Risk of Frost and Freezing Temperatures in Kentucky

By JERRY D. HILL

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ACKNOWLEDGMENTS

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By JERRY D. HILL[2]

During the course of producing and marketing a profitable crop, the Kentucky farmer has many hazards to deal with. One of the more important of these is, in many instances, the risk of a damaging late frost or freeze in the spring and the risk of a similar occurrence early in the fall. The truck farmer and fruit grower are possibly the most concerned with late spring and early fall freezes, but those who raise some of the other more basic field crops such as cotton, corn, and tobacco sometimes experience losses from unusually late freezing temperatures in spring. Likewise, some late-maturing crops are also subject to damage by early fall freezing.

Since it is not always economically feasible to attempt to prevent the occurrence of freezing temperatures in Kentucky fields and orchards, it would be desirable for the farmer to be able to plan and carry out his operations in such a way that his risk of damage will be minimized. To do this he must have information regarding the chance or risk of freezing temperatures occurring in his part of the state after certain dates in the spring and before certain dates in the fall. In some instances, the length of the growing season (the number of days between spring and fall freezes) determines the economic feasibility of growing certain crops. The purpose of this study is to provide the needed information concerning growing season length and spring and fall freezing temperatures.

While the effect of sub-freezing temperatures on agriculture is of great importance, other significant interests such as construction, sale of seasonal items, maintenance, heating, etc., are affected to varying degrees.

The data in this pamphlet will inform the farmer, home gardener, or orchardist of the risks involved in early and late planting dates. These data should also be of considerable value to certain industries in planning their respective operations.

FREEZING TEMPERATURES AND PLANT INJURY

It is generally agreed that injury to plants by freezing usually occurs when ice crystals form within the plant tissues as a result of the freezing of the liquid in these tissues. The freezing point of the liquid within the plant tissues varies greatly from one plant to another and at different stages of development in the same plant. For this reason there is a wide range in the temperature necessary to cause major damage to growing plants. A temperature of freezing or slightly below will damage and possibly kill very tender young plants but may have little adverse effect on more hardy, older plants. Peach blossoms usually sustain little or no damage from a temperature of 30° F, but serious damage may be expected when temperatures drop to the 24-27° F range.

The duration of sub-freezing conditions is also an important factor in determining the extent of damage. If the temperature remains below freezing for only a short time, the damage may be negligible, while the same temperature over a period of several hours could cause major damage.

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[1]This publication is a revision of Kentucky Agricultural Experiment Station Progress Report 139, "Late Spring and Early Fall Freezes in Kentucky," by Doyle Cook published in 1964.

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Other factors that seemingly have a definite bearing on the amount of damage are the temperatures present prior to the sub-freezing conditions, the suddenness of the temperature drop, and the wind speed. Several days of unseasonably warm weather in early spring will often cause perennials to come out of dormancy prematurely and become especially vulnerable to later freezing temperatures. Some types of plants seem to be more susceptible to sudden freezes than to slowly dropping temperatures, even though the same temperature may be reached in both cases. Drying winds, that often accompany unusually severe outbreaks of cold weather, can add considerably to the damage.

The appearance of frost has commonly been associated with plant injury. Frost is defined as the deposit of atmospheric moisture in the form of feathery ice crystals on the ground or other surfaces, whose temperatures have fallen to 32° F or lower. Frost and dew are both caused by condensation of atmospheric moisture (water vapor) on the cool ground or plant surface. In the case of frost, the water vapor is deposited as ice crystals instead of water droplets when the temperature of the air at the surface is at the freezing point (32° F) or below. Dew or frost can be expected to occur only on clear still nights. Since sub-freezing temperatures can and often do occur without the appearance of frost, plant injury may occur in the absence of frost. For this reason, air temperature is usually considered a better criterion for measuring the extent of plant injury than the occurrence or non-occurrence of frost.

Recent research (2) has determined the critical temperatures for various fruits during their early development when freeze damage is most likely to occur. Some of these are given in Tables 1a-d.

TABLE 1a.—CRITICAL TEMPERATURES FOR CERTAIN FRUITS.

Fruit	Stage of Development		
	Buds Closed But Showing Color	Full Bloom	Small Green Fruit
	°F	°F	°F
Apricot	25	28	29
Blueberry	25	26	27
Cherries	28	28	30
Grapes	30	31	31
Plums	25	28	30
Raspberries (black)	28	30	28
Raspberries (red)	27	29	27
Strawberries	28	31	28
Walnuts, English	30	30	30

More detailed information (3), (4) has been gathered for apples, peaches, and pears during their blossom stages (Tables 1b-d).

TABLE 1b.—CRITICAL TEMPERATURES FOR APPLES.

Bud Development Stages*	Average Temperature for 10% Kill	Average Temperature for 90% Kill
	°F	°F
Silver tip	15	2
Green tip	18	10
Half-inch green	23	15
Tight cluster	27	21
First pink	28	24
Full pink	28	25
First bloom	28	25
Full bloom	28	25
Post bloom	28	25

*For Red Delicious. Golden Delicious and Winesap are approximately 1 degree hardier and Rome Beauty 2 degrees hardier, except after petal fall when all varieties are equally tender.

TABLE 1c.—CRITICAL TEMPERATURES FOR PEACHES.

Bud Development Stages*	Average Temperature for 10% Kill	Average Temperature for 90% Kill
	°F	°F
First swelling	18	1
Calyx green	21	5
Calyx red	23	9
First pink	25	15
First bloom	26	21
Full bloom	27	24
Post bloom	28	25

*For Elberta.

TABLE 1d.—CRITICAL TEMPERATURES FOR PEARS.

Bud Development Stages*	Average Temperature for 10% Kill	Average Temperature for 90% Kill
	°F	°F
Scales separating	15	0
Blossom buds exposed	20	6
Tight cluster	24	15
First white	25	19
Full white	26	22
First bloom	27	23
Full bloom	28	24
Post bloom	28	24

*For Bartlett. Anjou is similar in hardiness but may bloom earlier and, therefore, may be more tender than Bartlett at the same date.

Very little specific information is available regarding the critical temperatures for truck-garden crops. However, these crops are usually classified as tender, semi-hardy, or hardy according to their ability to withstand low temperatures. Tender plants will be damaged or killed by any temperature of freezing or below. Included in this group are watermelons, tomatoes, beans, and peppers. Temperatures slightly below freezing are necessary before injury to semi-hardy plants occurs. This group includes carrots, lettuce, and celery. Hardy plants, which include cabbage, turnips, and garden peas, can withstand a fairly hard freeze without being killed.

FREEZE CLASSIFICATION

Freezes have been classified (1) as light, moderate, or severe, as follows:

Light freeze—temperatures 29° through 32°
Moderate freeze—temperatures 25° through 28°
Severe freeze—temperatures 24° or lower

It may be generally assumed that a light freeze will kill only the tenderest plants; a moderate freeze will damage most plants to some extent, with heavy damage to fruit blossoms and tender and semi-hardy plants; and a severe freeze will cause heavy damage to most plants.

On clear nights, under favorable conditions, the heat lost from the surface of leaves and plant buds will cause the temperature of those parts to drop below freezing while the air temperature remains about 32° F. Thus there is still a risk of cold weather injury in the spring when there is little chance of a freeze. Similarly, frost risk in the fall increases even before there is a significant chance of having the first 32 degree reading.

Under conditions of clear skies, low humidity, and light wind, frost becomes a slight possibility when air temperatures drop near 40 degrees. In the 35- to 36-degree range, frost becomes even more of a possibility. To indicate when frost risk may become critical even before freezing temperatures are likely, temperature values of 36° F and 40° F have been included in this study.

FAVORABLE CONDITIONS FOR LATE SPRING AND EARLY FALL FREEZE

In late spring and early fall, temperatures in Kentucky usually remain above freezing during the daylight hours and drop below freezing only at night. The last spring freeze and the first fall freeze are more likely to occur on clear nights. Fair skies permit the invisible heat waves (long-wave radiation), which are constantly leaving the earth's surface, to pass more readily through the atmosphere. Each night a large amount of heat is lost from the soil and plant surfaces by these heat waves. Since the soil is a good insulator, the rate of replenishment of heat to the surface is much lower than the rate of heat loss by longwave radiation, resulting in a net cooling effect.

Because of the loss of heat, the earth's surface and the air near the surface gradually become cooler on clear nights. The cooling process continues throughout the night, with the lowest temperature occurring near sunrise. If the air is sufficiently cool to start with, below-freezing temperatures will result. The temperature profiles which develop near the ground on clear nights are shown in Fig. 1.

When skies are overcast, the heat leaving the earth is absorbed then radiated to the earth in some degree by the cloud cover and not so much heat is lost from the surface. By this means,
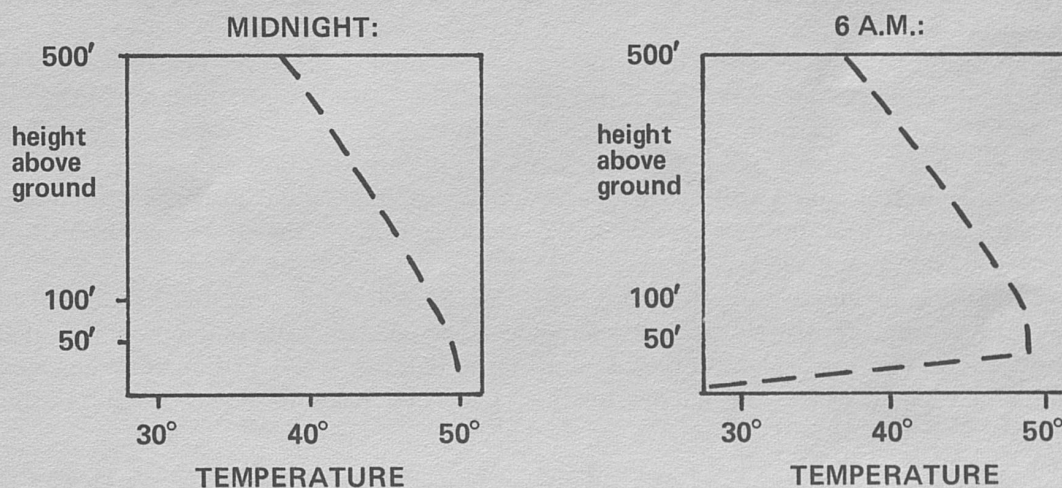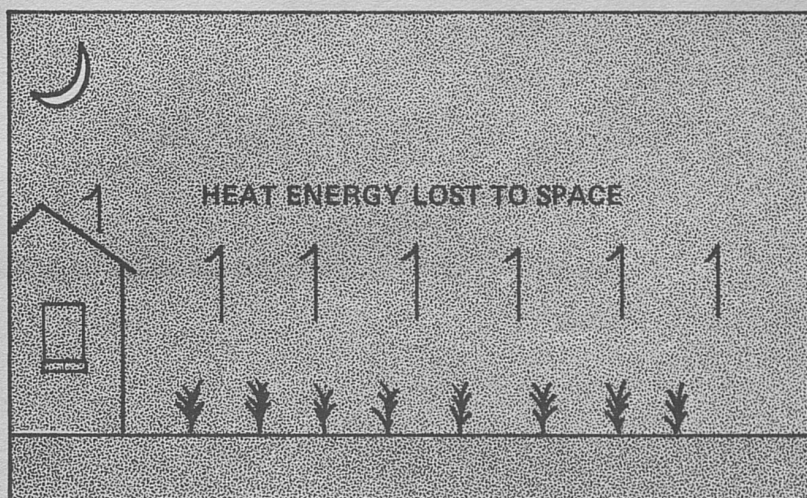
Fig. 1.—Loss of heat from a crop surface by radiation on a clear night and typical temperature profiles which develop near the ground.

cloud cover prevents the temperatures near the surface from falling so much, and freezing temperatures are not so likely to occur.

Wind may prevent the occurrence of freezing temperatures. On clear nights, the temperature near the surface is cooler than the temperature a few feet above the surface, and the wind mixes the cooler air near the surface with warmer air above it. This prevents cool air from accumulating within the plant cover, and sub-freezing temperatures are not likely to be within the plant cover; consequently, sub-freezing temperatures are not likely to be observed. One should remember that the speed of the wind is usually less at night than during the day. An afternoon breeze may die down during the night, and the mechanism for mixing the air may be lost. Producers of freeze-sensitive plants should observe the wind after sundown before concluding that the wind will prevent the occurrence of sub-freezing temperatures.

The first prerequisite for late spring and early fall freezes is the presence of cool Canadian air over Kentucky. If this air is so cool that its temperature is below freezing upon reaching Kentucky, freeze damage will result even if the skies are cloudy and the wind is blowing.

Producers may be warned of such conditions by forecasts from the National Weather Service which will, in such cases, warn of "much cooler temperatures," "cold wave," "becoming cooler tonight," "frost or freeze tonight," etc.

Not all locations in an area have the same temperature. On clear, calm nights, temperatures are cooler in valleys than on the adjacent hillsides. Cool air, being more dense than warm air, moves down the slopes of hills, accumulating in the valleys. Owing to the cooler valley temperatures, orchard and garden sites should be located on slopes. Because of less erosion and higher soil fertility, truck gardens are often placed in bottom lands; but farmers should recognize that there is a greater risk of late spring and early fall freeze damage in the valley locations.

SOURCE OF FREEZE DATA

Thirty-eight National Weather Service climatological stations in Kentucky are the source of the temperature data presented in the accompanying charts and tables. The length of the period studied ranged from 20 to 38 years.

The location of the stations from which data were used is shown in Fig. 6, page 23. The thermometers were exposed in standard instrument shelters, usually at a height of 5 to 6 feet above the ground. Temperatures thus obtained should be representative of the general area. However, on clear, still, nights temperatures may vary greatly in short distances. Under such conditions, the lowest values will usually be found in low places and near the ground. Also, temperatures in and near the larger cities will usually average somewhat higher than those in surrounding areas.

Temperatures included in the study are 12, 16, 20, 24, 28, 32, 36, and 40° F. An analysis of the long-term weather records at each station indicates the date when there is a given risk of each temperature level occurring in the spring. Likewise, the dates of a given risk can be determined for the fall as chances of freezing temperature increase. These risks are shown for each station in Table 2.

EXPLANATION OF TABLES AND FIGURES

Figure 2a shows the average date of the last occurrence in spring of 32° or lower, while Figure 2b shows the average date of the first occurrence in the fall. In the past these dates have been used as mileposts in the progress of the seasons, but it should be remembered that they are only the average dates. There remains a 50% chance of freezing temperatures occurring after the average date in the spring or before the average date in the fall. This is certainly a greater risk than most farmers can afford to take.

The data shown in Table 2 can be used to determine the date when the risk has decreased to 25% or 10%. For instance, a farmer in Bowling Green wishes to postpone planting a particular crop until the statistical chance of a temperature of 32° or lower is down to 25%. The Bowling Green data show that date to be April 20, which means that a freezing temperature will occur after this date in only 1 year out of 4. If he postpones planting until April 26 the risk is down to 10%, or only 1 year in 10.

TABLE 2.—DATES OF GIVEN PROBABILITY FOR VARIOUS TEMPERATURES.

STATION	°C	°F	Spring Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Decreases to:					Fall Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Increases to:				
			90%	75%	50%	25%	10%	10%	25%	50%	75%	90%
ASHLAND	4	40	Apr 26	May 5	May 16	May 26	Jun 5	Sep 20	Sep 25	Oct 1	Oct 7	Oct 13
	2	36	Apr 15	Apr 24	May 4	May 13	May 22	Sep 24	Oct 1	Oct 10	Oct 19	Oct 27
	0	32	Apr 8	Apr 15	Apr 23	May 1	May 8	Oct 3	Oct 12	Oct 22	Nov 1	Nov 10
	-2	28	Mar 17	Mar 27	Apr 6	Apr 17	Apr 27	Oct 21	Oct 27	Nov 2	Nov 9	Nov 14
	-4	24	Mar 2	Mar 12	Mar 23	Apr 3	Apr 13	Oct 31	Nov 6	Nov 13	Nov 20	Nov 27
	-7	20	Feb 20	Mar 2	Mar 14	Mar 26	Apr 5	Nov 9	Nov 17	Nov 25	Dec 4	Dec 12
	-9	16	Jan 29	Feb 12	Feb 27	Mar 13	Mar 26	Nov 22	Nov 28	Dec 4	Dec 11	Dec 17
	-11	12	Jan 18	Feb 1	Feb 15	Feb 28	Mar 12	Nov 23	Dec 8	Dec 24	Jan 10	Jan 28
BARDSTOWN	4	40	Apr 28	May 5	May 13	May 21	May 28	Sep 14	Sep 22	Sep 30	Oct 9	Oct 17
	2	36	Apr 16	Apr 24	May 3	May 12	May 20	Sep 22	Sep 29	Oct 8	Oct 16	Oct 23
	0	32	Apr 3	Apr 12	Apr 22	May 3	May 12	Oct 4	Oct 10	Oct 17	Oct 24	Oct 30
	-2	28	Mar 24	Mar 31	Apr 7	Apr 14	Apr 20	Oct 11	Oct 17	Oct 23	Oct 30	Nov 5
	-4	24	Mar 17	Mar 22	Mar 27	Apr 2	Apr 7	Oct 25	Oct 29	Nov. 4	Nov 9	Nov 14
	-7	20	Feb 15	Feb 27	Mar 12	Mar 25	Apr 6	Oct 28	Nov 4	Nov 12	Nov 20	Nov 27
	-9	16	Jan 31	Feb 13	Feb 28	Mar 14	Mar 27	Nov 11	Nov 20	Nov 29	Dec 9	Dec 18
	-11	12	Jan 6	Jan 25	Feb 11	Feb 27	Mar 14	Nov 17	Nov 30	Dec 14	Dec 29	Jan 15
BEAVER DAM	4	40	Apr 26	May 4	May 12	May 21	May 29	Sep 13	Sep 20	Sep 27	Oct 4	Oct 11
	2	36	Apr 16	Apr 24	May 3	May 13	May 21	Sep 20	Sep 27	Oct 5	Oct 12	Oct 19
	0	32	Apr 5	Apr 13	Apr 22	Apr 30	May 8	Sep 29	Oct 6	Oct 13	Oct 21	Oct 27
	-2	28	Mar 27	Apr 2	Apr 8	Apr 14	Apr 19	Oct 10	Oct 18	Oct 26	Nov 3	Nov 10
	-4	24	Mar 6	Mar 14	Mar 22	Mar 31	Apr 7	Oct 25	Oct 31	Nov 6	Nov 12	Nov 17
	-7	20	Feb 24	Mar 4	Mar 13	Mar 22	Mar 29	Oct 29	Nov 5	Nov 12	Nov 20	Nov 27
	-9	16	Jan 26	Jan 9	Feb 25	Mar 12	Mar 26	Nov 10	Nov 20	Nov 30	Dec 11	Dec 20
	-11	12	Jan 17	Jan 31	Feb 15	Mar 1	Mar 13	Nov 20	Dec 4	Dec 20	Jan 6	Jan 22
BEREA	4	40	Apr 23	May 1	May 10	May 20	May 28	Sep 15	Sep 22	Sep 30	Oct 7	Oct 14
	2	36	Apr 11	Apr 19	Apr 28	May 7	May 16	Sep 27	Oct 3	Oct 9	Oct 16	Oct 22
	0	32	Apr 2	Apr 9	Apr 17	Apr 25	May 2	Oct 6	Oct 13	Oct 20	Oct 28	Nov 4
	-2	28	Mar 9	Mar 21	Apr 2	Apr 15	Apr 27	Oct 20	Oct 26	Nov 3	Nov 10	Nov 17
	-4	24	Feb 27	Mar 8	Mar 20	Mar 31	Apr 10	Oct 26	Nov 2	Nov 10	Nov 18	Nov 25
	-7	20	Feb 14	Feb 24	Mar 8	Mar 20	Mar 31	Nov 6	Nov 14	Nov 23	Dec 1	Dec 9
	-9	16	Jan 28	Feb 10	Feb 25	Mar 11	Mar 24	Nov 9	Nov 20	Dec 3	Dec 16	Dec. 27
	-11	12	Jan 14	Jan 30	Feb 14	Mar 1	Mar 14	Nov 22	Dec 4	Dec 18	Jan 2	Jan 16
BOWLING GREEN	4	40	Apr 23	Apr 30	May 7	May 15	May 22	Sep 23	Sep 29	Oct 5	Oct 11	Oct 16
	2	36	Apr 3	Apr 16	Apr 25	May 4	May 12	Oct 1	Oct 7	Oct 14	Oct 21	Oct 28
	0	32	Mar 27	Apr 6	Apr 13	Apr 20	Apr 26	Oct 11	Oct 17	Oct 24	Oct 31	Nov 6
	-2	28	Mar 12	Mar 22	Mar 30	Apr 6	Apr 12	Oct 22	Oct 28	Nov 3	Nov 9	Nov 15
	-4	24	Feb 25	Mar 6	Mar 16	Mar 26	Apr 4	Nov 1	Nov 8	Nov 15	Nov 22	Nov 29
	-7	20	Feb 2	Feb 15	Mar 1	Mar 15	Mar 28	Nov 8	Nov 16	Nov 25	Dec 4	Dec 13
	-9	16	Jan 13	Jan 29	Feb 14	Mar 2	Mar 16	Nov 19	Nov 30	Dec 12	Dec 25	Jan 7
	-11	12	Jan 2	Jan 22	Feb 6	Feb 21	Mar 6	Nov 28	Dec 10	Dec 24	Jan 8	Jan 27
COVINGTON	4	40	May 2	May 7	May 14	May 21	May 27	Sep 18	Sep 24	Sep 30	Oct 7	Oct 13
	2	36	Apr 15	Apr 23	May 2	May 11	May 19	Sep 26	Oct 3	Oct 9	Oct 16	Oct 22
	0	32	Apr 5	Apr 12	Apr 19	Apr 27	May 4	Oct 8	Oct 15	Oct 22	Oct 29	Nov 4
	-2	28	Mar 21	Mar 29	Apr 6	Apr 15	Apr 23	Oct 19	Oct 24	Oct 30	Nov 6	Nov 12
	-4	24	Mar 13	Mar 19	Mar 25	Mar 31	Apr 6	Oct 29	Nov 4	Nov 11	Nov 17	Nov 24
	-7	20	Feb 25	Mar 5	Mar 14	Mar 24	Apr 1	Nov 1	Nov 9	Nov 19	Nov 28	Dec. 7
	-9	16	Feb 9	Feb 19	Mar 2	Mar 14	Mar 24	Nov 10	Nov 21	Dec 3	Dec 16	Dec 27
	-11	12	Jan 21	Feb 2	Feb 14	Feb 27	Mar 10	Nov 17	Nov 30	Dec 14	Dec 27	Jan 9

(continued)

Table 2 (continued)

STATION	TEMP. °C	°F	Spring Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Decreases to:					Fall Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Increases to:				
			90%	75%	50%	25%	10%	10%	25%	50%	75%	90%
DANVILLE	4	40	Apr 27	May 3	May 11	May 18	May 25	Sep 17	Sep 23	Sep 29	Oct 6	Oct 12
	2	36	Apr 13	Apr 21	Apr 29	May 8	May 16	Sep 26	Oct 3	Oct 11	Oct 18	Oct 25
	0	32	Mar 31	Apr 8	Apr 17	Apr 26	May 3	Oct 10	Oct 15	Oct 22	Oct 29	Nov 4
	-2	28	Mar 20	Mar 27	Apr 5	Apr 14	Apr 22	Oct 23	Oct 29	Nov 4	Nov 9	Nov 15
	-4	24	Mar 8	Mar 15	Mar 23	Mar 31	Apr 7	Oct 30	Nov 5	Nov 13	Nov 20	Nov 26
	-7	20	Feb 19	Mar 1	Mar 11	Mar 21	Mar 30	Nov 10	Nov 17	Nov 24	Dec 1	Dec 8
	-9	16	Jan 30	Feb 13	Feb 26	Mar 11	Mar 23	Nov 15	Nov 26	Dec 7	Dec 20	Jan 4
	-11	12	Jan 15	Jan 31	Feb 14	Feb 27	Mar 10	Nov 18	Dec 3	Dec 21	Jan 9	Feb 15
FARMERS	4	40	May 6	May 13	May 21	May 28	June 4	Sep 11	Sep 17	Sep 25	Oct 2	Oct 9
	2	36	Apr 24	May 1	May 10	May 18	May 25	Sep 19	Sep 25	Oct 2	Oct 9	Oct 15
	0	32	Apr 13	Apr 21	Apr 30	May 9	May 17	Sep 30	Oct 5	Oct 12	Oct 18	Oct 24
	-2	28	Mar 31	Apr 7	Apr 14	Apr 22	Apr 29	Oct 10	Oct 17	Oct 25	Nov 1	Nov 8
	-4	24	Mar 16	Mar 23	Apr 1	Apr 10	Apr 18	Oct 24	Oct 29	Nov 3	Nov 8	Nov 13
	-7	20	Feb 27	Mar 8	Mar 19	Mar 30	Apr 8	Oct 31	Nov 6	Nov 13	Nov 20	Nov 26
	-9	16	Feb 15	Feb 25	Mar 8	Mar 20	Mar 30	Nov 6	Nov 13	Nov 21	Nov 30	Dec 7
	-11	12	Feb 1	Feb 12	Feb 24	Mar 8	Mar 18	Nov 16	Nov 26	Dec 7	Dec 18	Dec 29
FORDS FERRY	4	40	Apr 14	Apr 22	May 1	May 10	May 18	Sep 29	Oct 5	Oct 12	Oct 18	Oct 24
	2	36	Mar 28	Apr 5	Apr 15	Apr 24	May 2	Oct 10	Oct 16	Oct 23	Oct 30	Nov 5
	0	32	Mar 24	Mar 29	Apr 4	Apr 10	Apr 16	Oct 19	Oct 24	Oct 29	Nov 3	Nov 8
	-2	28	Mar 15	Mar 19	Mar 23	Mar 28	Apr 1	Oct 25	Oct 31	Nov 7	Nov 13	Nov 20
	-4	24	Feb 21	Mar 2	Mar 12	Mar 21	Mar 30	Nov 5	Nov 11	Nov 18	Nov 26	Dec 2
	-7	20	Feb 6	Feb 17	Mar 1	Mar 13	Mar 24	Nov 11	Nov 21	Dec 1	Dec 12	Dec 21
	-9	16	Jan 14	Jan 30	Feb 14	Feb 28	Mar 13	Nov 17	Nov 29	Dec 12	Dec 26	Jan 10
	-11	12	Dec 31	Jan 19	Feb 5	Feb 21	Mar 7	Nov 19	Dec 3	Dec 18	Jan 4	Dec 1
FRANKFORT	4	40	May 1	May 7	May 14	May 20	May 27	Sep 19	Sep 24	Sep 30	Oct 7	Oct 12
	2	36	Apr 17	Apr 25	May 3	May 12	May 20	Sep 27	Oct 3	Oct 10	Oct 17	Oct 23
	0	32	Apr 7	Apr 14	Apr 22	Apr 30	May 7	Oct 10	Oct 16	Oct 23	Oct 29	Nov 4
	-2	28	Mar 23	Mar 31	Apr 8	Apr 17	Apr 25	Oct 21	Oct 26	Nov 1	Nov 7	Nov 12
	-4	24	Mar 6	Mar 14	Mar 23	Mar 31	Apr 8	Oct 28	Nov 4	Nov 11	Nov 19	Nov 26
	-7	20	Feb 23	Mar 4	Mar 13	Mar 23	Mar 31	Nov 5	Nov 12	Nov 21	Nov 30	Dec 7
	-9	16	Feb 6	Feb 17	Mar 1	Mar 13	Mar 24	Nov 20	Nov 28	Dec 6	Dec 14	Dec 21
	-11	12	Dec 24	Feb 5	Feb 17	Mar 1	Mar 11	Nov 22	Dec 4	Dec 18	Jan 1	Jan 15
GREENSBURG	4	40	May 1	May 7	May 13	May 20	May 26	Sep 16	Sep 22	Sep 28	Oct 5	Oct 10
	2	36	Apr 19	Apr 25	May 2	May 10	May 16	Sep 26	Oct 1	Oct 7	Oct 13	Oct 18
	0	32	Apr 2	Apr 10	Apr 19	Apr 28	May 6	Sep 30	Oct 6	Oct 13	Oct 20	Oct 27
	-2	28	Mar 20	Mar 28	Apr 5	Apr 14	Apr 21	Oct 15	Oct 21	Oct 28	Nov 4	Nov 10
	-4	24	Mar 8	Mar 15	Mar 23	Mar 31	Apr 7	Oct 20	Oct 28	Nov 5	Nov 13	Nov 21
	-7	20	Feb 21	Mar 3	Mar 13	Mar 24	Apr 3	Nov 2	Nov 9	Nov 17	Nov 26	Dec 3
	-9	16	Feb 3	Feb 13	Feb 26	Mar 10	Mar 21	Nov 7	Nov 18	Nov 30	Dec 13	Dec 26
	-11	12	Jan 17	Jan 31	Feb 14	Feb 27	Mar 11	Nov 20	Dec 3	Dec 17	Jan 3	0
GREENVILLE	4	40	Apr 19	Apr 28	May 8	May 17	May 26	Sep 17	Sep 23	Sep 29	Oct 6	Oct 12
	2	36	Apr 10	Apr 19	Apr 30	May 10	May 20	Sep 25	Oct 2	Oct 9	Oct 16	Oct 22
	0	32	Apr 3	Apr 10	Apr 18	Apr 26	May 3	Oct 5	Oct 12	Oct 19	Oct 26	Nov 1
	-2	28	Mar 21	Mar 28	Apr 5	Apr 13	Apr 19	Oct 12	Oct 19	Oct 28	Nov 5	Nov 12
	-4	24	Mar 10	Mar 18	Mar 26	Apr 4	Apr 11	Oct 24	Oct 30	Nov 6	Nov 13	Nov 19
	-7	20	Feb 25	Mar 6	Mar 15	Mar 25	Apr 2	Nov 1	Nov 8	Nov 14	Nov 21	Nov 27
	-9	16	Feb 1	Feb 12	Feb 24	Mar 7	Mar 18	Nov 16	Nov 24	Dec 3	Dec 13	Dec 25
	-11	12	Jan 7	Jan 26	Jan 13	Mar 3	Mar 19	Nov 24	Dec 4	Dec 15	Dec 27	0

Table 2 (continued

STATION	TEMP. °C	°F	Spring Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Decreases to:					Fall Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Increases to:				
			90%	75%	50%	25%	10%	10%	25%	50%	75%	90%
HEIDELBERG	4	40	May 5	May 11	May 18	May 25	May 31	Sep 18	Sep 23	Sep 29	Oct 5	Oct 11
	2	36	Apr 20	Apr 27	May 5	May 12	May 19	Sep 23	Sep 29	Oct 5	Oct 11	Oct 17
	0	32	Apr 14	Apr 20	Apr 26	May 3	May 9	Oct 2	Oct 9	Oct 16	Oct 23	Oct 29
	-2	28	Mar 29	Apr 5	Apr 12	Apr 20	Apr 27	Oct 15	Oct 21	Oct 28	Nov 3	Nov 9
	-4	24	Mar 11	Mar 19	Mar 29	Apr 7	Apr 16	Oct 23	Oct 29	Nov 4	Nov 11	Nov 17
	-7	20	Feb 28	Mar 8	Mar 18	Mar 28	Apr 5	Oct 31	Nov 8	Nov 17	Nov 25	Dec 3
	-9	16	Feb 13	Feb 23	Mar 7	Mar 19	Mar 29	Nov 10	Nov 18	Nov 26	Dec 4	Dec 11
	-11	12	Jan 24	Feb 6	Feb 20	Mar 6	Mar 18	Nov 16	Nov 29	Dec 13	Dec 27	Jan 9
HENDERSON	4	40	Apr 20	Apr 27	May 5	May 13	May 20	Sep 20	Sep 25	Oct 1	Oct 7	Oct 13
	2	36	Apr 11	Apr 19	Apr 27	May 5	May 13	Sep 29	Oct 5	Oct 11	Oct 18	Oct 24
	0	32	Mar 28	Apr 3	Apr 11	Apr 18	Apr 25	Oct 13	Oct 19	Oct 26	Nov 3	Nov 9
	-2	28	Mar 14	Mar 20	Mar 27	Apr 3	Apr 9	Oct 19	Oct 26	Nov 3	Nov 10	Nov 17
	-4	24	Mar 2	Mar 8	Mar 16	Mar 23	Mar 30	Oct 29	Nov 4	Nov 11	Nov 18	Nov 24
	-7	20	Feb 12	Feb 22	Mar 5	Mar 16	Mar 26	Nov 10	Nov 19	Nov 29	Dec 9	Dec 17
	-9	16	Jan 28	Feb 9	Feb 22	Mar 6	Mar 18	Nov 19	Nov 30	Dec 12	Dec 23	Jan 3
	-11	12	Jan 16	Jan 30	Feb 13	Feb 27	Mar 11	Nov 21	Dec 5	Dec 21	Jan 7	Jan 25
HICKMAN	4	40	Apr 16	Apr 25	May 4	May 14	May 22	Sep 15	Sep 21	Sep 28	Oct 5	Oct 11
	2	36	Mar 31	Apr 10	Apr 20	Apr 30	May 10	Sep 24	Oct 1	Oct 9	Oct 16	Oct 24
	0	32	Mar 26	Mar 31	Apr 6	Apr 11	Apr 16	Oct 9	Oct 15	Oct 22	Oct 28	Nov 3
	-2	28	Mar 10	Mar 17	Mar 25	Apr 1	Apr 8	Oct 22	Oct 27	Nov 2	Nov 7	Nov 12
	-4	24	Feb 19	Mar 2	Mar 14	Mar 25	Apr 5	Oct 30	Nov 5	Nov 12	Nov 19	Nov 26
	-7	20	Feb 6	Feb 17	Mar 2	Mar 15	Mar 26	Nov 3	Nov 10	Nov 18	Nov 26	Dec 3
	-9	16	Jan 16	Jan 29	Feb 13	Mar 1	Mar 14	Nov 18	Nov 29	Dec 11	Dec 23	Jan 4
	-11	12	Dec 26	Jan 16	Feb 3	Feb 21	Mar 8	Dec 2	Dec 13	Dec 26	Jan 8	Jan 19
HOPKINSVILLE	4	40	Apr 22	Apr 30	May 8	May 16	May 23	Sep 22	Sep 28	Oct 5	Oct 13	Oct 19
	2	36	Apr 6	Apr 13	Apr 21	Apr 29	May 7	Oct 4	Oct 10	Oct 16	Oct 22	Oct 28
	0	32	Mar 29	Apr 4	Apr 11	Apr 19	Apr 25	Oct 15	Oct 20	Oct 25	Oct 31	Nov 5
	-2	28	Mar 13	Mar 21	Mar 29	Apr 7	Apr 14	Oct 24	Oct 30	Nov 5	Nov 11	Nov 16
	-4	24	Feb 27	Mar 7	Mar 15	Mar 24	Mar 31	Oct 30	Nov 5	Nov 11	Nov 18	Nov 24
	-7	20	Feb 6	Feb 17	Mar 2	Mar 14	Mar 26	Nov 10	Nov 16	Nov 23	Nov 30	Dec 7
	-9	16	Jan 17	Feb 1	Feb 18	Mar 6	Mar 21	Nov 19	Nov 28	Dec 8	Dec 19	Dec 28
	-11	12	Jan 9	Jan 25	Feb 10	Feb 26	Mar 12	Nov 24	Dec 7	Dec 20	Jan 4	Jan 23
IRVINGTON	4	40	Apr 21	May 1	May 11	May 20	May 28	Sep 17	Sep 23	Sep 29	Oct 6	Oct 13
	2	36	Apr 13	Apr 23	May 2	May 11	May 19	Sep 25	Oct 1	Oct 8	Oct 15	Oct 22
	0	32	Mar 29	Apr 9	Apr 20	Apr 30	May 9	Oct 2	Oct 10	Oct 18	Oct 26	Nov 4
	-2	28	Mar 19	Mar 28	Apr 7	Apr 16	Apr 24	Oct 14	Oct 20	Oct 28	Nov 4	Nov 11
	-4	24	Mar 10	Mar 18	Mar 26	Apr 3	Apr 10	Oct 26	Oct 31	Nov 6	Nov 12	Nov 18
	-7	20	Feb 23	Mar 5	Mar 14	Mar 23	Mar 31	Nov 6	Nov 13	Nov 21	Nov 30	Dec 8
	-9	16	Feb 1	Feb 15	Feb 28	Mar 13	Mar 25	Nov 14	Nov 25	Dec 6	Dec 18	Dec 29
	-11	12	Jan 13	Feb 1	Feb 16	Mar 2	Mar 15	Nov 19	Dec 3	Dec 20	Jan 8	Jan 29
LEITCHFIELD	4	40	Apr 18	Apr 27	May 7	May 16	May 25	Sep 22	Sep 27	Oct 3	Oct 9	Oct 14
	2	36	Apr 10	Apr 18	Apr 26	May 4	May 12	Sep 30	Oct 7	Oct 15	Oct 22	Oct 29
	0	32	Mar 31	Apr 4	Apr 14	Apr 21	Apr 28	Oct 12	Oct 19	Oct 27	Nov 4	Nov 11
	-2	28	Mar 21	Mar 27	Apr 2	Apr 8	Apr 14	Oct 22	Oct 28	Nov 4	Nov 10	Nov 16
	-4	24	Mar 2	Mar 10	Mar 20	Mar 29	Apr 6	Oct 31	Nov 6	Nov 14	Nov 21	Nov 28
	-7	20	Feb 18	Feb 27	Mar 9	Mar 19	Mar 29	Nov 10	Nov 16	Nov 24	Dec 1	Dec 7
	-9	16	Feb 1	Feb 13	Feb 27	Mar 12	Mar 24	Nov 13	Nov 24	Dec 6	Dec 18	Dec 29
	-11	12	Jan 13	Jan 29	Feb 14	Mar 2	Mar 16	Nov 20	Dec 5	Dec 21	Jan 7	Jan 24

(continued)

Table 2 (continued)

STATION	TEMP.		Spring Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Decreases to:					Fall Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Increases to:				
	°C	°F	90%	75%	50%	25%	10%	10%	25%	50%	75%	90%
LONDON	4	40	May 3	May 9	May 17	May 24	May 30	Sep 14	Sep 20	Sep 27	Oct 5	Oct 11
	2	36	Apr 23	Apr 30	May 8	May 16	May 24	Sep 19	Sep 26	Oct 5	Oct 13	Oct 21
	0	32	Apr 8	Apr 16	Apr 26	May 5	May 13	Oct 5	Oct 11	Oct 19	Oct 26	Nov 1
	-2	28	Mar 25	Apr 1	Apr 8	Apr 16	Apr 23	Oct 12	Oct 18	Oct 26	Nov 2	Nov 8
	-4	24	Mar 7	Mar 15	Mar 23	Apr 1	Apr 9	Oct 24	Oct 30	Nov 6	Nov 13	Nov 19
	-7	20	Feb 28	Mar 9	Mar 18	Mar 27	Apr 4	Nov 1	Nov 7	Nov 13	Nov 19	Nov 24
	-9	16	Feb 4	Feb 16	Feb 28	Mar 13	Mar 24	Nov 14	Nov 22	Dec 1	Dec 10	Dec 18
	-11	12	Jan 26	Feb 6	Feb 18	Mar 3	Mar 14	Nov 20	Dec 1	Dec 13	Dec 24	Jan 4
LOVELACEVILLE	4	40	Apr 22	Apr 29	May 7	May 14	May 21	Sep 20	Sep 25	Oct 1	Oct 7	Oct 12
	2	36	Apr 11	Apr 18	Apr 27	May 5	May 13	Sep 25	Oct 2	Oct 9	Oct 17	Oct 24
	0	32	Apr 1	Apr 7	Apr 15	Apr 22	Apr 29	Oct 5	Oct 12	Oct 19	Oct 27	Nov 3
	-2	28	Mar 21	Mar 27	Apr 4	Apr 11	Apr 17	Oct 20	Oct 25	Oct 30	Nov 4	Nov 9
	-4	24	Mar 7	Mar 14	Mar 22	Mar 30	Apr 6	Oct 26	Nov 1	Nov 8	Nov 15	Nov 22
	-7	20	Feb 14	Feb 25	Mar 9	Mar 20	Mar 31	Nov 2	Nov 9	Nov 18	Nov 26	Dec 3
	-9	16	Jan 30	Feb 10	Feb 23	Mar 8	Mar 19	Nov 12	Nov 23	Dec 6	Dec 18	Dec 30
	-11	12	Dec 24	Jan 24	Feb 8	Feb 21	Mar 4	Nov 19	Dec 5	Dec 22	Jan 10	Feb 16
MADISONVILLE	4	40	Apr 20	Apr 28	May 6	May 15	May 22	Sep 17	Sep 23	Sep 30	Oct 7	Oct 13
	2	36	Apr 8	Apr 16	Apr 25	May 4	May 12	Sep 28	Oct 3	Oct 9	Oct 15	Oct 20
	0	32	Mar 27	Apr 2	Apr 10	Apr 17	Apr 23	Oct 7	Oct 13	Oct 19	Oct 26	Nov 1
	-2	28	Mar 17	Mar 24	Mar 31	Apr 7	Apr 13	Oct 20	Oct 26	Nov 1	Nov 8	Nov 13
	-4	24	Mar 4	Mar 11	Mar 20	Mar 28	Apr 5	Oct 30	Nov 4	Nov 9	Nov 15	Nov 20
	-7	20	Feb 14	Feb 25	Mar 9	Mar 21	Apr 1	Nov 4	Nov 11	Nov 19	Nov 27	Dec 4
	-9	16	Jan 19	Feb 2	Feb 18	Mar 6	Mar 21	Nov 16	Nov 26	Dec 7	Dec 17	Dec 27
	-11	12	Dec 20	Jan 23	Feb 9	Feb 25	Mar 10	Nov 17	Nov 30	Dec 15	Dec 30	Jan 16
MAMMOTH CAVE	4	40	May 2	May 10	May 19	May 29	June 6	Aug 30	Sep 10	Sep 22	Oct 4	Oct 15
	2	36	Apr 20	Apr 28	May 8	May 18	May 26	Sep 23	Sep 29	Oct 6	Oct 12	Oct 18
	0	32	Apr 10	Apr 19	Apr 29	May 9	May 18	Oct 1	Oct 7	Oct 13	Oct 20	Oct 25
	-2	28	Mar 28	Apr 4	Apr 12	Apr 20	Apr 27	Oct 15	Oct 20	Oct 26	Nov 1	Nov 7
	-4	24	Mar 17	Mar 23	Mar 30	Apr 6	Apr 12	Oct 27	Nov 1	Nov 6	Nov 12	Nov 16
	-7	20	Mar 1	Mar 9	Mar 18	Mar 27	Apr 3	Nov 1	Nov 8	Nov 16	Nov 23	Nov 30
	-9	16	Feb 2	Feb 16	Mar 3	Mar 18	Apr 1	Nov 8	Nov 17	Nov 27	Dec 8	Dec 17
	-11	12	Jan 24	Feb 7	Feb 22	Mar 9	Mar 23	Nov 19	Nov 30	Dec 12	Dec 24	Jan 3
MANCHESTER	4	40	May 4	May 11	May 18	May 25	June 1	Sep 16	Sep 23	Sep 29	Oct 6	Oct 12
	2	36	Apr 25	May 3	May 11	May 19	May 26	Sep 22	Sep 28	Oct 6	Oct 13	Oct 20
	0	32	Apr 13	Apr 21	May 1	May 11	May 19	Oct 2	Oct 7	Oct 14	Oct 21	Oct 27
	-2	28	Mar 29	Apr 7	Apr 16	Apr 26	May 5	Oct 13	Oct 19	Oct 25	Nov 1	Nov 6
	-4	24	Mar 19	Mar 26	Apr 2	Apr 9	Apr 16	Oct 19	Oct 24	Oct 30	Nov 4	Nov 9
	-7	20	Mar 2	Mar 10	Mar 19	Mar 28	Apr 6	Oct 27	Nov 2	Nov 8	Nov 15	Nov 21
	-9	16	Feb 13	Feb 24	Mar 8	Mar 19	Mar 30	Nov 2	Nov 11	Nov 21	Dec 2	Dec 11
	-11	12	Jan 25	Feb 7	Feb 22	Mar 8	Mar 21	Nov 11	Nov 22	Dec 5	Dec 17	Dec 28
MAYFIELD	4	40	Apr 21	Apr 28	May 7	May 15	May 23	Sep 19	Sep 25	Oct 1	Oct 8	Oct 14
	2	36	Apr 7	Apr 15	Apr 24	May 3	May 11	Sep 28	Oct 5	Oct 13	Oct 21	Oct 28
	0	32	Mar 25	Apr 1	Apr 10	Apr 18	Apr 25	Oct 9	Oct 16	Oct 24	Oct 31	Nov 7
	-2	28	Mar 15	Mar 21	Mar 28	Apr 4	Apr 10	Oct 21	Oct 28	Nov 6	Nov 15	Nov 22
	-4	24	Mar 8	Mar 15	Mar 22	Mar 30	Apr 5	Oct 29	Nov 6	Nov 14	Nov 22	Nov 30
	-7	20	Feb 22	Mar 2	Mar 12	Mar 22	Mar 30	Nov 6	Nov 15	Nov 24	Dec 4	Dec 12
	-9	16	Feb 2	Feb 12	Feb 23	Mar 6	Mar 15	Nov 21	Dec 2	Dec 13	Dec 25	Jan 4
	-11	12	Jan 22	Feb 3	Feb 16	Mar 1	Mar 12	Dec 2	Dec 14	Dec 26	Jan 8	Jan 19

Table 2 (continued)

STATION	TEMP. °C	°F	Spring Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Decreases to:					Fall Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Increases to:				
			90%	75%	50%	25%	10%	10%	25%	50%	75%	90%
MAYSVILLE	4	40	May 1	May 8	May 16	May 24	June 1	Sep 18	Sep 23	Sep 30	Oct 6	Oct 12
	2	36	Apr 18	Apr 25	May 3	May 11	May 18	Sep 18	Sep 29	Oct 11	Oct 23	Nov 2
	0	32	Apr 7	Apr 15	Apr 25	May 4	May 12	Oct 4	Oct 13	Oct 24	Nov 4	Nov 14
	-2	28	Mar 24	Mar 31	Apr 9	Apr 17	Apr 24	Oct 18	Oct 26	Nov 4	Nov 13	Nov 21
	-4	24	Mar 7	Mar 14	Mar 23	Mar 31	Apr 8	Oct 27	Nov 5	Nov 14	Nov 24	Dec 2
	-7	20	Feb 23	Mar 4	Mar 13	Mar 22	Mar 31	Nov 4	Nov 14	Nov 24	Dec 4	Dec 13
	-9	16	Feb 9	Feb 18	Mar 1	Mar 12	Mar 21	Nov 19	Nov 28	Dec 8	Dec 17	Dec 26
	-11	12	Jan 23	Feb 4	Feb 18	Mar 3	Mar 15	Nov 21	Dec 3	Dec 15	Dec 28	Jan 8
MIDDLESBORO	4	40	May 1	May 7	May 15	May 22	May 28	Sep 18	Sep 23	Sep 29	Oct 5	Oct 10
	2	36	Apr 18	Apr 26	May 6	May 15	May 23	Sep 23	Oct 1	Oct 9	Oct 17	Oct 24
	0	32	Apr 12	Apr 19	Apr 27	May 5	May 13	Oct 4	Oct 11	Oct 19	Oct 27	Nov 3
	-2	28	Mar 28	Apr 4	Apr 12	Apr 20	Apr 27	Oct 20	Oct 24	Oct 29	Nov 2	Nov 6
	-4	24	Mar 17	Mar 23	Mar 29	Apr 5	Apr 11	Oct 25	Oct 29	Nov 4	Nov 9	Nov 14
	-7	20	Feb 22	Mar 3	Mar 14	Mar 25	Apr 3	Oct 28	Nov 3	Nov 10	Nov 17	Nov 23
	-9	16	Jan 31	Feb 13	Feb 26	Mar 12	Mar 25	Nov 10	Nov 19	Nov 29	Dec 9	Dec 17
	-11	12	Dec 25	Jan 21	Feb 8	Feb 23	Mar 9	Nov 17	Nov 30	Dec 15	Jan 1	Jan 28
MURRAY	4	40	Apr 14	Apr 22	May 2	May 11	May 19	Sep 23	Sep 30	Oct 8	Oct 15	Oct 22
	2	36	Mar 31	Apr 9	Apr 18	Apr 27	May 6	Oct 2	Oct 9	Oct 17	Oct 25	Nov 1
	0	32	Mar 21	Mar 28	Apr 4	Apr 12	Apr 19	Oct 13	Oct 20	Oct 28	Nov 5	Nov 12
	-2	28	Mar 11	Mar 19	Mar 27	Apr 4	Apr 12	Oct 23	Oct 29	Nov 5	Nov 13	Nov 19
	-4	24	Feb 28	Mar 8	Mar 16	Mar 24	Mar 31	Nov 1	Nov 8	Nov 16	Nov 24	Dec 1
	-7	20	Feb 7	Feb 18	Mar 2	Mar 15	Mar 26	Nov 7	Nov 18	Nov 29	Dec 11	Dec 21
	-9	16	Jan 13	Jan 27	Feb 11	Feb 26	Mar 12	Nov 18	Dec 1	Dec 14	Dec 28	Jan 9
	-11	12	Dec 18	Jan 19	Feb 3	Feb 16	Feb 28	Nov 27	Dec 10	Dec 26	Jan 12	Feb 14
OWENSBORO	4	40	Apr 20	Apr 27	May 5	May 12	May 20	Sep 19	Sep 25	Oct 2	Oct 10	Oct 16
	2	36	Apr 6	Apr 14	Apr 23	May 2	May 10	Sep 25	Oct 2	Oct 10	Oct 18	Oct 25
	0	32	Mar 29	Apr 4	Apr 10	Apr 17	Apr 23	Oct 7	Oct 14	Oct 21	Oct 28	Nov 4
	-2	28	Mar 16	Mar 23	Mar 30	Apr 7	Apr 13	Oct 22	Oct 27	Nov 2	Nov 7	Nov 12
	-4	24	Mar 2	Mar 9	Mar 16	Mar 24	Mar 31	Oct 30	Nov 4	Nov 10	Nov 16	Nov 22
	-7	20	Feb 9	Feb 20	Mar 4	Mar 15	Mar 26	Nov 4	Nov 13	Nov 23	Dec 3	Dec 12
	-9	16	Jan 25	Feb 6	Feb 20	Mar 6	Mar 19	Nov 17	Nov 28	Dec 10	Dec 22	Jan 2
	-11	12	Jan 10	Jan 27	Feb 11	Feb 25	Mar 9	Nov 22	Dec 5	Dec 20	Jan 5	Jan 23
PADUCAH	4	40	Apr 14	Apr 22	Apr 30	May 9	May 17	Sep 24	Sep 30	Oct 6	Oct 13	Oct 18
	2	36	Apr 5	Apr 13	Apr 22	May 1	May 9	Oct 1	Oct 8	Oct 15	Oct 23	Oct 30
	0	32	Mar 21	Mar 27	Apr 4	Apr 11	Apr 17	Oct 16	Oct 22	Oct 28	Nov 4	Nov 9
	-2	28	Mar 11	Mar 17	Mar 24	Mar 31	Apr 7	Oct 25	Oct 31	Nov 7	Nov 13	Nov 20
	-4	24	Feb 24	Mar 4	Mar 12	Mar 21	Mar 29	Oct 31	Nov 7	Nov 14	Nov 21	Nov 28
	-7	20	Feb 6	Feb 17	Mar 2	Mar 15	Mar 26	Nov 7	Nov 17	Nov 28	Dec 9	Dec 19
	-9	16	Jan 21	Feb 2	Feb 15	Mar 1	Mar 13	Nov 16	Nov 30	Dec 16	Jan 1	Jan 16
	-11	12	—	Jan 21	Feb 5	Feb 19	Mar 2	Nov 27	Dec 10	Dec 25	Jan 10	Feb 15
PIKEVILLE	4	40	Apr 16	Apr 25	May 4	May 14	May 22	Sep 24	Sep 29	Oct 5	Oct 11	Oct 17
	2	36	Apr 17	Apr 22	Apr 28	May 4	May 10	Sep 29	Oct 7	Oct 16	Oct 24	Nov 1
	0	32	Apr 2	Apr 9	Apr 17	Apr 25	May 2	Oct 15	Oct 20	Oct 26	Nov 1	Nov 6
	-2	28	Mar 17	Mar 23	Mar 30	Apr 7	Apr 13	Oct 24	Oct 29	Nov 4	Nov 9	Nov 14
	-4	24	Feb 28	Mar 8	Mar 17	Mar 27	Apr 4	Oct 28	Nov 4	Nov 12	Nov 20	Nov 28
	-7	20	Feb 15	Feb 25	Mar 8	Mar 20	Mar 30	Nov 12	Nov 20	Nov 29	Dec 8	Dec 16
	-9	16	Jan 28	Feb 9	Feb 23	Mar 9	Mar 21	Nov 21	Dec 1	Dec 12	Dec 23	Jan 1
	-11	12	—	Jan 29	Feb 13	Feb 26	Mar 9	Nov 28	Dec 11	Dec 25	Jan 10	Jan 28

(continued)

Table 2 (continued)

STATION	TEMP.		Spring Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Decreases to:					Fall Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Increases to:				
	°C	°F	90%	75%	50%	25%	10%	10%	25%	50%	75%	90%
PRINCETON	4	40	Apr 26	May 2	May 9	May 15	May 21	Sep 12	Sep 19	Sep 27	Oct 5	Oct 12
	2	36	Apr 11	Apr 19	Apr 29	May 8	May 17	Sep 22	Sep 30	Oct 10	Oct 19	Oct 28
	0	32	Mar 24	Apr 1	Apr 10	Apr 19	Apr 26	Oct 1	Oct 10	Oct 19	Oct 28	Nov 5
	-2	28	Mar 20	Mar 26	Apr 1	Apr 8	Apr 14	Oct 20	Oct 26	Nov 1	Nov 8	Nov 14
	-4	24	Mar 8	Mar 15	Mar 23	Mar 31	Apr 7	Oct 25	Oct 31	Nov 8	Nov 16	Nov 23
	-7	20	Feb 21	Mar 4	Mar 15	Mar 27	Apr 7	Nov 4	Nov 12	Nov 21	Nov 30	Dec 9
	-9	16	Feb 12	Feb 23	Mar 7	Mar 19	Mar 30	Nov 15	Nov 25	Dec 6	Dec 17	Dec 26
	-11	12	Feb 2	Feb 12	Feb 24	Mar 8	Mar 19	Nov 27	Dec 10	Dec 24	Jan 8	Jan 27
RICHMOND	4	40	Apr 25	May 2	May 10	May 18	May 25	Sep 18	Sep 25	Oct 2	Oct 9	Oct 15
	2	36	Apr 9	Apr 17	Apr 26	May 5	May 12	Sep 29	Oct 6	Oct 13	Oct 20	Oct 26
	0	32	Apr 4	Apr 12	Apr 20	Apr 29	May 7	Oct 11	Oct 18	Oct 25	Nov 1	Nov 7
	-2	28	Mar 23	Mar 29	Apr 6	Apr 14	Apr 20	Oct 19	Oct 25	Oct 31	Nov 7	Nov 12
	-4	24	Mar 7	Mar 15	Mar 23	Mar 31	Apr 8	Oct 29	Nov 4	Nov 11	Nov 19	Nov 25
	-7	20	Feb 17	Feb 28	Mar 12	Mar 24	Apr 4	Nov 4	Nov 12	Nov 21	Nov 30	Dec 8
	-9	16	Feb 2	Feb 15	Feb 28	Mar 14	Mar 27	Nov 12	Nov 23	Dec 4	Dec 16	Dec 26
	-11	12	Jan 21	Feb 3	Feb 16	Feb 28	Mar 11	Nov 24	Dec 7	Dec 23	Jan 7	Jan 23
RUSSELLVILLE	4	40	Apr 20	Apr 29	May 9	May 18	May 27	Sep 14	Sep 23	Oct 3	Oct 13	Oct 21
	2	36	Apr 11	Apr 19	Apr 28	May 8	May 16	Sep 23	Oct 1	Oct 11	Oct 21	Oct 30
	0	32	Mar 31	Apr 8	Apr 18	Apr 27	May 6	Oct 1	Oct 10	Oct 20	Oct 29	Nov 7
	-2	28	Mar 20	Mar 26	Apr 2	Apr 9	Apr 15	Oct 17	Oct 24	Oct 31	Nov 8	Nov 14
	-4	24	Mar 1	Mar 9	Mar 17	Mar 26	Apr 2	Oct 22	Nov 1	Nov 11	Nov 22	Dec 2
	-7	20	Feb 13	Feb 23	Mar 7	Mar 19	Mar 29	Nov 1	Nov 11	Nov 23	Dec 4	Dec 14
	-9	16	Jan 24	Feb 7	Feb 23	Mar 10	Mar 25	Nov 14	Nov 26	Dec 11	Dec 25	Jan 7
	-11	12	Jan 10	Jan 28	Feb 13	Feb 27	Mar 11	Nov 23	Dec 7	Dec 23	Jan 9	Jan 30
SHELBYVILLE	4	40	Apr 30	May 7	May 15	May 22	May 29	Sep 20	Sep 25	Oct 1	Oct 6	Oct 12
	2	36	Apr 17	Apr 23	Apr 30	May 7	May 14	Sep 24	Oct 1	Oct 8	Oct 15	Oct 21
	0	32	Apr 4	Apr 12	Apr 20	Apr 28	May 6	Oct 2	Oct 9	Oct 17	Oct 24	Oct 31
	-2	28	Mar 25	Apr 2	Apr 11	Apr 20	Apr 27	Oct 18	Oct 24	Oct 30	Nov 5	Nov 11
	-4	24	Mar 13	Mar 19	Mar 26	Apr 2	Apr 9	Oct 26	Nov 1	Nov 7	Nov 13	Nov 19
	-7	20	Feb 24	Mar 5	Mar 14	Mar 24	Apr 2	Nov 4	Nov 11	Nov 19	Nov 27	Dec 5
	-9	16	Feb 13	Feb 22	Mar 5	Mar 16	Mar 25	Nov 13	Nov 21	Nov 30	Dec 9	Dec 17
	-11	12	Jan 26	Feb 7	Feb 20	Mar 6	Mar 17	Nov 17	Nov 30	Dec 14	Dec 29	Jan 10
SOMERSET	4	40	May 3	May 9	May 16	May 23	May 28	Sep 16	Sep 23	Sep 30	Oct 8	Oct 14
	2	36	Apr 14	Apr 23	May 3	May 13	May 22	Sep 24	Sep 30	Oct 7	Oct 14	Oct 20
	0	32	Apr 4	Apr 13	Apr 23	May 3	May 13	Oct 4	Oct 10	Oct 17	Oct 24	Oct 31
	-2	28	Mar 22	Apr 1	Apr 11	Apr 21	May 1	Oct 14	Oct 19	Oct 25	Oct 31	Nov 6
	-4	24	Mar 10	Mar 19	Mar 29	Apr 8	Apr 17	Oct 23	Oct 28	Nov 3	Nov 8	Nov 13
	-7	20	Feb 20	Mar 2	Mar 14	Mar 25	Apr 4	Oct 26	Nov 2	Nov 10	Nov 18	Nov 25
	-9	16	Feb 2	Feb 14	Feb 27	Mar 12	Mar 24	Nov 12	Nov 19	Nov 27	Dec 5	Dec 12
	-11	12	Jan 16	Feb 1	Feb 15	Feb 28	Mar 12	Nov 15	Nov 27	Dec 11	Dec 27	Jan 12
WILLIAMSBURG	4	40	Apr 24	May 3	May 11	May 19	May 26	Sep 18	Sep 24	Oct 1	Oct 8	Oct 15
	2	36	Apr 17	Apr 26	May 5	May 13	May 20	Sep 27	Oct 4	Oct 11	Oct 18	Oct 24
	0	32	Mar 30	Apr 11	Apr 21	May 2	May 11	Oct 1	Oct 9	Oct 18	Oct 27	Nov 4
	-2	28	Mar 15	Mar 28	Apr 9	Apr 20	Apr 30	Oct 20	Oct 25	Oct 31	Nov 6	Nov 11
	-4	24	Mar 6	Mar 15	Mar 24	Apr 1	Apr 8	Oct 27	Nov 2	Nov 9	Nov 15	Nov 21
	-7	20	Feb 12	Feb 27	Mar 12	Mar 25	Apr 5	Nov 3	Nov 10	Nov 18	Nov 26	Dec 3
	-9	16	Feb 2	Feb 17	Mar 1	Mar 12	Mar 22	Nov 17	Nov 25	Dec 5	Dec 14	Dec 22
	-11	12	Jan 31	Feb 10	Feb 19	Feb 28	Mar 8	Nov 26	Dec 7	Dec 19	Jan 1	Jan 15

Table 2 (continued)

STATION	TEMP. °C	°F	Spring Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Decreases to:					Fall Dates by Which the Chance of Occurrence of Indicated Temperature (or Lower) Increases to:				
			90%	75%	50%	25%	10%	10%	25%	50%	75%	90%
WILLIAMSTOWN	4	40	Apr 27	May 4	May 12	May 20	May 28	Sep 20	Sep 25	Oct 1	Oct 7	Oct 12
	2	36	Apr 14	Apr 21	Apr 30	May 8	May 16	Sep 29	Oct 5	Oct 12	Oct 19	Oct 25
	0	32	Apr 3	Apr 11	Apr 20	Apr 29	May 8	Oct 15	Oct 20	Oct 26	Nov 1	Nov 6
	-2	28	Mar 18	Mar 26	Apr 4	Apr 13	Apr 22	Oct 22	Oct 28	Nov 4	Nov 10	Nov 16
	-4	24	Mar 12	Mar 19	Mar 27	Apr 3	Apr 10	Oct 30	Nov 5	Nov 12	Nov 19	Nov 26
	-7	20	Feb 26	Mar 6	Mar 15	Mar 24	Apr 1	Nov 6	Nov 12	Nov 20	Nov 27	Dec 4
	-9	16	Feb 15	Feb 25	Mar 7	Mar 18	Mar 28	Nov 15	Nov 23	Dec 2	Dec 12	Dec 20
	-11	12	Feb 26	Feb 15	Feb 26	Mar 8	Mar 18	Nov 19	Nov 30	Dec 12	Dec 24	Jan 4
WOLF CREEK DAM	4	40	Apr 29	May 6	May 14	May 23	May 30	Sep 17	Sep 23	Sep 29	Oct 6	Oct 12
	2	36	Apr 16	Apr 25	May 4	May 14	May 23	Sep 27	Oct 3	Oct 11	Oct 18	Oct 25
	0	32	Apr 11	Apr 18	Apr 26	May 4	May 11	Oct 7	Oct 14	Oct 21	Oct 28	Nov 4
	-2	28	Mar 21	Mar 29	Apr 7	Apr 16	Apr 25	Oct 19	Oct 24	Oct 29	Nov 4	Nov 9
	-4	24	Mar 12	Mar 20	Mar 28	Apr 5	Apr 13	Oct 25	Oct 31	Nov 6	Nov 13	Nov 19
	-7	20	Feb 17	Feb 28	Mar 12	Mar 25	Apr 4	Oct 30	Nov 6	Nov 13	Nov 20	Nov 27
	-9	16	Jan 11	Feb 2	Feb 23	Mar 14	Mar 31	Nov 10	Nov 21	Dec 4	Dec 17	Dec 31
	-11	12	Dec 13	Jan 22	Feb 10	Feb 28	Mar 15	Nov 26	Dec 8	Dec 22	Jan 6	Feb 6

Some tender plants, such as tomatoes, can be seriously injured by a frost without the temperature actually reaching 32°. For crops such as this the grower may wish to use 36° as a threshold to determine the risk of cold damage rather than 32°. If the farmer in Bowling Green chose to do that, he would find the risk of 36° temperature has dropped to 25% on May 4 and would continue to drop to 10% by May 12.

The relative shortness of the growing season, "freeze-free" days or "frost free" days influences greatly the choice of crops and varieties. Figure 2c shows the average number of days between the last occurrence of 32° or lower in the spring and the first occurrence of 32° or lower in the fall. Again, some farmers may prefer to estimate the length of the frost-free season by using 36° instead of 32. The average length of that period is shown in Fig. 3c. Data shown in Table 3 can be used to determine the length of probable growing season for various temperature thresholds.

For instance, the table shows the average length of the 32° growing season at Henderson is 198 days. There is a 90% chance that it will be 181 days but only a 10% chance of 214 days. The average period between the last 36° reading in the spring and the first 36° reading in the fall is about 30 days shorter there.

Many fruit trees are susceptible to cold injury during the spring after buds begin to swell. Table 1 indicates that 24° and 28° are rather key temperatures during the development stage of several different fruits. Figures 4 and 5 have been prepared to show the average dates when the probability of these particular temperatures occurring has dropped to 50%.

In addition to experiencing freeze damage during the fall or spring, many crops grown in Kentucky such as peaches and small grain can be injured by extreme winter cold. The degree of damage often varies with the temperature trends just prior to the extreme conditions. A long period of generally cold weather develops a hardiness which strengthens a plant's endurance to cold however several days of abnormally warm winter weather can cause the loss of a certain amount of winter hardiness and increase the risk of cold injury. Table 4 has been prepared to

Fig. 2a.—Average date of last 32°F in spring.

Fig. 2b.—Average date of first 32°F in fall.

Fib. 2c.—Average number of days between last 32°F in spring and first 32°F in fall.
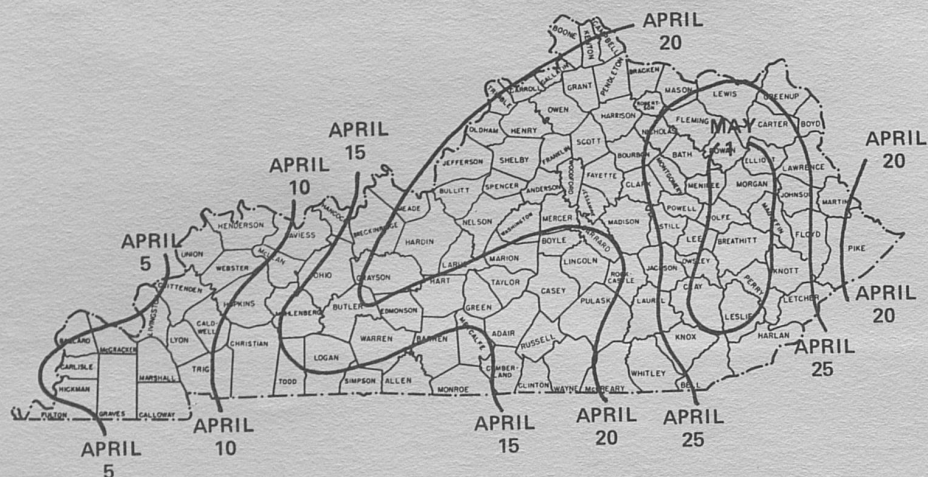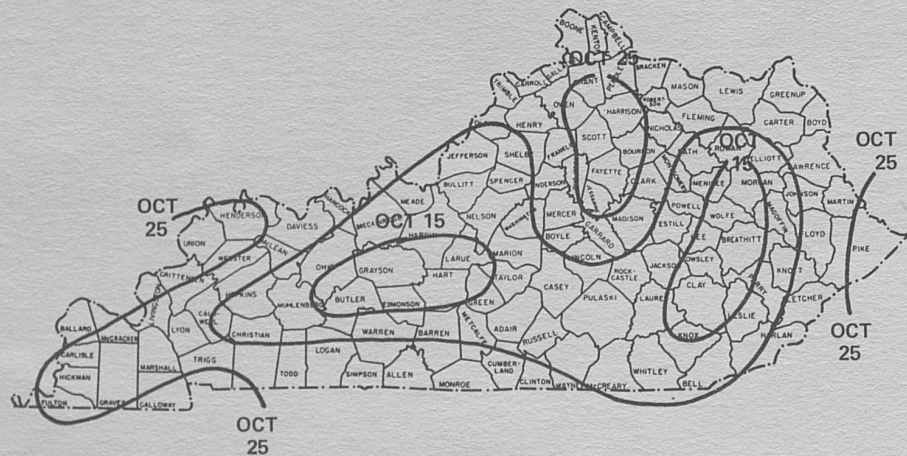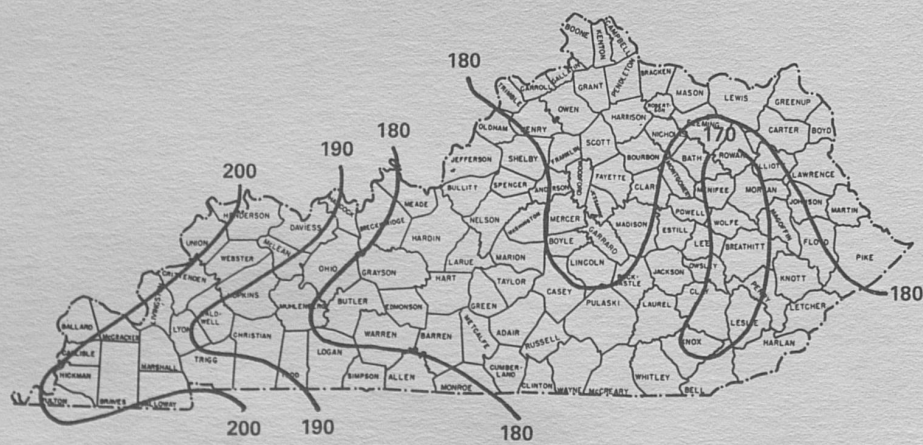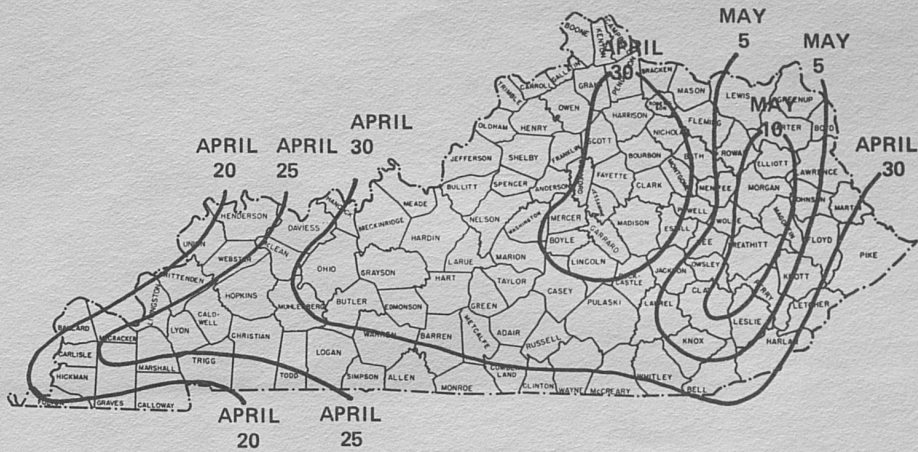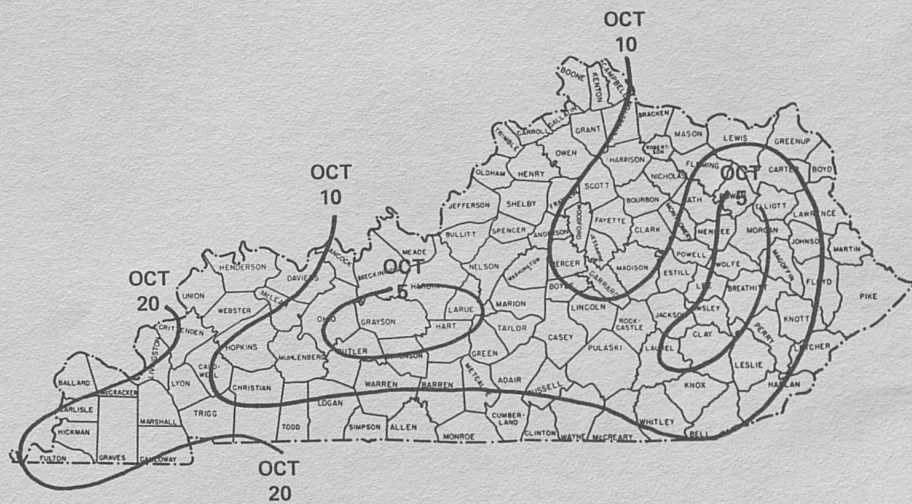
Fig. 3a.—Average date of last 36°F in spring.

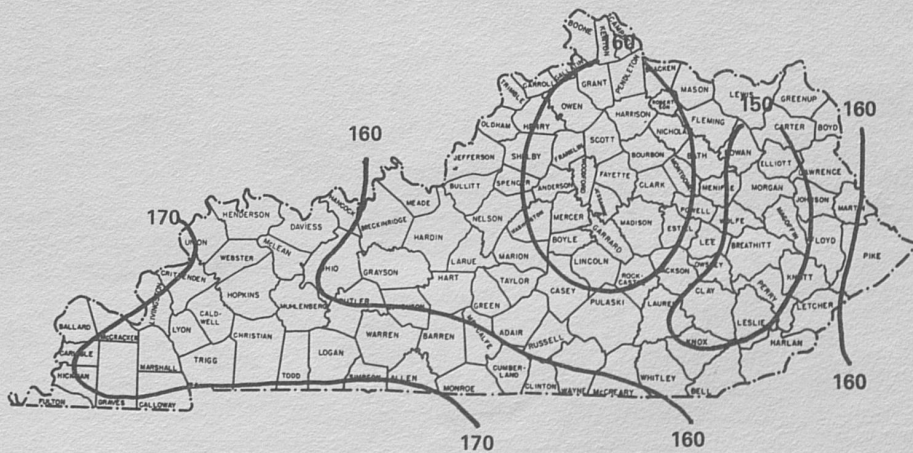Fig. 3b.—Average date of first 36°F in fall.

Fig. 3c.—Average number of days between last 36°F in spring and first 36°F in fall.

TABLE 3.—PROBABILITY OF A GIVEN NUMBER OF DAYS OR MORE BETWEEN LAST SPRING AND FIRST FALL OCCURRENCES.

STATION	°C	°F	10%	25%	50%	75%	90%	STATION	°C	°F	10%	25%	50%	75%	90%
ASHLAND	4	40	163	151	138	125	113	DANVILLE	4	40	160	151	141	131	122
	2	36	186	173	159	144	132		2	36	187	176	163	151	140
	0	32	206	194	181	168	156		0	32	206	197	187	178	169
	-2	28	232	221	209	197	186		-2	28	234	223	212	200	190
	-4	24	262	249	235	221	208		-4	24	256	246	234	221	211
	-7	20	288	273	256	239	224		-7	20	280	270	258	246	235
	-9	16	305	290	274	257	236		-9	16	312	296	277	256	218
	-11	12	355	332	306	278	243		-11	12	345	324	298	266	—
BARDSTOWN	4	40	159	150	139	129	120	FARMERS	4	40	147	137	127	116	106
	2	36	181	170	157	144	133		2	36	164	155	145	135	126
	0	32	201	190	177	165	153		0	32	183	174	164	154	145
	-2	28	215	207	199	190	183		-2	28	211	202	193	183	174
	-4	24	238	230	220	211	202		-4	24	235	226	215	205	195
	-7	20	272	259	244	230	217		-7	20	263	251	238	225	213
	-9	16	314	295	274	252	233		-9	16	282	270	257	244	233
	-11	12	345	323	296	266	—		-11	12	315	300	283	266	249
BEAVER DAM	4	40	159	148	137	125	112	FORDS FERRY	4	40	182	173	163	152	143
	2	36	175	165	154	142	131		2	36	208	200	191	182	173
	0	32	190	182	173	164	155		0	32	222	215	207	199	192
	-2	28	216	209	200	191	182		-2	28	241	235	228	221	214
	-4	24	246	237	227	217	207		-4	24	276	264	251	238	225
	-7	20	264	254	243	231	220		-7	20	304	290	274	259	245
	-9	16	312	296	277	258	238		-9	16	332	314	292	268	220
	-11	12	350	327	300	270	214		-11	12	351	331	308	283	232
BEREA	4	40	163	153	141	129	117	FRANKFORT	4	40	154	147	139	131	122
	2	36	184	174	162	150	138		2	36	179	170	159	148	136
	0	32	206	196	185	174	162		0	32	200	192	183	173	163
	-2	28	243	228	212	196	179		-2	28	229	218	205	192	179
	-4	24	258	247	234	221	208		-4	24	251	242	232	222	212
	-7	20	287	274	258	242	226		-7	20	277	265	252	238	224
	-9	16	320	301	280	258	236		-9	16	307	293	278	262	246
	-11	12	341	322	300	275	228		-11	12	332	316	298	278	239
BOWLING GREEN	4	40	167	159	149	140	131	GREENSBURG	4	40	151	145	137	130	123
	2	36	190	181	171	161	153		2	36	174	166	157	148	139
	0	32	209	201	193	185	178		0	32	197	187	176	166	156
	-2	28	234	227	218	209	201		-2	28	227	216	205	193	183
	-4	24	269	257	243	230	218		-4	24	247	237	226	215	205
	-7	20	297	283	269	254	240		-7	20	272	261	248	236	225
	-9	16	335	316	295	272	244		-9	16	304	290	275	259	242
	-11	12	353	334	311	284	—		-11	12	324	309	292	269	—
COVINGTON	4	40	156	148	139	129	121	GREENVILLE	4	40	167	156	144	132	121
	2	36	180	170	159	149	139		2	36	187	175	161	148	135
	0	32	201	193	185	176	168		0	32	202	193	183	173	165
	-2	28	226	217	207	196	187		-2	28	227	216	205	193	183
	-4	24	247	239	230	221	213		-4	24	244	234	224	213	204
	-7	20	276	263	249	234	222		-7	20	266	255	243	231	221
	-9	16	304	290	275	260	246		-9	16	304	291	276	260	241
	-11	12	339	321	302	282	264		-11	12	330	315	297	278	—

Table 3 (continued)

STATION	TEMP. °C	TEMP. °F	PROBABILITY 10%	25%	50%	75%	90%
HEIDELBERG	4	40	150	142	133	124	116
	2	36	173	163	153	142	133
	0	32	189	181	172	163	155
	-2	28	215	207	198	189	181
	-4	24	243	232	220	207	196
	-7	20	272	258	243	227	214
	-9	16	291	277	263	248	235
	-11	12	335	317	296	275	256
HENDERSON	4	40	165	157	149	140	132
	2	36	185	176	167	157	149
	0	32	214	207	198	189	181
	-2	28	240	231	220	209	199
	-4	24	256	248	239	230	222
	-7	20	295	282	268	253	240
	-9	16	328	311	292	274	257
	-11	12	350	329	305	280	248
HICKMAN	4	40	164	155	146	137	129
	2	36	194	183	171	159	148
	0	32	216	208	198	188	180
	-2	28	239	231	221	212	204
	-4	24	269	256	243	229	217
	-7	20	291	277	260	244	230
	-9	16	344	323	300	277	256
	-11	12	367	245	321	295	266
HOPKINSVILLE	4	40	171	161	150	139	129
	2	36	195	187	177	168	159
	0	32	214	205	196	187	178
	-2	28	241	231	220	208	198
	-4	24	262	252	241	229	219
	-7	20	291	279	266	252	240
	-9	16	330	312	293	273	256
	-11	12	353	332	307	278	—
IRVINGTON	4	40	163	151	138	125	108
	2	36	180	169	156	143	127
	0	32	200	190	178	165	150
	-2	28	220	211	201	190	177
	-4	24	240	232	222	211	199
	-7	20	272	261	249	236	220
	-9	16	312	295	276	255	230
	-11	12	345	322	295	263	—
LEITCHFIELD	4	40	172	161	148	135	122
	2	36	193	182	170	158	145
	0	32	213	204	194	184	174
	-2	28	233	224	214	204	194
	-4	24	262	251	237	224	210
	-7	20	282	271	258	245	232
	-9	16	314	299	281	263	245
	-11	12	351	329	303	274	221
LONDON	4	40	154	144	133	122	112
	2	36	174	162	149	135	124
	0	32	200	188	175	162	150
	-2	28	217	209	199	190	181
	-4	24	244	236	227	218	209
	-7	20	258	249	239	230	221
	-9	16	310	293	275	257	241
	-11	12	336	317	296	275	257
LOVELACEVILLE	4	40	164	156	147	137	128
	2	36	185	176	165	154	143
	0	32	208	198	186	175	163
	-2	28	227	218	208	198	187
	-4	24	248	239	230	220	210
	-7	20	278	266	253	239	225
	-9	16	320	304	285	265	246
	-11	12	351	328	300	261	—
MADISONVILLE	4	40	163	155	146	137	129
	2	36	184	176	166	157	148
	0	32	206	199	192	184	177
	-2	28	235	225	215	204	195
	-4	24	252	244	234	224	215
	-7	20	282	269	254	240	227
	-9	16	332	312	291	269	249
	-11	12	343	322	297	266	—
MAMMOTH CAVE	4	40	159	142	124	105	86
	2	36	174	162	150	137	124
	0	32	185	176	165	155	144
	-2	28	213	205	196	187	178
	-4	24	237	229	220	211	202
	-7	20	265	254	241	228	215
	-9	16	303	287	268	249	229
	-11	12	331	312	291	269	247
MANCHESTER	4	40	152	143	134	124	115
	2	36	168	158	147	136	127
	0	32	183	174	165	156	148
	-2	28	211	202	191	181	172
	-4	24	225	218	210	202	195
	-7	20	254	244	233	222	212
	-9	16	281	270	258	246	235
	-11	12	322	305	285	266	249
MAYFIELD	4	40	171	159	146	132	115
	2	36	189	180	169	158	145
	0	32	218	207	194	180	165
	-2	28	244	233	220	207	191
	-4	24	260	248	234	220	202
	-7	20	282	270	256	240	222
	-9	16	319	307	293	278	261
	-11	12	347	329	310	289	264

(continued)

Table 3 (continued)

STATION	TEMP.		PROBABILITY					STATION	TEMP.		PROBABILITY				
	°C	°F	10%	25%	50%	75%	90%		°C	°F	10%	25%	50%	75%	90%
MAYSVILLE	4	40	155	146	136	125	115	PRINCETON	4	40	158	150	141	131	119
	2	36	189	175	159	143	127		2	36	186	174	161	147	130
	0	32	211	197	181	165	148		0	32	215	202	188	173	155
	-2	28	232	221	208	195	182		-2	28	234	223	211	197	182
	-4	24	257	247	235	223	211		-4	24	252	240	227	213	197
	-7	20	281	268	254	240	225		-7	20	281	266	249	230	208
	-9	16	312	297	280	263	246		-9	16	305	290	272	254	232
	-11	12	335	318	299	280	260		-11	12	334	317	297	272	—
MIDDLESBORO	4	40	152	145	137	129	121	RICHMOND	4	40	163	154	143	133	122
	2	36	178	167	155	143	132		2	36	191	181	169	156	144
	0	32	196	185	174	163	152		0	32	207	197	186	175	164
	-2	28	211	205	199	192	186		-2	28	226	217	207	197	187
	-4	24	234	227	219	210	203		-4	24	254	244	232	220	207
	-7	20	263	252	240	228	218		-7	20	281	268	252	237	221
	-9	16	300	288	274	261	249		-9	16	309	294	277	260	243
	-11	12	343	322	296	261	—		-11	12	346	326	304	278	235
MURRAY	4	40	181	170	158	146	133	RUSSELLVILLE	4	40	174	161	146	131	116
	2	36	198	190	180	170	161		2	36	189	178	165	152	139
	0	32	231	218	205	191	177		0	32	209	197	183	169	155
	-2	28	243	233	222	210	198		-2	28	230	221	210	199	188
	-4	24	269	257	244	230	216		-4	24	265	252	238	223	208
	-7	20	297	285	271	256	242		-7	20	291	276	259	242	224
	-9	16	345	326	305	283	261		-9	16	334	313	289	265	241
	-11	12	359	337	311	273	—		-11	12	345	325	301	271	—
OWENSBORO	4	40	170	160	150	140	130	SHELBYVILLE	4	40	157	148	138	129	120
	2	36	190	180	169	158	148		2	36	179	170	160	150	140
	0	32	211	202	193	184	175		0	32	201	191	179	167	157
	-2	28	235	226	216	205	196		-2	28	221	212	201	191	182
	-4	24	257	248	238	228	219		-4	24	242	234	225	216	208
	-7	20	291	278	263	249	236		-7	20	275	263	249	235	223
	-9	16	329	311	292	273	255		-9	16	296	283	269	255	242
	-11	12	346	326	303	276	—		-11	12	335	317	296	276	257
PADUCAH	4	40	179	169	157	145	133	SOMERSET	4	40	155	146	137	127	119
	2	36	199	188	175	162	148		2	36	174	166	156	147	139
	0	32	227	217	206	194	183		0	32	199	188	176	164	154
	-2	28	246	237	226	214	203		-2	28	218	208	197	185	175
	-4	24	266	256	245	234	222		-4	24	237	228	218	208	199
	-7	20	303	288	270	252	233		-7	20	262	252	240	229	219
	-9	16	344	325	303	281	258		-9	16	299	286	272	258	245
	-11	12	351	331	307	272	—		-11	12	326	310	291	269	—
PIKEVILLE	4	40	175	165	153	142	132	WILLIAMSBURG	4	40	158	150	141	131	115
	2	36	190	180	170	159	149		2	36	176	167	156	144	125
	0	32	210	201	191	181	171		0	32	202	189	174	158	131
	-2	28	233	226	218	210	202		-2	28	228	215	201	185	160
	-4	24	259	250	239	228	219		-4	24	249	238	226	213	193
	-7	20	288	277	265	252	241		-7	20	280	265	247	227	195
	-9	16	326	310	291	273	256		-9	16	305	292	277	260	234
	-11	12	342	325	304	275	—		-11	12	330	315	297	276	—

Table 3 (continued)

| STATION	TEMP. °C	°F	PROBABILITY 10%	25%	50%	75%	90%	STATION	TEMP. °C	°F	PROBABILITY 10%	25%	50%	75%	90%
WILLIAMSTOWN	4	40	160	151	140	129	119	WOLF CREEK DAM	4	40	159	149	137	126	115
	2	36	186	175	164	152	140		2	36	181	170	159	147	136
	0	32	207	198	187	176	165		0	32	199	189	178	166	156
	-2	28	235	224	211	198	185		-2	28	224	214	204	193	184
	-4	24	251	241	229	217	205		-4	24	243	233	223	212	202
	-7	20	274	262	249	235	221		-7	20	267	256	245	233	223
	-9	16	295	283	269	254	240		-9	16	317	297	274	248	197
	-11	12	317	303	288	272	256		-11	12	341	321	296	261	—
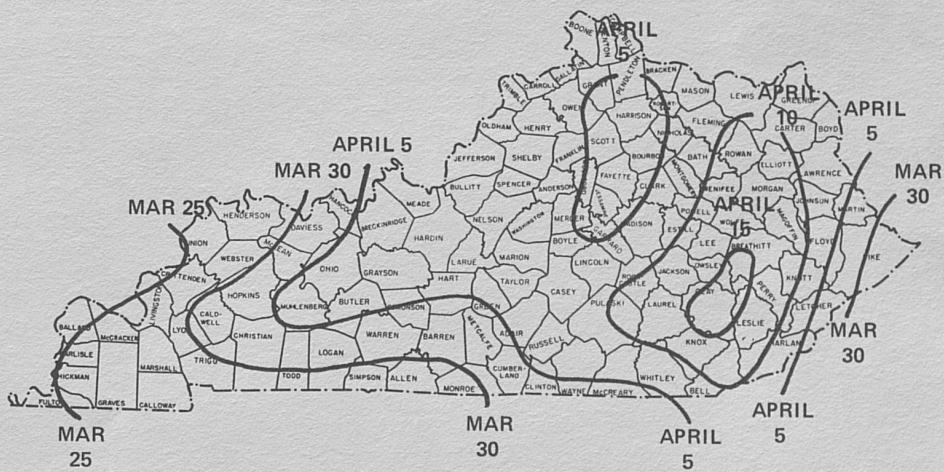
Fig. 4.—Average date of last 28°F in spring.
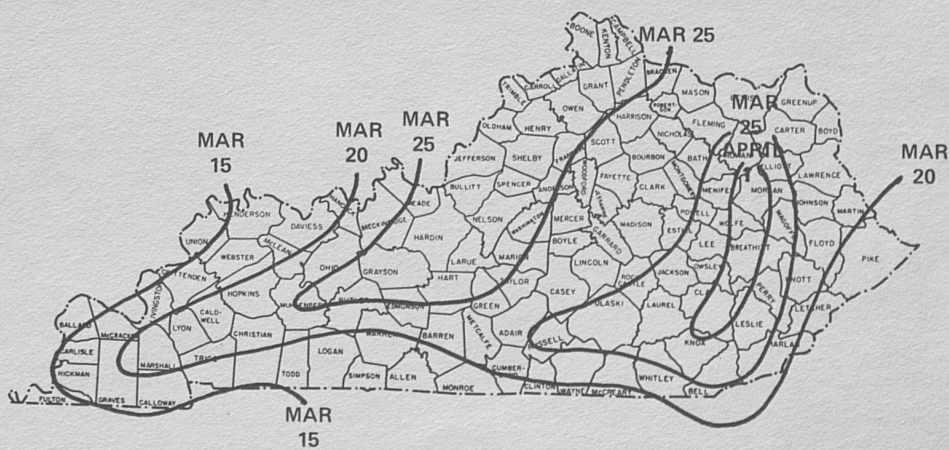
Fig. 5.—Average date of last 24°F in spring.

TABLE 4.—EXTREME WINTER TEMPERATURES.

STATION	Coldest Reached or Exceeded:			Lowest Observed*	Years of Observations
	1 Year in 10	5 Years in 10	9 Years in 10		
ANCHORAGE	-15	-5	4	-22	71
ASHLAND	- 9	-1	8	-15	43
BARDSTOWN	-15	-5	4	-25	61
BEAVER DAM	-15	-4	7	-25	55
BEREA	-11	-3	6	-21	67
BOWLING GREEN	-11	-1	10	-21	86
COVINGTON	-13	-5	4	-19	26
DANVILLE	-11	-2	4	-19	56
FARMERS	-17	-7	4	-28	63
FORDS FERRY	- 7	+1	8	-11	27
FRANKFORT	-12	-3	6	-20	76
GREENSBURG	-13	-3	7	-29	79
GREENVILLE	-12	-2	8	-19	41
HEIDELBERG	-15	-5	4	-22	39
HENDERSON	-10	-2	7	-18	42
HICKMAN	- 6	+2	9	-10	22
HOPKINSVILLE	-12	-2	9	-22	77
IRVINGTON	-13	-4	6	-25	75
LEITCHFIELD	-12	-2	8	-26	79
LEXINGTON	-12	-3	5	-21	29
LONDON	-16	-7	2	-18	19
LOVELACEVILLE	-12	-2	9	-20	43
MADISONVILLE	-12	-2	8	-28	31
MAMMOTH CAVE	-14	-5	4	-21	39
MANCHESTER	-16	-7	2	-18	22
MAYFIELD	- 9	0	8	-17	55
MAYSVILLE	-12	-3	6	-22	75
MIDDLESBORO	- 9	0	10	-20	69
MURRAY	- 7	+2	10	-20	45
OWENSBORO	-12	-3	7	-21	77
PADUCAH	- 8	+2	11	-17	60
PIKEVILLE	- 6	+3	11	-11	38
PRINCETON	-14	-3	9	-32	41
RICHMOND	-13	-3	6	-24	71
RUSSELLVILLE	-11	0	10	-21	49
SHELBYVILLE	-15	-5	5	-23	71
SOMERSET	-18	-8	3	-28	31
WILLIAMSBURG	- 9	0	9	-19	71
WILLIAMSTOWN	-14	-4	5	-21	70
WOLF CREEK DAM	-13	-2	9	-22	18

*The extreme low recorded at any official weather observing station in Kentucky is -34°F., which occurred at Bonnieville on Jan. 24, 1963 and at Cynthiana on Jan. 28, 1963.

indicate the extreme low temperature which might be expected to occur during the winter season at various locations in Kentucky.

There is considerable variation in the extreme low temperatures experienced in Kentucky, and they do not follow a pattern one would expect with coldest temperatures in the north and warmest in the south. This is due primarily to the effect of terrain and shelter which allow considerable local variation within very short distances. Such effects emphasize the need for considerable planning in the selection of sites for orchards and other tender crops in order to avoid these localized areas where the risk of freeze damage may be high.
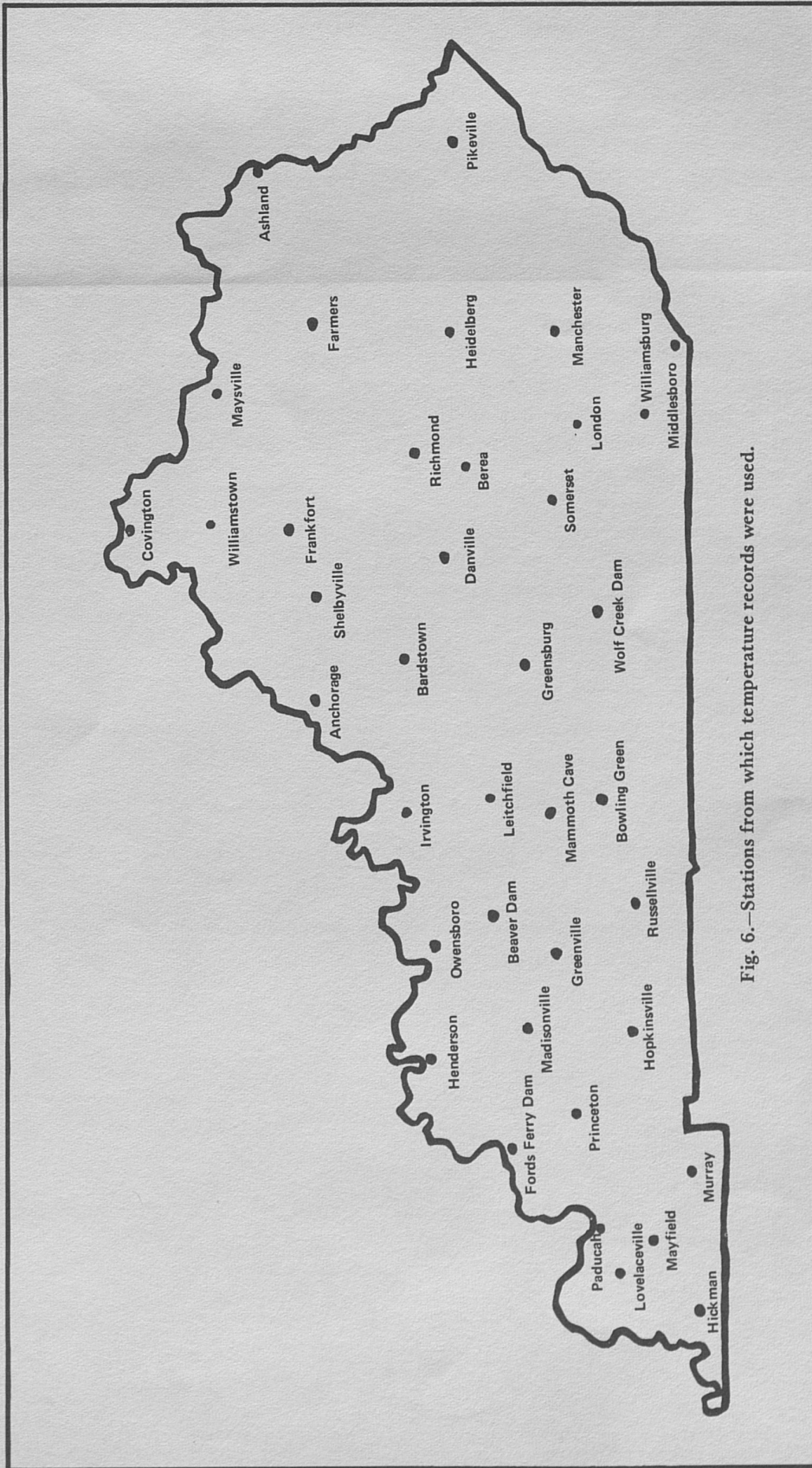
Fig. 6.—Stations from which temperature records were used.

PROPER USE OF THESE DATA

Freeze risk data in this study should be used only to determine the probability that spring and fall freezes will occur before or after certain dates. These data are obviously not forecasts that freezes in any given year will or will not take place by a certain date.

Daily forecasts are issued by the National Weather Service for all of Kentucky. These forecasts contain detailed temperature information and should be used as day-to-day guides in planning for protection against late spring or early fall freezes. For longer-range planning purposes, 5-day forecasts are issued each evening. These provide, in more general terms, temperature and precipitation forecasts for the up-coming 5-day period and may be used to plan farming operations for that time.

Twice each month, on the first and fifteenth, 30-day forecasts are issued which give an estimate of the average rainfall and temperature for the next 30 days.

It should be kept in mind that nearly always there are changes in the weather every few days, sometimes of a sudden and severe nature. Notice of these changes is widely disseminated in the daily forecasts and in occasional warnings.

This study of Kentucky freeze data should prevent farmers from taking undue risk with regard to freeze-susceptible crops. However, if a farmer, owing to his own economic situation, is willing to take a chance on an early planting or late harvest date, this study will at least answer his question, "what are my chances of success?"

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