 11	Apr. 14	Apr. 23	Apr. 12	Apr. 24	Apr. 21	Apr. 19	May 10	Apr. 21	Apr. 4
Chattanooga	Mart 31	Mar. 28	Apr. 6	Mar. 30	Mar. 23	Mar. 22	Mar. 19	Apr. 24	Mar. 26	Apr. 17	Mar. 21	Apr. 15	Feb. 28
Decatur	Apr. 2	Apr. 17	Apr. 9	Apr. 10	Apr. 14	Apr. 4	Apr. 9	Apr. 24	Apr. 21	Apr. 18	May 10	Apr. 20	May 1
Elizabethton	Apr. 9	Apr. 18	Apr. 20	Apr. 17	Apr. 4	Apr. 24	Apr. 9	Apr. 24	Apr. 21	Apr. 18	May 10	Apr. 16	Apr. 4
Greeneville	Apr. 7	Apr. 15	Apr. 8	Apr. 17	Apr. 13	Apr. 24	Apr. 9	Apr. 24	Apr. 21	Apr. 18	Apr. 24	--------	--------
Harriman	Apr. 7	Apr. 11	Apr. 5	Apr. 10	Apr. 14	Apr. 20	Apr. 8	Apr. 24	Apr. 21	Apr. 10	Apr. 3	Apr. 20	May 1
Jonesboro	Apr. 8	Apr. 18	Apr. 6	Apr. 17	May 4	Apr. 16	Apr. 13	Apr. 24	Apr. 21	--------	May 10	Apr. 14	Apr. 4
Knoxville	Mar. 24	Apr. 11	Apr. 8	Apr. 3	Apr. 1	Mar. 30	Apr. 8	Apr. 24	Apr. 21	Apr. 17	Mar. 31	Apr. 15	Apr. 4
Maryville	--------	--------	Apr. 8	Apr. 10	Apr. 13	Mar. 26	Apr. 6	Apr. 24	Apr. 21	Apr. 17	Apr. 3	Apr. 15	Apr. 4
Newport	Apr. 5	Apr. 15	Apr. 6	Apr. 17	Apr. 5	Apr. 21	Apr. 8	Apr. 24	Apr. 21	Apr. 18	Apr. 24	Apr. 20	Apr. 4
Rogersville	Apr. 7	Apr. 18	Apr. 8	Apr. 11	Apr. 14	Apr. 22	Apr. 3	Apr. 24	Apr. 22	Apr. 19	Apr. 24	Apr. 20	Apr. 4
Rugby	Apr. 7	Apr. 20	Apr. 26	Apr. 17	May 4	Apr. 23	Apr. 8	Apr. 24	May 16	Apr. 19	May 8	Apr. 24	May 1
Silver Lake	--------	--------	Apr. 26	Apr. 17	May 4	Apr. 24	Apr. 19	Apr. 24	Apr. 22	Apr. 19	May 8	May 22	--------
Springdale	Apr. 6	Apr. 18	Apr. 6	Apr. 17	May 4	Apr. 20	Apr. 19	Apr. 24	Apr. 23	Apr. 17	May 10	Apr. 21	Apr. 13
Tellico Plains	--------	Apr. 18	Apr. 9	Apr. 17	Apr. 14	Apr. 20	Apr. 9	Apr. 24	Apr. 17	Apr. 18	Apr. 2	Apr. 20	Apr. 4
Ashwood	Apr. 2	Apr. 18	Apr. 6	Apr. 3	Apr. 6	Apr. 21	Apr. 9	Apr. 23	Apr. 17	Apr. 18	Apr. 2	Apr. 24	Apr. 4
Byrdstown	--------	Apr. 10	Apr. 8	Apr. 9	Apr. 12	Apr. 20	Apr. 3	Apr. 24	Apr. 21	Apr. 19	Apr. 2	Apr. 15	May 1
Carthage	--------	--------	Apr. 8	Apr. 8	--------	Mar. 23	--------	--------	Mar. 26	Apr. 18	Apr. 3	Apr. 14	Apr. 4
Clarksville	Apr. 4	Mar. 28	Apr. 8	Apr. 9	Apr. 1	Mar. 21	Apr. 8	Apr. 4	Apr. 17	Apr. 17	Apr. 1	Apr. 11	May 1
Dickson	--------	--------	--------	--------	--------	Apr. 4	Apr. 8	Apr. 24	Apr. 17	Apr. 17	Apr. 3	Apr. 14	Apr. 4
Dover	--------	--------	Apr. 7	Apr. 10	--------	Apr. 23	--------	--------	Apr. 21	Apr. 19	Apr. 3	Apr. 14	Apr. 4
Erasmus	--------	May 2	May 9	Apr. 17	May 4	Apr. 4	Apr. 18	Apr. 24	Apr. 21	Apr. 19	May 10	Apr. 15	May 1
Florence	Apr. 7	Apr. 10	Apr. 8	Apr. 10	Apr. 6	Apr. 4	Apr. 18	Apr. 24	Apr. 17	Apr. 18	Apr. 3	Apr. 24	Apr. 4
Franklin	Apr. 7	Apr. 10	Apr. 8	Apr. 8	Apr. 8	Mar. 23	Apr. 8	Apr. 5	Apr. 17	Apr. 18	Apr. 3	Apr. 14	Apr. 4
Hohenwald	Apr. 7	May 3	Apr. 8	Apr. 7	Apr. 10	Apr. 21	Apr. 9	Apr. 24	Apr. 17	Apr. 17	Apr. 3	Apr. 14	Apr. 4
Iron City	--------	--------	--------	--------	--------	Apr. 14	Apr. 8	Apr. 24	Apr. 19	Apr. 18	May 30	Apr. 15	May 1
Johnsonville	Apr. 4	Apr. 17	Apr. 7	Apr. 17	Apr. 14	Apr. 18	Apr. 3	Apr. 5	Apr. 18	Apr. 18	Apr. 3	Apr. 14	Apr. 4
La Fayette	--------	--------	Apr. 7	Apr. 8	Apr. 13	Apr. 20	Apr. 8	--------	Apr. 21	Apr. 10	Apr. 3	Apr. 11	May 1
Lexington	--------	--------	Apr. 7	Apr. 8	Apr. 6	Mar. 21	Apr. 3	Apr. 5	Apr. 17	Apr. 18	Apr. 3	Apr. 20	Apr. 4
Liberty	Apr. 4	Apr. 18	Apr. 7	Apr. 10	--------	Apr. 4	Apr. 8	Apr. 24	Apr. 17	Apr. 18	May 10	Apr. 20	May 1
Lynnville	Apr. 3	Mar. 26	Apr. 8	Apr. 11	Apr. 1	Apr. 4	Apr. 8	Apr. 5	Apr. 17	Apr. 18	Apr. 2	Apr. 14	Apr. 4
McMinnville	Apr. 4	Apr. 10	Apr. 8	--------	Apr. 1	Apr. 3	Apr. 8	Apr. 24	Apr. 17	Apr. 18	May 10	Apr. 20	May 1
Nashville	Apr. 4	Apr. 18	Apr. 8	Apr. 8	Apr. 1	Mar. 21	Mar. 20	Apr. 4	Apr. 17	Apr. 17	Mar. 31	Apr. 15	Mar. 21
Nunnelly	Mar. 24	Mar. 23	Apr. 8	Apr. 8	Apr. 14	Apr. 21	Apr. 8	Apr. 5	--------	--------	--------	--------	--------
Palmetto	Apr. 7	Mar. 28	Apr. 6	Apr. 10	Apr. 9	Apr. 21	Apr. 5	Apr. 5	Apr. 17	Apr. 17	Apr. 3	Apr. 15	Apr. 4
Pope	--------	Apr. 18	Apr. 8	Apr. 10	May 4	Apr. 4	Apr. 5	May 3	Apr. 18	Apr. 17	May 30	Apr. 15	May 1
Sewanee	Apr. 3	Apr. 9	Apr. 6	Apr. 2	Apr. 13	Apr. 22	Apr. 9	Apr. 24	Apr. 20	Apr. 17	May 10	Apr. 16	May 1
Tracy City	--------	--------	Apr. 8	Apr. 10	Apr. 14	Apr. 23	Apr. 9	Apr. 24	Apr. 17	Apr. 18	May 10	Apr. 20	May 1
Tullahoma	Apr. 3	Apr. 16	Apr. 8	Apr. 17	Apr. 14	Mar. 28	Apr. 8	Apr. 24	Apr. 17	Apr. 18	May 10	Apr. 20	May 1
Waynesboro	Apr. 4	Apr. 18	Apr. 8	Apr. 8	--------	Apr. 4	Apr. 8	Apr. 24	Apr. 21	Apr. 17	Apr. 18	May 10	Apr. 20
Yukon	--------	--------	--------	Apr. 10	Apr. 1	Apr. 1	Apr. 8	Apr. 5	Apr. 17	Apr. 17	Apr. 1	Apr. 11	Apr. 4
Arlington	--------	--------	--------	--------	--------	--------	--------	--------	--------	Apr. 17	Apr. 17	Apr. 1	--------
Bolivar	Apr. 3	Apr. 10	Apr. 7	--------	Apr. 1	Mar. 27	Mar. 30	Apr. 4	Apr. 17	Apr. 17	Apr. 1	Apr. 14	Mar. 21
Brownsville	--------	--------	--------	--------	--------	--------	--------	--------	Apr. 17	Apr. 17	Apr. 1	Apr. 14	Mar. 31
Covington	--------	--------	Apr. 7	--------	--------	--------	--------	--------	Mar. 28	Apr. 17	Apr. 1	Apr. 14	Mar. 31
Eyersburg	Mar. 25	Mar. 27	Apr. 7	--------	--------	--------	--------	Mar. 30	Mar. 27	Apr. 17	Apr. 1	Apr. 14	Mar. 21
Jackson	Apr. 3	Feb. 26	Apr. 7	Apr. 1	Mar. 31	Mar. 27	--------	--------	Mar. 26	Apr. 17	Mar. 31	Apr. 14	Apr. 3
Fenton	--------	--------	--------	--------	--------	--------	--------	May 3	Apr. 16	--------	Apr. 1	Apr. 14	Mar. 21
Memphis	Mar. 24	Mar. 15	Apr. 7	Apr. 1	Mar. 8	Mar. 21	Mar. 19	Apr. 4	Apr. 14	Apr. 17	Apr. 1	Apr. 14	Apr. 3
Milan	Apr. 3	--------	Apr. 21	--------	Mar. 8	--------	--------	May 3	Apr. 16	Apr. 17	Apr. 1	Feb. 22	Feb. 27
Savannah	Mar. 24	Feb. 28	Apr. 7	Apr. 10	Apr. 11	Apr. 8	Mar. 20	Apr. 24	Apr. 13	Apr. 17	Apr. 1	Apr. 14	Mar. 21
Trenton	Apr. 3	Mar. 13	Apr. 7	Apr. 1	Mar. 28	--------	Apr. 2	Apr. 4	Apr. 13	Apr. 17	Apr. 2	Apr. 14	Apr. 4
Union City	--------	Mar. 26	Apr. 7	Apr. 3	Apr. 12	Apr. 20	--------	--------	--------	Apr. 18	Apr. 1	Apr. 14	--------
Wilderaville	--------	--------	Apr. 7	Apr. 9	Apr. 4	Mar. 22	Apr. 3	Mar. 30	Apr. 13	Apr. 17	Apr. 1	Apr. 14	Apr. 30

DATE OF FIRST KILLING FROST IN FALL

	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908
Andersonville	Oct. 19	Oct. 30	Oct. 15	Oct. 1	Nov. 8	Nov. 8	Oct. 27	Oct. 23	Oct. 23	Oct. 23	Oct. 11	--------	--------
Benton	Oct. 19	Oct. 30	Oct. 15	Sept. 30	Nov. 6	Oct. 15	Oct. 15	Oct. 19	Oct. 23	Oct. 22	Oct. 11	Oct. 16	Oct. 31
Bristol	Oct. 18	Oct. 30	Oct. 19	Sept. 15	Nov. 7	Oct. 14	Oct. 15	Oct. 23	Oct. 23	Oct. 22	Oct. 11	Oct. 14	Oct. 23
Chattanooga	Oct. 19	Nov. 17	Oct. 27	Nov. 4	Nov. 9	Nov. 8	Nov. 7	Oct. 28	Nov. 15	Nov. 12	Oct. 11	Oct. 13	Oct. 31
Decatur	Oct. 19	Oct. 30	Oct. 15	Nov. 4	Nov. 9	Oct. 15	Oct. 25	Oct. 25	Oct. 24	Oct. 13	Oct. 11	Oct. 13	Oct. 31
Elizabethton	Oct. 19	Oct. 30	Oct. 15	Sept. 16	Nov. 6	Oct. 4	Oct. 15	Oct. 25	Oct. 24	Oct. 13	Oct. 11	--------	--------
Greeneville	Oct. 19	Oct. 30	Oct. 15	Sept. 30	Nov. 5	Oct. 15	Oct. 25	Oct. 25	Oct. 24	Oct. 13	Oct. 11	Oct. 14	Sept. 30
Harriman	Oct. 19	Nov. 13	Oct. 15	Oct. 17	Nov. 4	Sept. 15	Oct. 15	Oct. 24	Oct. 23	Oct. 23	Oct. 11	--------	--------
Jonesboro	Oct. 19	Oct. 30	Oct. 15	Sept. 30	Nov. 5	Nov. 5	Oct. 25	Oct. 19	Oct. 23	Oct. 23	Oct. 11	--------	Oct. 30
Knoxville	Oct. 9	Nov. 13	Oct. 27	Nov. 5	Nov. 9	Nov. 5	Nov. 5	Nov. 25	Nov. 25	Oct. 24	Oct. 11	Oct. 14	Sept. 25
Maryville	--------	--------	Oct. 15	Nov. 4	Nov. 9	Oct. 15	Oct. 15	Oct. 24	Oct. 23	Oct. 22	Oct. 11	Oct. 13	Nov. 6
Newport	Oct. 19	Nov. 4	Oct. 19	Nov. 4	Nov. 9	Nov. 4	Oct. 15	Oct. 24	Oct. 23	Oct. 13	Oct. 11	Oct. 13	Nov. 6
Rogersville	Oct. 18	Oct. 30	Oct. 15	Sept. 30	Nov. 8	Oct. 15	Oct. 25	Oct. 24	Oct. 23	Oct. 13	Oct. 11	Oct. 13	Nov. 1
Rugby	Oct. 18	Oct. 30	Oct. 15	Sept. 27	Nov. 4	Oct. 15	Oct. 25	Sept. 18	Oct. 21	Oct. 13	Oct. 11	Oct. 13	Oct. 31
Silver Lake	--------	--------	Oct. 19	Nov. 1	Nov. 5	Oct. 4	Oct. 15	Oct. 19	Oct. 18	Oct. 13	Oct. 12	Oct. 14	Sept. 25
Springdale	Oct. 19	Oct. 30	Oct. 15	Sept. 30	Nov. 8	Oct. 5	--------	Oct. 24	Oct. 24	Oct. 23	Oct. 11	Oct. 13	Oct. 31
Tellico Plains	Oct. 19	Oct. 30	Oct. 15	Oct. 1	Nov. 9	Oct. 15	Sept. 19	Oct. 24	Oct. 23	Oct. 23	Oct. 11	Oct. 13	Oct. 3
Ashwood	Oct. 18	Oct. 25	Oct. 15	Oct. 1	Nov. 6	Nov. 4	Oct. 15	Oct. 19	Oct. 23	Oct. 22	Oct. 11	Oct. 13	Nov. 1
Byrdstown	Oct. 18	Oct. 30	Oct. 23	Sept. 16	Nov. 4	Oct. 18	Oct. 25	Oct. 24	Oct. 24	Oct. 23	Oct. 11	Oct. 14	Oct. 25
Carthage	--------	--------	Oct. 15	Nov. 4	--------	Nov. 2	--------	--------	Oct. 24	Oct. 22	Oct. 11	Oct. 28	Oct. 31
Clarksville	Oct. 18	Nov. 5	Oct. 27	Nov. 4	Nov. 9	Nov. 4	Oct. 23	Oct. 25	Oct. 27	Nov. 2	Oct. 11	Oct. 14	Oct. 31
Dickson	--------	--------	Oct. 23	--------	Nov. 9	Oct. 4	Oct. 15	Oct. 24	Oct. 23	Oct. 12	--------	Oct. 14	Oct. 31
Dover	--------	--------	Oct. 27	Sept. 27	Nov. 6	Oct. 25	--------	Oct. 24	Oct. 23	Oct. 13	Oct. 11	Oct. 14	Oct. 25
Erasmus	--------	Sept. 23	Oct. 15	Sept. 30	Nov. 6	Oct. 15	Oct. 15	Oct. 19	Oct. 21	Oct. 12	Oct. 10	Oct. 14	Oct. 25
Florence	Oct. 25	Oct. 30	Oct. 23	Oct. 1	Nov. 4	Nov. 4	Oct. 25	Oct. 19	Oct. 21	Oct. 12	Oct. 10	Oct. 13	Oct. 27
Franklin	--------	Oct. 30	Oct. 27	Nov. 4	Nov. 4	Oct. 25	--------	Oct. 24	Oct. 23	Oct. 13	Oct. 10	Oct. 14	Oct. 25
Hohenwald	Oct. 18	Sept. 22	Oct. 15	Sept. 27	Nov. 4	Oct. 15	Oct. 15	Sept. 19	Oct. 21	Oct. 11	Oct. 11	Oct. 14	Oct. 31
Iron City	--------	--------	--------	--------	Nov. 9	Nov. 15	Oct. 15	Oct. 18	Oct. 21	Oct. 12	Oct. 10	Oct. 13	Oct. 25
Johnsonville	Oct. 18	Sept. 22	Oct. 23	Sept. 30	Nov. 4	Oct. 15	Oct. 19	Oct. 24	Oct. 23	Oct. 13	Oct. 11	Oct. 13	Oct. 25
La Fayette	--------	--------	Oct. 15	Sept. 30	Nov. 4	Oct. 15	Oct. 19	Oct. 24	Oct. 23	Oct. 13	Oct. 10	Oct. 25	Oct. 25
Lexington	--------	--------	--------	Sept. 30	Nov. 4	Nov. 5	Oct. 19	Oct. 24	Oct. 23	Oct. 13	Oct. 11	Oct. 13	Oct. 25
Liberty	Oct. 18	Oct. 30	Oct. 23	Sept. 30	--------	Oct. 15	Oct. 23	Oct. 19	--------	--------	--------	--------	--------
Lynnville	Oct. 18	Sept. 23	Oct. 23	Sept. 27	Nov. 4	Nov. 4	Oct. 23	Oct. 25	Oct. 24	Nov. 2	Oct. 11	Oct. 14	Oct. 25
McMinnville	Oct. 18	Sept. 23	Oct. 23	Nov. 1	Nov. 4	--------	Oct. 15	Oct. 25	Oct. 27	Oct. 21	Oct. 12	Oct. 14	Oct. 25
Nashville	Oct. 18	Nov. 17	Oct. 27	Nov. 4	Nov. 9	Nov. 4	Oct. 15	Oct. 25	Nov. 14	Oct. 23	Oct. 11	Oct. 30	Nov. 6
Nunnelly	Oct. 18	Oct. 30	Oct. 14	Sept. 30	Nov. 4	Nov. 16	Oct. 15	--------	Oct. 21	--------	--------	--------	--------
Palmetto	Oct. 18	Oct. 30	Oct. 15	Sept. 30	Nov. 9	Nov. 3	Oct. 29	Oct. 25	Oct. 24	Oct. 13	Oct. 10	Oct. 13	Oct. 25
Pope	Oct. 18	Oct. 30	Oct. 23	Oct. 1	Nov. 10	Oct. 15	Oct. 15	Oct. 19	Oct. 21	Oct. 12	Oct. 10	Oct. 13	Oct. 25
Sewanee	Oct. 17	Nov. 16	Oct. 23	Nov. 4	Nov. 8	Nov. 4	Nov. 4	Nov. 29	Oct. 24	Oct. 23	Oct. 10	Oct. 13	Oct. 25
Tracy City	--------	Sept. 23	Oct. 15	Sept. 23	Nov. 4	Nov. 4	Oct. 15	Oct. 25	Oct. 24	Oct. 23	Oct. 10	Oct. 13	--------
Tullahoma	Oct. 18	Oct. 30	Oct. 18	Sept. 30	Nov. 4	Oct. 15	Oct. 15	Oct. 25	Oct. 31	Oct. 23	Oct. 11	--------	Oct. 26
Waynesboro	Oct. 17	Oct. 30	Oct. 23	Sept. 27	Nov. 4	Oct. 15	Oct. 15	Oct. 18	Oct. 21	Oct. 21	Oct. 11	Oct. 13	Oct. 25
Yukon	--------	--------	Oct. 23	Nov. 4	Nov. 9	Nov. 4	Oct. 29	Oct. 25	Oct. 24	Oct. 23	Oct. 11	Oct. 13	Oct. 25
Arlington	Oct. 18	--------	Oct. 27	--------	--------	--------	--------	Oct. 24	Oct. 23	Oct. 23	Oct. 11	--------	Nov. 5
Bolivar	Oct. 18	Oct. 30	Oct. 23	Nov. 4	Nov. 9	Nov. 14	Oct. 29	Oct. 25	Oct. 24	Oct. 23	Oct. 11	Oct. 14	Oct. 28
Brownsville	--------	--------	Oct. 27	--------	--------	--------	--------	Oct. 25	Oct. 24	Oct. 23	Nov. 11	Oct. 13	Oct. 25
Covington	Oct. 18	Nov. 13	Oct. 23	--------	--------	--------	--------	Oct. 24	Oct. 23	Nov. 11	Oct. 11	Oct. 14	Oct. 5
Eyersburg	Oct. 18	Oct. 30	Oct. 27	--------	--------	Nov. 4	--------	Oct. 25	Oct. 23	Nov. 11	Oct. 11	Oct. 14	Oct. 13
Jackson	Oct. 18	Oct. 30	Oct. 27	Nov. 4	Nov. 9	--------	--------	Oct. 25	Nov. 13	Oct. 13	Oct. 20	Oct. 14	Nov. 6
Fenton	--------	--------	--------	--------	--------	--------	--------	Oct. 24	Oct. 23	Nov. 1	Oct. 20	Oct. 12	Nov. 5
Memphis	Nov. 6	Nov. 17	Oct. 28	Nov. 3	Nov. 8	--------	Oct. 29	Oct. 18	Oct. 23	Oct. 13	Oct. 11	Oct. 13	Oct. 15
Milan	Oct. 18	--------	Oct. 27	--------	--------	Nov. 13	Nov. 27	Oct. 2	Nov. 13	Nov. 30	Nov. 13	Nov. 11	Nov. 18
Savannah	--------	Nov. 17	Oct. 23	Sept. 30	Nov. 8	Nov. 4	--------	Oct. 25	Oct. 23	Nov. 11	Oct. 11	Oct. 30	Oct. 28
Trenton	Oct. 18	Oct. 30	Oct. 27	Sept. 30	Nov. 9	Nov. 4	Oct. 15	Oct. 19	Oct. 23	Oct. 21	Oct. 20	Oct. 14	--------
Union City	--------	Nov. 6	Oct. 18	Nov. 4	Nov. 9	Nov. 4	Oct. 29	--------	--------	Oct. 12	Oct. 11	Oct. 14	Nov. 2
Wilderaville	--------	Nov. 3	Oct. 23	Nov. 4	Nov. 9	Nov. 4	Oct. 29	Oct. 24	Oct. 23	Nov. 2	Oct. 11	Oct. 14	Nov. 4