

Climate of Minnesota

PART I. PROBABILITY OF OCCUR-
RENCE IN THE SPRING AND FALL
OF SELECTED LOW TEMPERATURES

Donald G. Baker and Joseph H. Strub, Jr.



University of Minnesota
Agricultural Experiment Station

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OF concern to agriculture, to other industries, and pursuits of man dependent upon weather, is the spring date after which the season will be free of certain low temperatures, particularly freezing temperatures. Similarly there is need for information when these same temperatures may first be expected to occur near the end of the season. The objective of this bulletin is to provide such information based upon a climatological prediction.

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The usual weather forecast is based upon both the dynamics of the atmosphere and the projection into the future of past weather events. The projection into the future of past weather events is termed a climatological prediction.

Weather forecasts, issued in daily advisories through the various news media by the U. S. Department of Commerce Weather Bureau, aid the short term planning of activities subject to the vagaries of weather. These forecasts are still restricted to not longer than 2 to 5 days due to our limited knowledge of the atmosphere. Although the limited forecast period is a disadvantage, such forecasts can be quite precise as to the magnitude and timing of various meteorological events.

The climatological prediction, a statement as to the probability or likelihood of a certain meteorological event occurring in the future, is based on the past meteorological record. This method permits a prediction to be made for any period in the future. However, the disadvantage is that the prediction lacks the specificity of the short period meteorological forecast, and it does not differentiate the occurrence of events for any one particular year.

The lack of specificity of the climatological prediction is an important point that must be understood. As explained in detail later, the prediction gives the probability (chance) that over a period of years a particular event may be expected to occur by a certain date. Thus, over an interval of a number of years the prediction will be valid, but not necessarily when applied to any given year. Obviously such predictions are of no use in scheduling daily activities, but rather in the overall planning of general activities for a period of years.

In resume, the meteorological forecast is of aid only in the very immediate future for planning activities dependent upon weather. The climatological or probability prediction, as in this bulletin, is of value for the long term scheduling of such activities. These two methods, used either in combination or separately, are the major available means of reducing some of the natural hazards of weather.

Source of Data and Station Location

Data upon which this bulletin is based were obtained from 75 U. S. Department of Commerce Weather Bureau stations in Minnesota. A major portion of the computations were made by the Weather Bureau for a regional climatic study (6). Computations made by the authors include occurrence probabilities for some additional stations and all temperatures greater than 32° F.

Station location and the station index are shown in figure 1 and table 1, respectively.

All stations had records in excess of 25 years except Big Falls, Duluth (airport), Hinckley, Moose Lake, and Springfield.

Selected Temperatures

Temperatures for which probability of occurrence were determined include 16°, 20°, 24°, 28°, 32°, 36°, 40°, and 50° F. With one exception, the frequency with which each temperature was found to occur met the necessary statistical considerations and, therefore, the probability of occurrence could be readily calculated.¹ The exception was the 50° F. temperature threshold (the last occurrence in the spring or first occurrence in the fall), for which only the average date of occurrence was computed.

¹ Normality of the threshold temperature distribution was tested by a recommended method (6) for selected temperatures and stations plus the simple expedient of plotting occurrence dates on logarithmic paper. Variances were not pooled due to the great variation between stations, which is very likely a microclimatic effect and should not be masked. The problem of missing data was not encountered.

Low Temperature Injury To Plants

There are two kinds of low temperature injury to which plants may be subjected: winter injury and freezing injury. The former occurs when plants are dormant. Often such injuries occur when insufficient snow cover permits deeper penetration of low temperatures into the soil.

Freezing injury, however, occurs when air temperatures are near or below the freezing point and plants have either started to grow in the spring or have not yet entered the dormant period in the fall. This bulletin, as a guide to proper planning, may be of aid in avoiding such injury.

Three low temperature terms which have been or still are in current usage require explanation: frost, black frost, and killing frost.

Frost is similar to dew except that the surface on which it forms is at or below the freezing point. Therefore, the deposit is composed of ice crystals produced by sublimation directly from water vapor to ice crystals. Permanent damage to the plant will not necessarily occur unless the temperature is low enough that ice crystals also form within the plant tissue.

Black frost refers to below freezing temperatures which result in permanent damage to the plant when frost is absent. The damaged plant or plant parts turn black. There is no frost formation, however, because the moisture content of the air is too low for sublimation to occur.

Killing frost, a term once widely used, lacks preciseness. It referred to the case where permanent damage occurred to a plant, whether or not frost occurred.

None of these terms is explicit with respect to the temperature at which it may occur. Further, the temperature of a killing frost depends upon the kind of plant used as the indicator and will obviously vary depending upon the kind of plant. Therefore, these terms are of no significance here and are not used in this publication.

Many factors influence the degree of injury that may occur to plants subjected to low temperatures. These factors should

be considered:

1. Plant damage increases with duration of the low temperatures.
2. A rapid temperature drop is more injurious than a gradual one.
3. There is a great variation between plant species in their hardiness to cold. For example, woody plants are usually far more hardy than herbaceous plants.
4. Due to natural or artificial selection, within a particular species certain varieties are less subject to damage than others.
5. The stage of growth and development is important since a young plant is more tender than a mature one. Certain plant parts, such as blossoms and fruits, are more susceptible to damage than others (table 2).
6. Succulent plants and high moisture content seeds are less hardy than those low in moisture (table 3).

Because of the complex of factors that influence low temperature injury to plants, it is impossible to assign to a particular plant a specific temperature as being critical. Thus a range in temperatures is sometimes given as in tables 2 and 3, or plants are classified into relative scales of hardiness as in table 4.

Causes of Low Temperatures

Two meteorological situations cause low temperatures. One occurs when a cold air mass replaces a warmer one (frequently termed advective cooling). Temperatures often drop rapidly with the appearance of the cold air mass. They may not begin to rise for several days, and then often rise slowly. This situation may be identified by the following sequence of events: just preceding the cold air mass winds are from a southerly direction, usually strong and sometimes gusty, and precipitation frequently occurs. With the appearance of the cold air mass winds blow from the north or northwest and temperatures begin to drop, sometimes sharply.

Table 1. Station index (7)

Index No.	Station name	Location	County	Altitude (feet)
1	Ada	In town	Norman	906
2	Albert Lea	In town	Freeborn	1,235
3	Alexandria	Airport	Douglas	1,421
4	Argyle	In town	Marshall	845
5	Artichoke Lake	Farm site	Big Stone	1,075
6	Babbitt	2 miles southwest	St. Louis	1,615
7	Baudette	In town	Lake of the Woods	1,075
8	Beardsley	In town	Big Stone	1,090
9	Bemidji	Airport	Beltrami	1,392
10	Big Falls	Ranger station	Koochiching	1,220
11	Bird Island	In town	Renville	1,089
12	Brainerd	In town	Crow Wing	1,214
13	Cambridge	In town	Isanti	1,000
14	Campbell	In town	Wilkin	975
15	Canby	In town	Yellow Medicine	1,243
16	Cloquet	Experimental forest	Carlton	1,265
17	Crookston	Northwest School	Polk	883
18	Detroit Lakes	In town	Becker	1,375
19	Duluth	Airport	St. Louis	1,409
20	Duluth	In town	St. Louis	610
21	Fairmont	In town	Martin	1,187
22	Faribault	In town	Rice	1,190
23	Farmington	3 miles north	Dakota	902
24	Fergus Falls	In town	Otter Tail	1,210
25	Fosston	In town	Polk	1,289
26	Grand Marais	U. S. Coast Guard Station	Cook	688
27	Grand Meadow	In town	Mower	1,338
28	Grand Rapids	North Central School	Itasca	1,281
29	Gull Lake Dam	Dam site	Cass	1,215
30	Hallock	In town	Kittson	813
31	Hinckley	In town	Pine	1,035
32	International Falls	Airport	Koochiching	1,179
33	Itasca State Park	State Park	Clearwater	1,500
34	Leech Lake Dam	Dam site	Cass	1,301
35	Little Falls	In town	Morrison	1,115
36	Mahoning Mine	Mine site	St. Louis	1,578
37	Maple Plain	In town	Hennepin	1,030
38	Meadowlands	In town	St. Louis	1,270

Table 1. Station index (7) (continued)

Index No.	Station name	Location	County	Altitude (feet)
39	Milaca	In town	Mille Lacs	1,080
40	Milan	In town	Chippewa	1,005
41	Minneapolis	In town	Hennepin	830
42	Montevideo	In town	Chippewa	900
43	Moorhead	State Teachers College	Clay	940
44	Moose Lake	State Hospital	Carlton	1,085
45	Mora	In town	Kanabec	1,001
46	Morris	West Central School	Stevens	1,130
47	New London	In town	Kandiyohi	1,215
48	New Ulm	In town	Brown	826
49	Park Rapids	In town	Hubbard	1,434
50	Pine River Dam	Dam site	Crow Wing	1,215
51	Pipestone	In town	Pipestone	1,735
52	Pokegama Dam	Dam site	Itasca	1,280
53	Red Lake Falls	In town	Red Lake	1,035
54	Red Lake Indian Agency	Reservation	Beltrami	1,216
55	Redwood Falls	In town	Redwood	1,021
56	Roseau	In town	Roseau	1,047
57	St. Cloud	Airport	Stearns	1,034
58	St. Paul	Airport	Ramsey	920
59	St. Peter	2 miles southwest	Nicollet	825
60	Sandy Lake Dam Libby	Dam site	Aitkin	1,234
61	Springfield	In town	Brown	1,050
62	Tracy	In town	Lyon	1,403
63	Two Harbors	In town	Lake	614
64	Virginia	In town	St. Louis	1,445
65	Wadena	In town	Wadena	1,350
66	Walker	In town	Cass	1,407
67	Warroad	In town	Roseau	1,069
68	Waseca	Experimental farm	Waseca	1,153
69	Wheaton	In town	Traverse	1,018
70	Willmar	State Hospital	Kandiyohi	1,133
71	Winnebago	In town	Faribault	1,110
72	Winnibigoshish Dam	Dam site	Itasca	1,315
73	Winona	In town	Winona	652
74	Worthington	In town	Nobles	1,593
75	Zumbrota	In town	Goodhue	985

Table 2. Critical temperatures, degrees F., of certain fruits at various stages of development (2)

Fruit	Bud closed but showing color	In blossom	Setting of fruit
		degrees F.	
Apple	25-27	28-29	28-30
Apricot	22-30	27-31	28-32
Cherry	22-29	28-30	28-30
Grape	30	31	31
Pear	25-29	28-29	28-30
Plum	22-30	28-31	28-31
Raspberry (young shoots)*	30	-----	-----
Strawberry	-----	26-30	-----

*After Frederick, et al. (1)

Table 3. Influence of seed moisture content upon corn germination after a 24-hour exposure to low temperatures (3, 4)

Temperature range, °F.	Moisture content of seed, percent					
	10-15	15-20	20-25	25-30	30-35	35-40
	Germination of seed, percent					
-5 to 0	97	63	0	0	0	0
4 to 8	100	98	47	7	0	0
12 to 16	100	100	88	34	12	0
20 to 24	100	100	96	77	67	13
28 to 32	100	100	100	85	75	71

Table 4. Vegetables classified by hardiness (8)*

Hardy	Half-hardy	Tender	Very tender
Asparagus	Cauliflower	New Zealand Spinach	Cucumber
Beet	Celery	Snap Bean	Eggplant
Broccoli	Potato	Sweet Corn	Lima Bean
Cabbage		Tomato	Muskmelon
Carrot			Okra
Kale			Pepper
Lettuce			Pumpkin
Onion			Squash
Parsnip			Sweet Potato
Pea			Watermelon
Radish			
Rutabaga			
Salsify			
Spinach			
Swiss Chard			
Turnip			

*Plant hardy vegetables as soon as ground can be prepared.

Plant half-hardy vegetables 1 to 2 weeks after average date of last killing freeze.

Plant tender vegetables 2 to 3 weeks after average date of last killing freeze.

Plant very tender vegetables 3 to 4 weeks after average date of last killing freeze.

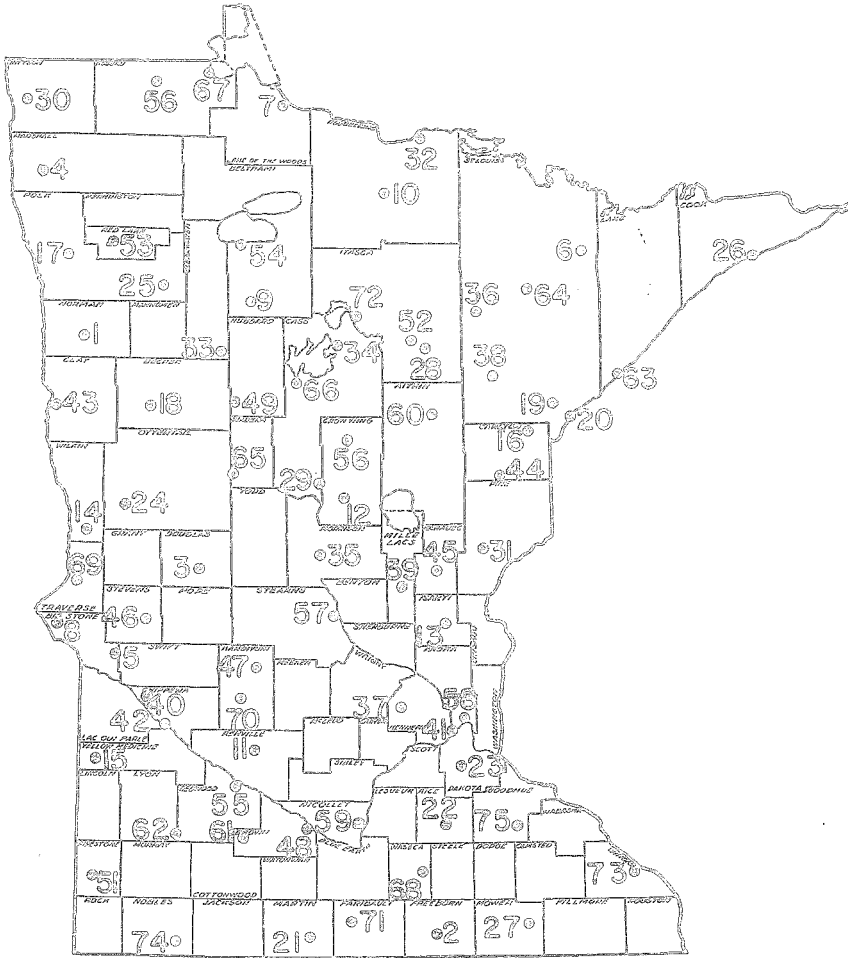


Figure 1. Station location. See table I for station names.

With the second meteorological situation (radiational cooling), no change in air mass occurs, but low temperatures develop through nighttime radiation loss of the earth's heat. Since clouds and moist air are effective "blankets" in reducing heat loss, low temperatures due to radiational cooling typically occur on calm, or nearly calm, clear nights with relatively dry air. In Minnesota this situation occurs most frequently with autumn "Indian Summer" type weather.

Low temperatures resulting from radiational cooling seldom persist for more than a few early morning hours, and the minimum temperature is ordinarily reached just before sunrise.

Lowest temperatures occur when both advective and radiational cooling join forces. This takes place most frequently in winter and less frequently in spring and fall, with a cold dry air mass entering the state and the attendant radiational cooling at night.

Plant Protection

Where radiational cooling is the major hazard or where the cold air mass is far enough south so that it is appreciably modified, such as in California and the Gulf States, plant protection methods include heating the air, moving the air with wind machines, flooding the soil, or spraying the vegetation with water.

These protective methods are seldom effective or economically feasible in Minnesota because cold air masses are at least as frequent a cause of low temperatures as radiational cooling, and also because different kinds of crops are grown.

Except in the case of small plots or individual plants where a temporary cover (such as burlap, a basket, or newspaper) to reduce the heat loss is practical, protective methods include planting and harvesting at the proper time to minimize the low temperature risk, and the planting of hardy plants. A third method, which may be the most difficult due to lack of availability, is to take advantage of a microclimatic difference and plant on sites which are least conducive to low temperatures.

Local Variations in Temperature

In spite of precautions to provide uniform conditions with respect to temperature measurements, both artificial and natural conditions occasionally cause outside air temperature to vary appreciably from the air temperature recorded in the shelter that houses the thermometers. These differences may extend in both a horizontal and vertical direction from the instrument shelter.

Location of the instrument shelter is the major artificial cause of local temperature variation. Often the shelters are not in open and essentially rural sites but are located within cities or towns. They may be adjacent to buildings, or even on rooftops, or other undesirable exposures. Any object which reduces the natural wind movement or otherwise alters the natural environment will seriously affect measured temperature. Minimum temperatures are frequently progressively

higher in going from rural to suburban to urban locations due to the influence of buildings and urban heating.

Even the temperature shelter which houses the instruments creates an artificial environment. There are obvious objections to this, but the shelter is the best method yet devised for general use and uniformity of conditions.

Natural causes of local temperature variations include stratification of the air, local topographic differences, adjacent bodies of water, and the kind and condition of the soil.

Normally air temperature decreases with altitude. However, under certain circumstances the air temperature may actually be colder at the ground and increase with altitude for some distance. Because the change in temperature has been inverted from the usual state of affairs this is termed an *inversion*. Thus there is a stratification of the air, with the colder and denser air next to the earth's surface and a layer of warmer and therefore lighter air overlying it. At the top of the inversion, which may vary from a few inches to several hundred feet above the ground, temperatures revert to the usual condition and decrease with altitude.

Inversions are most apt to occur between sunset and sunrise with clear skies and little or no air movement. Since the temperature shelter which houses the thermometers stands some 5 feet above ground, appreciable temperature differences may exist between the shelter and the soil or plant surface. Differences amounting to 5 to 10° F. *lower* at the crop or soil surface than the minimum recorded in the temperature shelter are not uncommon. It is apparent that plants may be subjected to freezing temperatures even when temperatures greater than 32° F. are obtained in the instrument shelter.

Inversions are naturally reduced in intensity or disappear entirely with the warming rays of the rising sun, and by sufficient wind movement to bring about a mixing of the stratified air.

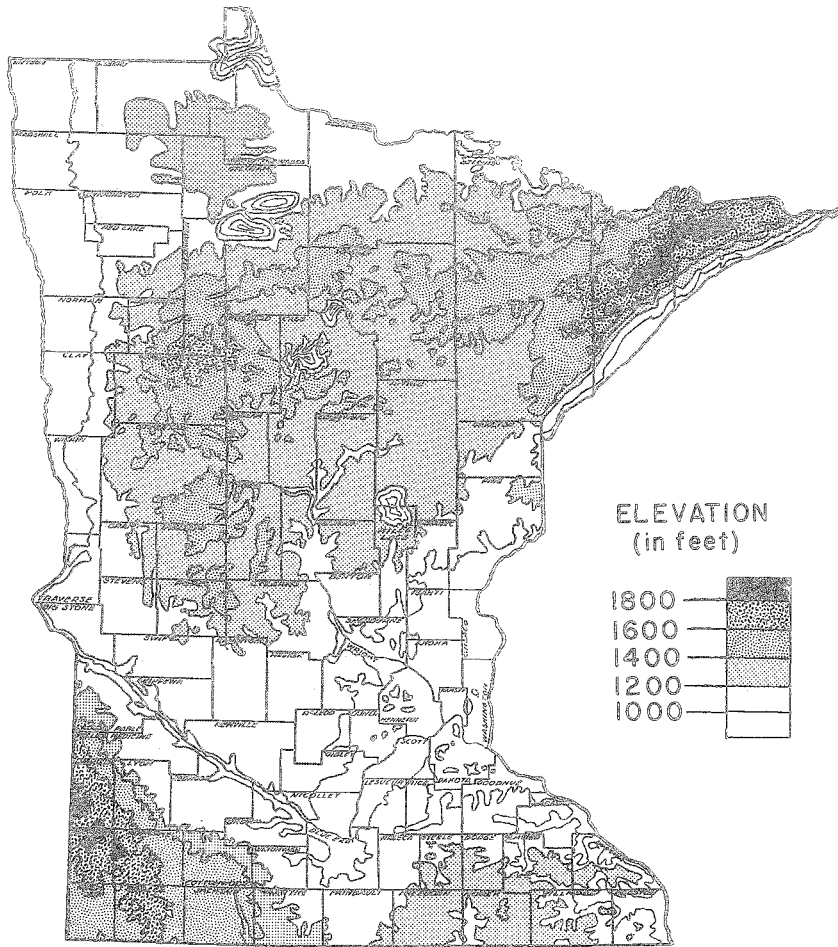


Figure 2. Topographic map of Minnesota.

Since cold air is denser and, therefore, heavier than warmer air, the cold air may also flow downslope under the force of gravity just as water does. Thus topography is most important in translating weather station temperature measurements to local sites. Any low spot, from a valley to a minor depression, is subject to this downslope movement of cold air, and a pool of colder air collects there. Temperature inversions are inten-

sified in low lying areas due to the additional cold air that flows in from the surrounding higher elevations. As a result the frequency of low temperatures is much greater in these depressions. For this reason it is never recommended that orchards be placed in valley bottoms.

A topographic map of the state is shown in figure 2. The map scale, however, precludes the identification of any but the most gross features. The highest

altitudes occur in northeastern and southwestern Minnesota. Areas adjoining these uplands are undoubtedly subject to considerable cold air drainage. Hilly topography of the extreme southeastern part of the state also creates a cold air drainage problem in the many small valleys and low lying areas. The Red River Valley, perhaps the largest area of nearly level land in the world, is certainly the area most free of microclimatic differences.

Comparison of figures 1 and 2 shows that certain areas are poorly represented. Unfortunately, this situation cannot be improved until more station records of sufficient longevity are available. The reader is further cautioned that local topographic differences of far less magnitude than could be illustrated in figure 2 may be of greater influence than the gross features shown.

Since water has a relatively high heat capacity, lakes cool and warm slower than adjacent land surfaces. If sufficiently large, ice-free lakes exert a modifying influence on local weather. But with a few exceptions Minnesota lakes are too small to appreciably alter temperatures more than a few hundred feet from the lake edge. If there is any wind movement the lake influence is restricted to the downwind side.

Even the larger lakes, such as Mille Lacs, Upper and Lower Red Lake, Lake of the Woods, Leech, and Winnibigoshish, are too small and shallow to produce more than a very local influence of perhaps a half mile or so.

Lake Superior, though of sufficient size to modify the weather several miles inland, has little influence on Minnesota weather for two reasons. One is the upland immediately west of the lake which rises some 200 to 300 feet above the lake surface (figure 2). The other is the prevailing winds, which blow from the west. Figures 3 and 4 show that the influence of Lake Superior is of importance only along the immediate lakeshore.

The kind of soil and the content of moisture within the soil also influence air

temperatures. Due to the usually poorer conduction of heat in organic (peat and muck) than mineral soils, the former are more hazardous to farm with respect to the occurrence of low temperatures. If a dry surface layer exists, which is frequently the case, only a small portion of the heat available during the day penetrates organic soils. The result is that at night there is an insufficient reservoir of heat available in the soil to prevent low temperatures from occurring both at the organic soil surface and in the air above. Hence conditions conducive to low temperatures are present.

Inorganic soils usually possess superior heat conduction characteristics because minerals transmit heat more rapidly than organic materials, and because there is a more intimate physical contact between soil particles. In addition, moisture in the inorganic soil is often more equally distributed within the soil profile.

The hazard of low temperatures over organic soils may be increased due to cold air drainage. This is true when these soils are lower than the surrounding terrain.

The influence of organic soils upon low temperature occurrence is apparent at Meadowlands, St. Louis County, which lies in a large area of such soils. The mean date of the last occurrence of 32° F. in the spring averages about 8 days later (figure 3), and the first occurrence in the fall 18 days earlier (figure 4), than at the nearby stations on mineral soils: Cloquet, Duluth (airport), Grand Rapids, Mahoning Mine, and Sandy Lake Dam Libby. In other words, the average duration of the period free of temperatures 32° F. or lower is some 24 days shorter at Meadowlands than at the nearby stations on mineral soils.

Since water has a higher heat capacity than all other soil constituents, a moist soil cools less rapidly than a dry one. For this reason fields are sometimes flooded when damaging temperatures are expected.

A dry soil warms more rapidly but to a shallower depth than a moist soil.

Therefore sandy soils, which usually have excellent drainage, are normally warmer during the day and in early spring than finer textured soils. However, the finer textured or more moist soils, due to better conduction and a greater heat reservoir, lose heat less rapidly and are warmer at night and in the autumn.

A wet soil warms very slowly and, by the same token, cools very slowly due to the high heat capacity of water. The great mass of water prevents rapid penetration of heat within the soil and thus a wet soil is cool in the spring. In the autumn and at night the heat reservoir retards development of low air temperatures. As a result daily and seasonal temperature fluctuations are minimal over wet soils, but only so long as a dry layer of soil does not form on the surface.

The Climatological Prediction

Intuitively it is recognized that as summer approaches there is less risk of low temperatures than in early spring. It is also recognized that the risk of low temperatures in the autumn increases as winter draws nearer. This is exactly what is found in tables 5 through 11 and tables 12 through 18 for the spring and fall, respectively.

Table 5, for example, shows that at Ada a temperature of 16° F. or lower will occur on or after March 21 in 90 percent of the years. By March 31 the risk is 70 percent, on April 6 the risk is reduced to 50 percent, and by April 23 the risk is only 10 percent.

For the first occurrence of 16° F or lower at the end of the season (table 12), the risk at Ada is only 10 percent that it may be expected on or before October 17. However, by November 1 the risk has increased to 50 percent, and by November 16 there is a 90-percent chance that 16° F or lower will have occurred.

The average date of the last occurrence in the spring and the first occurrence in the fall of 50° F. is shown in table 19. The average date of the last occurrence in spring or the first occurrence in the

fall of a particular temperature is, of course, the 50-percent probability date.

The selection of the degree of risk, that is 10, 20, or 30 percent, etc., depends upon the nature of the work, the crop, or the economic interests concerned. This is a choice that the individual must make.

Figures 3 and 4 show the average date (50-percent probability) of the last occurrence in the spring and first occurrence in fall, respectively, of 32° F. These maps have been drawn with an attempt to take into account various local influences such as lakes, rivers, soils, and topography. Maps of the other temperatures and probabilities are not shown due to similarity in configuration.

Figures 3 and 4 show how the average occurrence dates of 32° F. vary over the state. However, in viewing these figures the location of the stations should be considered, because even if ideally distributed each of the 75 stations would represent an area of about 1,067 square miles. In addition the areas of greatest topographic differences, the northeast, southeast, and southwest, are poorly represented.

The lack of specificity of a climatological prediction was mentioned earlier. From the examples given it should be noted that a definite statement is not made concerning the occurrence of a temperature. Rather the occurrence is stated as a probability such as 10 percent (1 year out of 10), 50 percent (5 years out of 10), and so on. Thus the practical use of these data for a specific project rests upon their application over a series of years and not just 1 year or season. That is, if the probability is 10 percent that a particular temperature will occur on or before a certain date no guarantee can be made as to which 1 year out of 10 this will be. All that can be stated is that over a period of time the temperature in question will have occurred by the specified date in about 10 percent of the years.

The probability tables may be used to determine two other items of interest.

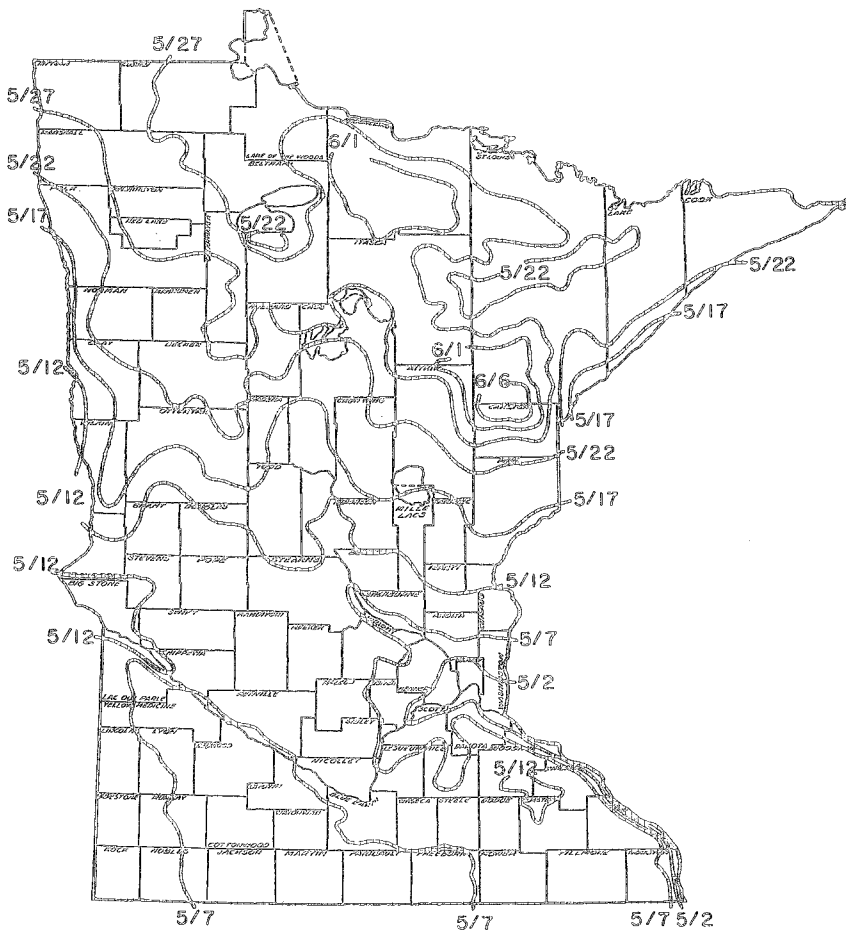


Figure 3. Average date of last occurrence of 32° F. or lower in the spring.

One is the average duration of the period free of a particular minimum temperature. This is equal to the number of days between the average dates of the last occurrence in the spring and the first occurrence in fall of the temperature in question. For example, at Morris the 50-percent probability dates of the last occurrence of 32° F. in the spring (table 9), and the first occurrence in the fall (table 16), are May 12 and September

25, respectively. The interval between these two dates is 136 days and is the average duration of the "freeze-free" period at Morris. This does not mean that the average duration of the freeze-free period extends from May 12 to September 25, but rather only that the period will be 136 days long.

The second item of interest that can be obtained from these tables is the probability that a certain period will be

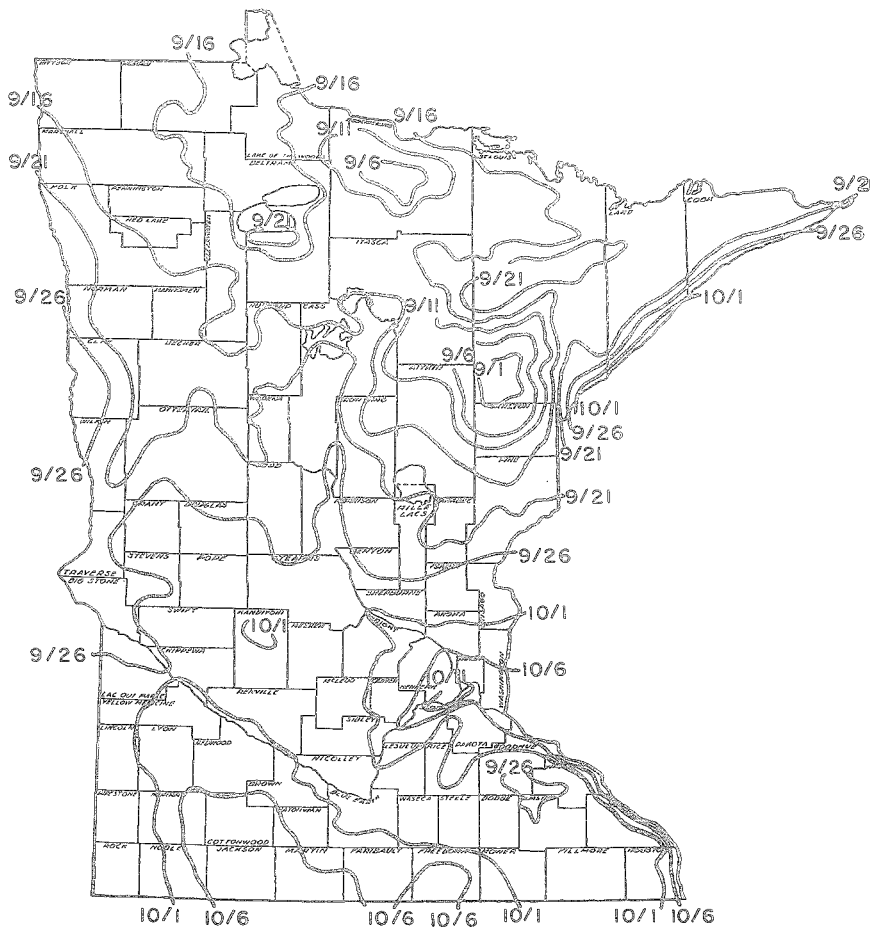


Figure 4. Average date of first occurrence of 32° F. or lower in the fall.

free of a particular minimum temperature. This probability equals the product of the two probabilities that the spring and fall periods will be *free* of that temperature. For example, since at Morris the average date of corn planting is about May 22, the question may arise as to the probability that the period May 22 to September 25 will be free of 32° F. or lower temperatures. Table 9 shows a 20-percent chance that 32° F. will occur

on or after May 22, and therefore an 80-percent chance that 32° F. will not occur after May 22, and table 16 shows a 50-percent chance that 32° F. will not occur until on or after September 25. Thus the probability that May 22 to September 25 will be freeze-free is $[80/100 \times 50/100] = 40$ percent. That is, there is a 40-percent chance the period will be freeze-free, and a 60-percent chance that freezing temperatures will occur.

Table 5. Percent probability that a temperature of 16°F. or lower will occur on or after a given date in the spring

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
1 Ada	4/23	4/17	4/13	4/10	4/6	4/3	3/31	3/27	3/21	
2 Albert Lea	4/5	3/31	3/28	3/25	3/22	3/19	3/16	3/12	3/7	
3 Alexandria	4/14	4/10	4/6	4/3	4/1	3/29	3/27	3/23	3/19	
4 Argyle	4/23	4/17	4/13	4/10	4/7	4/3	3/31	3/27	3/21	
5 Artichoke Lake	4/18	4/12	4/8	4/4	3/31	3/28	3/24	3/19	3/13	
6 Babbitt	4/24	4/20	4/17	4/13	4/12	4/10	4/8	4/5	4/1	
7 Baudette	4/25	4/20	4/17	4/14	4/11	4/8	4/6	4/2	3/28	
8 Beardesley	4/17	4/11	4/7	4/4	4/1	3/29	3/25	3/21	3/16	
9 Bemidji	4/29	4/25	4/22	4/19	4/17	4/14	4/12	4/9	4/4	
10 Big Falls	4/29	4/24	4/21	4/18	4/16	4/13	4/10	4/7	4/3	
11 Bird Island	4/11	4/5	4/1	3/29	3/26	3/22	3/19	3/15	3/9	
12 Brainerd	4/19	4/13	4/9	4/6	4/3	3/30	3/27	3/23	3/17	
13 Cambridge	4/17	4/11	4/6	4/2	3/30	3/26	3/22	3/18	3/12	
14 Campbell	4/25	4/19	4/14	4/10	4/7	4/3	3/31	3/26	3/20	
15 Canby	4/11	4/7	4/3	4/1	3/29	3/27	3/24	3/21	3/16	
16 Cloquet	5/2	4/26	4/23	4/19	4/16	4/13	4/10	4/6	3/31	
17 Crookston	4/20	4/16	4/12	4/9	4/6	4/4	4/1	3/28	3/23	
18 Detroit Lakes	4/18	4/13	4/9	4/6	4/3	4/1	3/29	3/25	3/20	
19 Duluth (airport)	4/20	4/13	4/9	4/5	4/1	3/29	3/25	3/21	3/14	
20 Duluth (city)	4/14	4/9	4/5	4/2	3/30	3/27	3/24	3/21	3/16	
21 Fairmont	4/9	4/3	3/30	3/27	3/23	3/20	3/17	3/12	3/7	
22 Faribault	4/7	4/2	3/29	3/25	3/22	3/19	3/16	3/12	3/6	
23 Farmington	4/9	4/4	3/31	3/27	3/24	3/21	3/18	3/14	3/9	
24 Fergus Falls	4/15	4/9	4/6	4/2	3/30	3/28	3/24	3/21	3/16	
25 Fosston	4/25	4/20	4/16	4/13	4/10	4/7	4/4	3/31	3/26	
26 Grand Marais	4/17	4/13	4/9	4/6	4/4	4/1	3/30	3/26	3/22	
27 Grand Meadow	4/12	4/7	4/3	3/31	3/28	3/25	3/22	3/18	3/12	
28 Grand Rapids	4/30	4/24	4/20	4/17	4/14	4/11	4/8	4/4	3/30	
29 Gull Lake Dam	4/20	4/15	4/12	4/9	4/6	4/3	3/31	3/28	3/23	
30 Hallock	5/1	4/25	4/21	4/18	4/15	4/12	4/9	4/5	3/31	
31 Hinckley	4/15	4/10	4/6	4/3	3/31	3/28	3/25	3/22	3/17	
32 International Falls	--	--	--	--	--	--	--	--	--	
33 Itasca State Park	4/30	4/25	4/22	4/20	4/17	4/14	4/11	4/8	4/3	
34 Leech Lake Dam	4/21	4/17	4/13	4/11	4/8	4/6	4/3	3/31	3/27	
35 Little Falls	4/19	4/13	4/9	4/5	4/1	3/29	3/26	3/21	3/15	
36 Mahoning Mine	4/21	4/17	4/13	4/10	4/8	4/5	4/2	3/30	3/25	
37 Maple Plain	4/10	4/5	4/1	3/29	3/26	3/24	3/20	3/17	3/12	
38 Meadowlands	4/28	4/22	4/18	4/14	4/11	4/7	4/4	3/30	3/24	

Table 5. Percent probability that a temperature of 16°F. or lower will occur on or after a given date in the spring (continued)

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
39 Milaca	4/14	4/9	4/6	4/3	3/31	3/28	3/25	3/21	3/16	
40 Milan	4/12	4/7	4/3	3/31	3/28	3/25	3/22	3/18	3/13	
41 Minneapolis	4/6	3/31	3/28	3/24	3/22	3/19	3/15	3/12	3/6	
42 Montevideo	4/9	4/5	4/1	3/30	3/27	3/25	3/22	3/19	3/15	
43 Moorhead	4/15	4/9	4/5	4/2	3/30	3/27	3/23	3/20	3/14	
44 Moose Lake	4/23	4/17	4/13	4/9	4/5	4/2	3/29	3/25	3/19	
45 Mora	4/15	4/10	4/6	4/3	3/31	3/28	3/25	3/21	3/16	
46 Morris	4/18	4/13	4/8	4/5	4/1	3/29	3/26	3/22	3/16	
47 New London	4/15	4/9	4/6	4/2	3/30	3/28	3/24	3/21	3/16	
48 New Ulm	4/11	4/6	4/2	3/30	3/27	3/24	3/21	3/17	3/12	
49 Park Rapids	4/24	4/19	4/16	4/13	4/10	4/8	4/5	4/1	3/28	
50 Pine River Dam	4/25	4/22	4/18	4/16	4/13	4/11	4/8	4/5	3/31	
51 Pipestone	4/12	4/7	4/4	3/31	3/28	3/26	3/23	3/19	3/14	
52 Pokegama Dam	4/25	4/20	4/17	4/14	4/11	4/8	4/5	4/2	3/28	
53 Red Lake Falls	4/25	4/20	4/16	4/13	4/10	4/7	4/4	3/31	3/26	
54 Red Lake Indian Agency	4/25	4/20	4/16	4/13	4/10	4/8	4/5	4/1	3/27	
55 Redwood Falls	4/10	4/4	3/31	3/28	3/25	3/22	3/18	3/14	3/9	
56 Roseau	4/28	4/23	4/20	4/17	4/14	4/11	4/8	4/4	3/30	
57 St. Cloud	4/12	4/7	4/3	4/1	3/28	3/26	3/23	3/19	3/14	
58 St. Paul	4/6	3/31	3/28	3/24	3/21	3/18	3/15	3/11	3/6	
59 St. Peter	4/7	4/2	3/29	3/25	3/22	3/19	3/16	3/12	3/7	
60 Sandy Lake Dam Libby	4/23	4/18	4/14	4/11	4/8	4/5	4/2	3/29	3/24	
61 Springfield	4/12	4/5	3/31	3/27	3/23	3/19	3/15	3/10	3/3	
62 Tracy	4/11	4/6	4/3	3/31	3/28	3/26	3/23	3/19	3/14	
63 Two Harbors	4/13	4/8	4/5	4/2	3/30	3/27	3/24	3/20	3/15	
64 Virginia	4/28	4/22	4/18	4/15	4/12	4/9	4/5	4/1	3/26	
65 Wadena	4/18	4/13	4/9	4/6	4/3	3/31	3/28	3/24	3/19	
66 Walker	4/22	4/17	4/13	4/10	4/7	4/5	4/2	3/29	3/24	
67 Warroad	4/26	4/21	4/17	4/13	4/10	4/7	4/4	3/31	3/25	
68 Waseca	4/10	4/5	4/1	3/29	3/26	3/23	3/20	3/16	3/11	
69 Wheaton	4/19	4/13	4/9	4/5	4/2	3/30	3/26	3/22	3/17	
70 Willmar	4/13	4/8	4/5	4/1	3/30	3/27	3/24	3/20	3/15	
71 Winnebago	4/10	4/4	3/31	3/28	3/25	3/21	3/18	3/14	3/8	
72 Winnibigoshish Dam	4/22	4/17	4/14	4/11	4/9	4/6	4/4	3/31	3/27	
73 Winona	4/2	3/28	3/25	3/22	3/19	3/17	3/14	3/11	3/6	
74 Worthington	4/11	4/6	4/2	3/30	3/28	3/25	3/22	3/18	3/13	
75 Zumbrota	4/9	4/3	3/30	3/27	3/24	3/21	3/18	3/14	3/9	

Table 6. Percent probability that a temperature of 20°F. or lower will occur on or after a given date in the spring

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
1 Ada	5/4	4/29	4/25	4/21	4/18	4/15	4/12	4/8	4/2
2 Albert Lea	4/11	4/6	4/3	3/31	3/29	3/26	3/24	3/20	3/16
3 Alexandria	4/23	4/18	4/14	4/11	4/8	4/5	4/2	3/29	3/24
4 Argyle	5/6	5/1	4/27	4/24	4/21	4/19	4/16	4/12	4/7
5 Artichoke Lake	4/29	4/23	4/19	4/15	4/11	4/8	4/4	3/30	3/24
6 Babbitt	5/8	5/2	4/29	4/25	4/23	4/20	4/17	4/13	4/8
7 Baudette	5/5	4/30	4/26	4/23	4/20	4/17	4/14	4/10	4/5
8 Beardsley	5/3	4/27	4/22	4/18	4/15	4/11	4/7	4/2	3/27
9 Bemidji	5/11	5/6	5/2	4/29	4/26	4/23	4/20	4/17	4/12
10 Big Falls	5/10	5/4	4/30	4/27	4/24	4/21	4/17	4/13	4/8
11 Bird Island	4/16	4/11	4/7	4/4	4/1	3/29	3/26	3/22	3/17
12 Brainerd	4/29	4/25	4/21	4/19	4/17	4/14	4/12	4/9	4/5
13 Cambridge	4/28	4/21	4/16	4/12	4/9	4/5	4/1	3/27	3/20
14 Campbell	5/5	4/30	4/26	4/23	4/19	4/16	4/13	4/9	4/3
15 Canby	4/27	4/20	4/15	4/11	4/7	4/3	3/29	3/24	3/17
16 Cloquet	5/14	5/9	5/5	5/1	4/28	4/25	4/22	4/18	4/13
17 Crookston	5/4	4/28	4/24	4/21	4/17	4/14	4/11	4/7	4/1
18 Detroit Lakes	5/1	4/26	4/23	4/19	4/17	4/14	4/10	4/7	4/1
19 Duluth (airport)	5/2	4/28	4/25	4/23	4/21	4/19	4/16	4/13	4/10
20 Duluth (city)	4/27	4/21	4/17	4/13	4/10	4/7	4/3	3/30	3/25
21 Fairmont	4/13	4/8	4/4	4/1	3/29	3/26	3/23	3/19	3/14
22 Faribault	4/16	4/11	4/7	4/4	4/1	3/29	3/26	3/22	3/17
23 Farmington	4/20	4/15	4/11	4/8	4/5	4/2	3/30	3/27	3/22
24 Fergus Falls	4/28	4/22	4/17	4/13	4/10	4/6	4/2	3/29	3/23
25 Fosston	5/4	4/29	4/25	4/21	4/18	4/15	4/12	4/8	4/2
26 Grand Marais	4/27	4/21	4/17	4/14	4/11	4/8	4/4	3/31	3/26
27 Grand Meadow	4/20	4/15	4/11	4/8	4/5	4/2	3/30	3/26	3/21
28 Grand Rapids	5/13	5/8	5/4	4/30	4/27	4/24	4/21	4/17	4/11
29 Gull Lake Dam	4/27	4/22	4/19	4/16	4/13	4/11	4/8	4/4	3/30
30 Hallock	5/17	5/11	5/7	5/3	4/30	4/26	4/23	4/18	4/12
31 Hinckley	4/29	4/24	4/20	4/17	4/14	4/11	4/9	4/5	3/31
32 International Falls	--	--	--	--	--	--	--	--	--
33 Itasca State Park	5/15	5/10	5/6	5/3	4/30	5/27	4/23	4/19	4/14
34 Leech Lake Dam	5/1	4/27	4/24	4/21	4/18	4/16	4/13	4/10	4/5
35 Little Falls	4/25	4/20	4/17	4/14	4/11	4/8	4/5	4/1	3/28
36 Mahoning Mine	5/2	4/27	4/24	4/22	4/19	4/17	4/14	4/11	4/6
37 Maple Plain	4/19	4/14	4/10	4/7	4/4	4/1	3/28	3/25	3/19
38 Meadowlands	5/15	5/9	5/5	5/2	4/29	4/26	4/22	4/18	4/13

Table 6. Percent probability that a temperature of 20°F. or lower will occur on or after a given date in the spring (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	4/24	4/20	4/16	4/13	4/11	4/8	4/6	4/2	3/29
40 Milan	4/30	4/23	4/18	4/14	4/10	4/7	4/3	3/29	3/22
41 Minneapolis	4/13	4/8	4/4	4/1	3/29	3/26	3/23	3/19	3/14
42 Montevideo	4/19	4/14	4/9	4/6	4/3	3/30	3/27	3/22	3/17
43 Moorhead	4/26	4/20	4/15	4/12	4/8	4/4	4/1	3/27	3/21
44 Moose Lake	5/5	4/30	4/26	4/23	4/20	4/17	4/14	4/11	4/6
45 Mora	4/29	4/23	4/19	4/15	4/12	4/9	4/5	4/1	3/26
46 Morris	4/28	4/22	4/18	4/14	4/11	4/7	4/4	3/31	3/25
47 New London	4/24	4/18	4/14	4/11	4/8	4/5	4/1	3/28	3/23
48 New Ulm	4/21	4/16	4/12	4/8	4/5	4/2	3/29	3/25	3/19
49 Park Rapids	5/3	4/28	4/25	4/22	4/19	4/16	4/13	4/9	4/4
50 Pine River Dam	5/6	5/1	4/28	4/25	4/23	4/20	4/17	4/14	4/10
51 Pipestone	4/22	4/17	4/14	4/11	4/8	4/5	4/3	3/30	3/25
52 Pokegama Dam	5/10	5/5	5/1	4/28	4/25	4/22	4/19	4/15	4/9
53 Red Lake Falls	5/7	5/1	4/27	4/24	4/21	4/18	4/15	4/11	4/5
54 Red Lake Indian Agency	5/4	4/29	4/26	4/23	4/20	4/18	4/15	4/12	4/7
55 Redwood Falls	4/14	4/10	4/6	4/3	4/1	3/29	3/26	3/23	3/18
56 Roseau	5/10	5/5	5/2	4/29	4/26	4/23	4/20	4/16	4/11
57 St. Cloud	4/25	4/18	4/14	4/10	4/6	4/3	3/30	3/25	3/19
58 St. Paul	4/12	4/7	4/3	3/31	3/28	3/25	3/21	3/18	3/12
59 St. Peter	4/15	4/9	4/6	4/2	3/30	3/27	3/24	3/20	3/14
60 Sandy Lake Dam Libby	5/3	4/28	4/25	4/22	4/19	4/16	4/13	4/10	4/5
61 Springfield	4/13	4/8	4/4	3/31	3/28	3/24	3/21	3/17	3/11
62 Tracy	4/17	4/12	4/8	4/5	4/3	3/31	3/28	3/24	3/19
63 Two Harbors	4/21	4/16	4/12	4/9	4/6	4/3	3/30	3/27	3/21
64 Virginia	5/8	5/3	4/29	4/25	4/22	4/19	4/15	4/11	4/6
65 Wadena	5/3	4/27	4/23	4/20	4/17	4/13	4/10	4/6	4/1
66 Walker	4/28	4/24	4/21	4/18	4/15	4/13	4/10	4/7	4/3
67 Warroad	5/5	4/30	4/26	4/23	4/20	4/17	4/14	4/10	4/5
68 Waseca	4/18	4/12	4/8	4/5	4/2	3/30	3/26	3/22	3/17
69 Wheaton	5/2	4/25	4/19	4/15	4/11	4/7	4/2	3/28	4/21
70 Willmar	4/19	4/13	4/9	4/5	4/2	3/30	3/26	3/22	3/16
71 Winnebago	4/13	4/9	4/5	4/3	3/31	3/28	3/26	3/22	3/18
72 Winnibigoshish Dam	4/29	4/25	4/22	4/20	4/18	4/15	4/13	4/10	4/7
73 Winona	4/11	4/6	4/1	3/29	3/26	3/23	3/19	3/15	3/9
74 Worthington	4/16	4/12	4/9	4/6	4/3	4/1	3/29	3/26	3/21
75 Zumbrota	4/23	4/17	4/13	4/9	4/6	4/3	3/30	3/26	3/20

Table 7. Percent probability that a temperature of 24^oF. or lower will occur on or after a given date in the spring

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
1 Ada	5/16	5/10	5/6	5/3	4/29	4/26	4/22	4/18	4/13	
2 Albert Lea	4/18	4/14	4/11	4/8	4/6	4/3	4/1	3/28	3/24	
3 Alexandria	5/3	4/28	4/25	4/22	4/19	4/16	4/13	4/10	4/5	
4 Argyle	5/18	5/13	5/9	5/5	5/3	4/29	4/26	4/22	4/17	
5 Artichoke Lake	5/6	5/1	4/27	4/24	4/21	4/18	4/15	4/11	4/6	
6 Babbitt	5/15	5/10	5/7	5/4	5/1	4/29	4/26	4/22	4/18	
7 Baudette	5/16	5/11	5/7	5/4	5/1	4/28	4/25	4/21	4/16	
8 Beardsley	5/12	5/6	5/2	4/28	4/25	4/22	4/18	4/14	4/8	
9 Bemidji	5/14	5/9	5/6	5/4	5/1	4/29	4/26	4/23	4/19	
10 Big Falls	5/15	5/12	5/9	5/7	5/4	5/2	4/30	4/27	4/23	
11 Bird Island	4/28	4/24	4/20	4/17	4/14	4/11	4/8	4/4	3/31	
12 Brainerd	5/9	5/4	4/30	4/27	4/24	4/21	4/18	4/15	4/10	
13 Cambridge	5/4	4/29	4/26	4/23	4/20	4/17	4/14	4/11	4/6	
14 Campbell	5/13	5/8	5/4	5/1	4/28	4/25	4/22	4/18	4/13	
15 Canby	5/2	4/27	4/23	4/20	4/17	4/14	4/11	4/7	4/2	
16 Cloquet	5/22	5/17	5/14	5/11	5/8	5/5	5/2	4/29	4/24	
17 Crookston	5/16	5/10	5/5	5/2	4/28	4/24	4/21	4/16	4/10	
18 Detroit Lakes	5/13	5/8	5/5	5/2	4/29	4/26	4/23	4/20	4/15	
19 Duluth (airport)	5/16	5/12	5/8	5/6	5/3	5/1	4/28	4/25	4/20	
20 Duluth (city)	5/5	4/30	4/27	4/24	4/21	4/18	4/15	4/12	4/7	
21 Fairmont	4/28	4/23	4/18	4/15	4/11	4/8	4/5	3/31	3/25	
22 Faribault	5/5	4/28	4/24	4/20	4/17	4/13	4/10	4/5	3/30	
23 Farmington	4/27	4/23	4/20	4/18	4/15	4/13	4/11	4/7	4/3	
24 Fergus Falls	5/7	5/2	4/29	4/25	4/23	4/20	4/17	4/13	4/9	
25 Fosston	5/17	5/11	5/7	5/4	5/1	4/28	4/25	4/21	4/16	
26 Grand Marais	5/11	5/5	5/1	4/28	4/25	4/21	4/18	4/14	4/8	
27 Grand Meadow	4/28	4/23	4/20	4/17	4/14	4/11	4/8	4/5	3/31	
28 Grand Rapids	5/22	5/16	5/12	5/8	5/5	5/2	4/28	4/24	4/18	
29 Gull Lake Dam	5/12	5/7	5/3	4/30	4/27	4/24	4/21	4/17	4/12	
30 Hallock	5/22	5/17	5/14	5/11	5/8	5/5	5/2	4/29	4/24	
31 Hinckley	5/7	5/2	4/28	4/25	4/22	4/19	4/15	4/11	4/6	
32 International Falls	5/15	5/10	5/6	5/3	4/30	4/27	4/24	4/21	4/16	
33 Itasca State Park	5/20	5/15	5/12	5/9	5/6	5/3	4/30	4/27	4/22	
34 Leech Lake Dam	5/17	5/12	5/9	5/5	5/3	4/30	4/27	4/23	4/18	
35 Little Falls	5/5	5/1	4/27	4/25	4/22	4/19	4/16	4/13	4/8	
36 Mahoning Mine	5/11	5/6	5/3	4/30	4/27	4/25	4/21	4/18	4/13	
37 Maple Plain	4/28	4/24	4/21	4/19	4/16	4/14	4/11	4/9	4/4	
38 Meadowlands	5/26	5/21	5/17	5/14	5/11	5/8	5/5	5/2	4/27	

Table 7. Probability that a temperature of 24°F. or lower will occur on or after a given date in the spring (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	5/8	5/2	4/29	4/25	4/22	4/19	4/16	4/12	4/7
40 Milan	5/8	5/3	4/29	4/25	4/22	4/19	4/15	4/11	4/5
41 Minneapolis	4/19	4/14	4/11	4/8	4/5	4/2	3/30	3/27	3/22
42 Montevideo	4/30	4/25	4/22	4/19	4/16	4/13	4/10	4/6	4/1
43 Moorhead	5/7	5/2	4/28	4/25	4/22	4/19	4/16	4/13	4/8
44 Moose Lake	5/12	5/8	5/5	5/2	4/30	4/27	4/25	4/21	4/17
45 Mora	5/9	5/4	4/30	4/27	4/24	4/21	4/18	4/14	4/9
46 Morris	5/6	5/1	4/27	4/24	4/21	4/18	4/15	4/11	4/6
47 New London	4/30	4/26	4/22	4/20	4/17	4/14	4/12	4/8	4/4
48 New Ulm	4/30	4/24	4/20	4/16	4/13	4/10	4/6	4/2	3/27
49 Park Rapids	5/15	5/11	5/7	5/4	5/1	4/28	4/25	4/21	4/16
50 Pine River Dam	5/17	5/12	5/7	5/5	5/2	4/29	4/27	4/22	4/17
51 Pipestone	5/4	4/29	4/26	4/23	4/20	4/17	4/14	4/11	4/6
52 Pokegama Dam	5/20	5/15	5/11	5/8	5/5	5/2	4/29	4/25	4/20
53 Red Lake Falls	5/19	5/13	5/9	5/6	5/3	4/29	4/26	4/22	4/16
54 Red Lake Indian Agency	5/15	5/10	5/7	5/5	5/2	4/30	4/27	4/24	4/20
55 Redwood Falls	4/28	4/23	4/20	4/17	4/14	4/11	4/8	4/5	3/31
56 Roseau	5/21	5/16	5/12	5/9	5/6	5/3	4/29	4/25	4/20
57 St. Cloud	5/1	4/26	4/22	4/18	4/15	4/12	4/8	4/4	3/30
58 St. Paul	4/18	4/13	4/9	4/6	4/3	3/31	3/28	3/25	3/20
59 St. Peter	4/28	4/22	4/17	4/14	4/10	4/7	4/3	3/29	3/23
60 Sandy Lake Dam Libby	5/14	5/9	5/5	5/1	4/29	4/25	4/22	4/19	4/13
61 Springfield	4/26	4/21	4/17	4/14	4/11	4/8	4/5	4/1	3/26
62 Tracy	4/30	4/26	4/22	4/20	4/17	4/14	4/12	4/8	4/4
63 Two Harbors	5/4	4/29	4/26	4/23	4/21	4/18	4/15	4/12	4/7
64 Virginia	5/16	5/11	5/7	5/4	5/1	4/28	4/25	4/21	4/16
65 Wadena	5/11	5/6	5/2	4/28	4/25	4/22	4/18	4/14	4/9
66 Walker	5/8	5/3	4/29	4/26	4/23	4/21	4/17	4/14	4/9
67 Warroad	5/18	5/13	5/9	5/6	5/3	4/30	4/27	4/23	4/17
68 Waseca	5/2	4/26	4/23	4/20	4/17	4/14	4/11	4/8	4/2
69 Wheaton	5/7	5/3	4/29	4/26	4/24	4/21	4/18	4/14	4/10
70 Willmar	5/5	4/29	4/25	4/22	4/19	4/16	4/13	4/9	4/3
71 Winnebago	4/26	4/22	4/18	4/15	4/12	4/9	4/6	4/2	3/29
72 Winnibigoshish Dam	5/10	5/5	5/2	4/29	4/27	4/24	4/21	4/18	4/13
73 Winona	4/18	4/13	4/10	4/7	4/4	4/1	3/29	3/26	3/21
74 Worthington	5/2	4/26	4/21	4/18	4/14	4/10	4/7	4/2	3/27
75 Zumbrota	5/2	4/26	4/22	4/19	4/16	4/13	4/10	4/6	3/31

Table 8. Percent probability that a temperature of 28°F. or lower will occur on or after a given date in the spring

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
1 Ada	5/24	5/19	5/15	5/12	5/9	5/7	5/3	4/30	4/25	
2 Albert Lea	5/2	4/28	4/25	4/22	4/20	4/17	4/15	4/12	4/7	
3 Alexandria	5/12	5/8	5/5	5/3	5/1	4/28	4/26	4/23	4/19	
4 Argyle	5/23	5/19	5/17	5/14	5/12	5/10	5/8	5/5	5/1	
5 Artichoke Lake	5/16	5/12	5/8	5/5	5/3	4/30	4/27	4/24	4/19	
6 Babbitt	5/24	5/20	5/17	5/14	5/12	5/9	5/6	5/3	4/29	
7 Baudette	5/27	5/22	5/19	5/16	5/13	5/11	5/8	5/4	4/30	
8 Beardsley	5/22	5/17	5/12	5/9	5/6	5/3	4/29	4/25	4/20	
9 Bemidji	6/2	5/28	5/24	5/20	5/17	5/14	5/11	5/7	5/1	
10 Big Falls	5/28	5/24	5/22	5/19	5/17	5/15	5/12	5/10	5/6	
11 Bird Island	5/12	5/7	5/3	4/29	4/26	4/23	4/19	4/17	4/10	
12 Brainerd	5/17	5/13	5/10	5/7	5/4	5/2	4/29	4/26	4/21	
13 Cambridge	5/14	5/8	5/5	5/2	4/29	4/26	4/23	4/20	4/14	
14 Campbell	5/21	5/16	5/12	5/8	5/5	5/2	4/29	4/25	4/19	
15 Canby	5/14	5/8	5/4	5/1	4/28	4/25	4/22	4/18	4/12	
16 Cloquet	6/3	5/29	5/26	5/23	5/20	5/17	5/14	5/11	5/6	
17 Crookston	5/20	5/16	5/12	5/10	5/7	5/4	5/2	4/28	4/24	
18 Detroit Lakes	5/22	5/18	5/14	5/12	5/9	5/6	5/4	4/30	4/26	
19 Duluth (airport)	5/19	5/15	5/12	5/10	5/8	5/6	5/4	4/30	4/26	
20 Duluth (city)	5/17	5/12	5/8	5/5	5/2	4/29	4/26	4/23	4/18	
21 Fairmont	5/10	5/5	5/1	4/28	4/25	4/22	4/19	4/15	4/10	
22 Faribault	5/14	5/8	5/4	4/30	4/27	4/24	4/20	4/16	4/10	
23 Farmington	5/12	5/6	5/2	4/29	4/25	4/22	4/18	4/14	4/9	
24 Fergus Falls	5/16	5/11	5/8	5/5	5/2	4/29	4/26	4/22	4/17	
25 Fosston	5/23	5/18	5/15	5/13	5/10	5/8	5/5	5/2	4/28	
26 Grand Marais	5/26	5/21	5/17	5/14	5/11	5/8	5/5	5/1	4/25	
27 Grand Meadow	5/16	5/11	5/7	5/3	4/30	4/27	4/23	4/19	4/14	
28 Grand Rapids	5/31	5/26	5/22	5/19	5/16	5/13	5/10	5/6	5/1	
29 Gull Lake Dam	5/16	5/13	5/10	5/8	5/6	5/4	5/2	4/29	4/26	
30 Hallock	5/28	5/23	5/20	5/18	5/15	5/12	5/10	5/7	5/2	
31 Hinckley	5/18	5/13	5/10	5/7	5/4	5/1	4/29	4/25	4/20	
32 International Falls	5/27	5/22	5/18	5/15	5/12	5/10	5/6	5/3	4/28	
33 Itasca State Park	6/3	5/30	5/26	5/24	5/21	5/18	5/16	5/12	5/8	
34 Leech Lake Dam	5/29	5/24	5/20	5/17	5/14	5/11	5/8	5/4	4/29	
35 Little Falls	5/14	5/9	5/6	5/3	4/30	4/27	4/25	4/21	4/16	
36 Mahoning Mine	5/21	5/16	5/13	5/11	5/8	5/6	5/3	4/30	4/26	
37 Maple Plain	5/9	5/5	5/1	4/28	4/25	4/22	4/19	4/16	4/11	
38 Meadowlands	6/6	5/31	5/27	5/23	5/20	5/17	5/13	5/9	5/3	

Table 8. Percent probability that a temperature of 28°F. or lower will occur on or after a given date in the spring (continued)

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
39 Milaca	5/17	5/12	5/9	5/5	5/3	4/30	4/27	4/23	4/18	
40 Milan	5/22	5/17	5/13	5/9	5/6	5/3	4/30	4/26	4/20	
41 Minneapolis	5/3	4/28	4/25	4/22	4/19	4/16	4/13	4/10	4/5	
42 Montevideo	5/13	5/8	5/4	5/1	4/28	4/25	4/23	4/19	4/14	
43 Moorhead	5/19	5/14	5/10	5/7	5/3	4/30	4/27	4/23	4/17	
44 Moose Lake	5/30	5/25	5/21	5/18	5/15	5/12	5/9	5/5	4/30	
45 Mora	5/17	5/13	5/9	5/7	5/4	5/1	4/29	4/25	4/21	
46 Morris	5/20	5/14	5/10	5/7	5/4	5/1	4/28	4/24	4/18	
47 New London	5/12	5/7	5/4	5/1	4/28	4/25	4/22	4/19	4/14	
48 New Ulm	5/13	5/7	5/3	4/30	4/27	4/24	4/21	4/17	4/11	
49 Park Rapids	5/26	5/21	5/17	5/14	5/11	5/8	5/5	5/1	4/26	
50 Pine River Dam	5/28	5/22	5/19	5/16	5/13	5/10	5/7	5/4	4/28	
51 Pipestone	5/18	5/12	5/8	5/5	5/2	4/29	4/26	4/22	4/16	
52 Pokegama Dam	6/1	5/27	5/23	5/20	5/17	5/14	5/11	5/7	5/2	
53 Red Lake Falls	5/28	5/23	5/19	5/16	5/13	5/11	5/8	5/4	4/29	
54 Red Lake Indian Agency	5/26	5/21	5/18	5/15	5/13	5/10	5/8	5/5	4/30	
55 Redwood Falls	5/12	5/6	5/2	4/29	4/26	4/23	4/20	4/16	4/10	
56 Roseau	5/30	5/25	5/22	5/19	5/16	5/13	5/10	5/7	5/2	
57 St. Cloud	5/9	5/4	4/30	4/27	4/24	4/21	4/18	4/14	4/9	
58 St. Paul	4/30	4/26	4/22	4/20	4/17	4/15	4/12	4/9	4/4	
59 St. Peter	5/13	5/8	5/4	5/1	4/28	4/25	4/22	4/18	4/12	
60 Sandy Lake Dam Libby	5/26	5/20	5/15	5/12	5/8	5/4	5/1	4/26	4/20	
61 Springfield	5/11	5/4	4/30	4/26	4/22	4/19	4/15	4/10	4/4	
62 Tracy	5/13	5/8	5/4	5/1	4/28	4/25	4/22	4/18	4/13	
63 Two Harbors	5/18	5/13	5/9	5/6	5/3	4/30	4/27	4/24	4/19	
64 Virginia	5/23	5/19	5/16	5/13	5/11	5/9	5/6	5/3	4/29	
65 Wadena	5/18	5/13	5/10	5/7	5/4	5/1	4/28	4/25	4/20	
66 Walker	5/19	5/14	5/10	5/7	5/5	5/2	4/29	4/25	4/20	
67 Warroad	5/26	5/21	5/17	5/14	5/11	5/9	5/5	5/2	4/27	
68 Waseca	5/14	5/9	5/5	5/1	4/28	4/25	4/21	4/17	4/12	
69 Wheaton	5/17	5/13	5/9	5/6	5/4	5/1	4/28	4/25	4/20	
70 Willmar	5/14	5/9	5/5	5/1	4/28	4/25	4/22	4/17	4/12	
71 Winnebago	5/12	5/6	5/2	4/28	4/25	4/22	4/18	4/14	4/8	
72 Winnibigoshish Dam	5/19	5/15	5/12	5/9	5/7	5/5	5/3	4/30	4/26	
73 Winona	5/1	4/26	4/23	4/20	4/17	4/14	4/11	4/8	4/3	
74 Worthington	5/14	5/9	5/5	5/2	4/29	4/26	4/23	4/19	4/14	
75 Zumbrota	5/16	5/10	5/6	5/3	4/30	4/27	4/24	4/20	4/14	

Table 9. Percent probability that a temperature of 32°F. or lower will occur on or after a given date in the spring

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
1 Ada	6/8	6/2	5/29	5/26	5/23	5/20	5/17	5/13	5/7	
2 Albert Lea	5/18	5/13	5/9	5/6	5/3	5/1	4/28	4/24	4/19	
3 Alexandria	5/26	5/21	5/17	5/14	5/11	5/9	5/6	5/2	4/27	
4 Argyle	6/8	6/3	5/30	5/27	5/24	5/22	5/19	5/15	5/10	
5 Artichoke Lake	5/27	5/22	5/18	5/15	5/12	5/9	5/6	5/2	4/27	
6 Babbitt	6/1	5/28	5/25	5/22	5/20	5/18	5/15	5/12	5/8	
7 Baudette	6/10	6/5	6/1	5/29	5/26	5/23	5/20	5/16	5/10	
8 Beardsley	6/1	5/27	5/23	5/20	5/17	5/14	5/11	5/7	5/2	
9 Bemidji	6/14	6/8	6/4	6/1	5/29	5/26	5/23	5/19	5/14	
10 Big Falls	6/18	6/13	6/10	6/6	6/4	6/1	5/29	5/25	5/20	
11 Bird Island	5/25	5/19	5/15	5/12	5/9	5/6	5/3	4/29	4/23	
12 Brainerd	5/30	5/25	5/22	5/19	5/16	5/13	5/10	5/6	5/1	
13 Cambridge	5/25	5/20	5/17	5/14	5/12	5/10	5/7	5/4	4/29	
14 Campbell	6/2	5/28	5/24	5/21	5/18	5/15	5/12	5/9	5/4	
15 Canby	5/22	5/17	5/14	5/11	5/8	5/5	5/2	4/29	4/24	
16 Cloquet	6/21	6/16	6/12	6/9	6/6	6/3	5/31	5/27	5/22	
17 Crookston	6/2	5/28	5/25	5/22	5/19	5/16	5/13	5/10	5/5	
18 Detroit Lakes	6/9	6/3	5/30	5/26	5/22	5/18	5/14	5/10	5/4	
19 Duluth (airport)	6/2	5/30	5/27	5/25	5/22	5/20	5/18	5/15	5/11	
20 Duluth (city)	5/27	5/22	5/19	5/16	5/13	5/10	5/7	5/4	4/29	
21 Fairmont	5/19	5/14	5/11	5/8	5/5	5/3	4/30	4/26	4/22	
22 Faribault	5/20	5/15	5/11	5/9	5/6	5/3	4/30	4/27	4/22	
23 Farmington	5/22	5/17	5/14	5/11	5/9	5/6	5/3	4/30	4/25	
24 Fergus Falls	5/29	5/24	5/20	5/16	5/13	5/10	5/7	5/3	4/28	
25 Fosston	6/8	6/2	5/30	5/27	5/24	5/21	5/17	5/14	5/9	
26 Grand Marais	6/9	6/3	5/30	5/26	5/23	5/20	5/16	5/12	5/6	
27 Grand Meadow	5/22	5/18	5/15	5/12	5/10	5/8	5/5	5/2	4/28	
28 Grand Rapids	6/14	6/8	6/4	6/1	5/29	5/26	5/23	5/19	5/13	
29 Gull Lake Dam	5/30	5/25	5/22	5/19	5/16	5/13	5/11	5/7	5/3	
30 Hallock	6/13	6/7	6/3	5/31	5/28	5/25	5/22	5/18	5/12	
31 Hinckley	5/31	5/27	5/24	5/21	5/19	5/17	5/14	5/11	5/7	
32 International Falls	6/8	6/3	5/30	5/26	5/23	5/20	5/17	5/13	5/7	
33 Itasca State Park	6/16	6/12	6/9	6/6	6/4	6/2	5/30	5/27	5/23	
34 Leech Lake Dam	6/12	6/6	6/2	5/29	5/26	5/23	5/19	5/15	5/9	
35 Little Falls	5/23	5/19	5/15	5/13	5/10	5/8	5/5	5/2	4/28	
36 Mahoning Mine	5/30	5/26	5/23	5/21	5/19	5/17	5/14	5/11	5/8	
37 Maple Plain	5/22	5/17	5/13	5/10	5/7	5/5	5/1	4/28	4/23	
38 Meadowlands	6/22	6/16	6/11	6/8	6/4	6/1	5/28	5/24	5/18	

Table 9. Percent probability that a temperature of 32°F. or lower will occur on or after a given date in the spring (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	5/26	5/21	5/18	5/15	5/12	5/9	5/6	5/3	4/28
40 Milan	5/29	5/24	5/21	5/17	5/15	5/12	5/9	5/5	4/30
41 Minneapolis	5/13	5/8	5/5	5/2	4/29	4/26	4/23	4/20	4/15
42 Montevideo	5/21	5/16	5/13	5/10	5/7	5/5	5/2	4/28	4/23
43 Moorhead	5/23	5/20	5/17	5/15	5/12	5/10	5/8	5/5	5/1
44 Moose Lake	6/3	5/31	5/28	5/26	5/24	5/22	5/20	5/18	5/14
45 Mora	5/27	5/23	5/19	5/17	5/14	5/11	5/9	5/5	5/1
46 Morris	5/27	5/22	5/18	5/15	5/12	5/9	5/6	5/2	4/27
47 New London	5/22	5/17	5/14	5/11	5/8	5/5	5/2	4/29	4/24
48 New Ulm	5/26	5/21	5/17	5/13	5/10	5/7	5/3	4/29	4/24
49 Park Rapids	6/5	5/31	5/27	5/24	5/21	5/18	5/15	5/11	5/6
50 Pine River Dam	6/9	6/3	5/30	5/27	5/24	5/21	5/18	5/14	5/8
51 Pipestone	5/23	5/19	5/15	5/13	5/10	5/7	5/5	5/1	4/27
52 Pokegama Dam	6/16	6/10	6/6	6/2	5/30	5/27	5/23	5/19	5/13
53 Red Lake Falls	6/11	6/6	6/3	5/31	5/28	5/25	5/22	5/18	5/13
54 Red Lake Indian Agency	6/9	6/4	5/31	5/28	5/25	5/23	5/19	5/16	5/11
55 Redwood Falls	5/16	5/12	5/9	5/6	5/3	5/1	4/28	4/25	4/20
56 Roseau	6/10	6/5	6/1	5/29	5/26	5/23	5/19	5/15	5/10
57 St. Cloud	5/20	5/16	5/12	5/10	5/7	5/4	5/2	4/28	4/24
58 St. Paul	5/14	5/9	5/6	5/3	4/30	4/27	4/24	4/21	4/16
59 St. Peter	5/23	5/18	5/15	5/11	5/9	5/6	5/2	4/29	4/23
60 Sandy Lake Dam Libby	6/12	6/6	6/2	5/29	5/26	5/23	5/19	5/15	5/9
61 Springfield	5/20	5/15	5/12	5/9	5/6	5/3	4/30	4/26	4/21
62 Tracy	5/21	5/16	5/13	5/10	5/7	5/4	5/1	4/28	4/23
63 Two Harbors	5/27	5/23	5/20	5/17	5/15	5/12	5/10	5/7	5/2
64 Virginia	6/8	6/3	5/30	5/27	5/24	5/21	5/18	5/14	5/9
65 Wadena	6/1	5/27	5/23	5/20	5/17	5/14	5/11	5/7	5/2
66 Walker	5/30	5/25	5/22	5/19	5/16	5/14	5/11	5/7	5/3
67 Warroad	6/10	6/4	5/31	5/27	5/24	5/21	5/17	5/13	5/7
68 Waseca	5/27	5/21	5/17	5/13	5/10	5/7	5/3	4/29	4/23
69 Wheaton	5/22	5/18	5/15	5/12	5/10	5/7	5/5	5/2	4/28
70 Willmar	5/22	5/17	5/14	5/11	5/8	5/5	5/2	4/29	4/24
71 Winnebago	5/19	5/14	5/11	5/8	5/5	5/2	4/29	4/26	4/21
72 Winnibigoshish Dam	6/3	5/29	5/26	5/23	5/21	5/19	5/16	5/13	5/8
73 Winona	5/15	5/10	5/6	5/2	4/29	4/26	4/22	4/18	4/13
74 Worthington	5/21	5/16	5/12	5/10	5/7	5/4	5/2	4/28	4/23
75 Zumbrota	5/28	5/22	5/18	5/15	5/12	5/9	5/6	5/2	4/26

Table 10. Percent probability that a temperature of 36°F. or lower will occur on or after a given date in the spring

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
11 Bird Island	6/1	5/27	5/24	5/21	5/18	5/15	5/12	5/9	5/4
13 Cambridge	6/5	6/1	5/29	5/26	5/24	5/22	5/19	5/16	5/12
15 Canby	5/29	5/25	5/22	5/19	5/17	5/15	5/12	5/9	5/5
16 Cloquet	6/24	6/20	6/17	6/14	6/12	6/10	6/7	6/4	5/31
17 Crookston	6/13	6/8	6/4	6/1	5/29	5/26	5/23	5/19	5/14
18 Detroit Lakes	6/17	6/11	6/7	6/4	6/1	5/29	5/26	5/22	5/16
27 Grand Meadow	6/4	5/30	5/26	5/23	5/20	5/17	5/14	5/10	5/5
28 Grand Rapids	6/22	6/17	6/14	6/11	6/8	6/5	6/2	5/30	5/25
30 Hallock	6/19	6/14	6/11	6/9	6/6	6/3	6/1	5/29	5/24
32 International Falls	6/21	6/15	6/11	6/8	6/5	6/2	5/30	5/26	5/21
33 Itasca State Park	6/25	6/20	6/17	6/14	6/11	6/8	6/5	6/2	5/28
41 Minneapolis	5/23	5/19	5/15	5/13	5/10	5/7	5/5	5/1	4/27
45 Mora	6/7	6/3	5/30	5/28	5/25	5/22	5/20	5/16	5/12
46 Morris	6/7	6/2	5/30	5/27	5/24	5/21	5/18	5/15	5/10
47 New London	6/5	5/30	5/26	5/22	5/19	5/16	5/12	5/8	5/2
48 New Ulm	6/4	5/29	5/25	5/21	5/18	5/15	5/11	5/7	5/1
50 Pine River Dam	6/19	6/15	6/11	6/8	6/5	6/2	5/30	5/26	5/22
51 Pipestone	6/2	5/29	5/26	5/23	5/21	5/19	5/16	5/13	5/9
57 St. Cloud	6/1	5/27	5/24	5/22	5/19	5/16	5/14	5/11	5/6
62 Tracy	5/30	5/26	5/23	5/20	5/18	5/16	5/13	5/10	5/6
64 Virginia	6/22	6/16	6/12	6/9	6/6	6/3	5/31	5/27	5/21
65 Wadena	6/13	6/7	6/4	6/1	5/29	5/26	5/23	5/20	5/14
68 Waseca	6/3	5/29	5/25	5/22	5/19	5/16	5/13	5/9	5/4
71 Winnebago	5/28	5/23	5/20	5/17	5/14	5/11	5/8	5/5	4/30
73 Winona	5/27	5/22	5/19	5/16	5/13	5/10	5/7	5/4	4/29
74 Worthington	5/30	5/25	5/22	5/20	5/17	5/14	5/12	5/9	5/4
75 Zumbrota	6/9	6/3	5/30	5/27	5/24	5/21	5/18	5/14	5/8

Table II. Percent probability that a temperature of 40°F. or lower will occur on or after a given date in the spring

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
11 Bird Island	6/14	6/8	6/4	6/1	5/29	5/26	5/23	5/19	5/13	
13 Cambridge	6/17	6/12	6/9	6/7	6/4	6/1	5/30	5/27	5/22	
15 Canby	6/13	6/9	6/5	6/3	5/31	5/28	5/26	5/22	5/18	
16 Cloquet	6/30	6/27	6/25	6/23	6/21	6/19	6/17	6/15	6/12	
17 Crookston	6/28	6/16	6/13	6/11	6/9	6/7	6/5	6/2	5/21	
18 Detroit Lakes	6/25	6/20	6/17	6/14	6/11	6/8	6/5	6/2	5/28	
27 Grand Meadow	6/16	6/11	6/7	6/3	5/31	5/28	5/24	5/20	5/15	
28 Grand Rapids	7/1	6/27	6/24	6/21	6/19	6/17	6/14	6/11	6/7	
30 Hallock	6/28	6/24	6/21	6/18	6/16	6/14	6/11	6/8	6/4	
32 International Falls	6/28	6/24	6/20	6/18	6/15	6/12	6/10	6/6	6/2	
33 Itasca State Park	6/29	6/26	6/24	6/22	6/20	6/18	6/16	6/14	6/11	
41 Minneapolis	5/30	5/26	5/22	5/20	5/17	5/14	5/12	5/8	5/4	
45 Mora	6/22	6/17	6/13	6/10	6/7	6/4	6/1	5/28	5/23	
46 Morris	6/17	6/12	6/8	6/5	6/2	5/30	5/27	5/23	5/18	
47 New London	6/3	6/2	6/1	5/31	5/30	5/29	5/28	5/27	5/26	
48 New Ulm	6/16	6/11	6/7	6/3	5/31	5/28	5/24	5/20	5/15	
50 Pine River Dam	6/25	6/20	6/17	6/15	6/12	6/9	6/7	6/4	5/30	
51 Pipestone	6/13	6/9	6/5	6/3	5/31	5/28	5/26	5/22	5/18	
57 St. Cloud	6/15	6/9	6/5	6/1	5/29	5/26	5/22	5/18	5/12	
62 Tracy	6/10	6/5	6/2	5/30	5/27	5/24	5/21	5/18	5/13	
64 Virginia	6/26	6/22	6/19	6/16	6/14	6/12	6/9	6/6	6/2	
65 Wadena	6/20	6/16	6/13	6/10	6/7	6/4	6/1	5/29	5/25	
68 Waseca	6/13	6/8	6/5	6/2	5/30	5/27	5/24	5/21	5/16	
71 Winnebago	6/6	6/1	5/29	5/26	5/23	5/20	5/17	5/14	5/9	
73 Winona	6/5	5/31	5/27	5/24	5/21	5/18	5/15	5/11	5/6	
74 Worthington	6/10	6/5	6/1	5/29	5/26	5/23	5/20	5/16	5/11	
75 Zumbrota	6/22	6/16	6/12	6/8	6/5	6/2	5/29	5/25	5/19	

Table 12. Percent probability that a temperature of 16 °F or lower will occur on or before a given date in the fall

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
1 Ada	10/17	10/22	10/26	10/29	11/1	11/4	11/7	11/11	11/16
2 Albert Lea	11/2	11/7	11/10	11/13	11/15	11/18	11/21	11/24	11/29
3 Alexandria	10/27	11/1	11/4	11/7	11/9	11/12	11/15	11/18	11/23
4 Argyle	10/10	10/16	10/21	10/25	10/28	11/1	11/5	11/9	11/15
5 Artichoke Lake	10/21	10/27	10/31	11/3	11/6	11/9	11/12	11/16	11/21
6 Babbitt	10/22	10/27	10/30	11/2	11/5	11/8	11/11	11/14	11/19
7 Baudette	10/16	10/22	10/26	10/30	11/2	11/5	11/9	11/13	11/19
8 Beardsley	10/16	10/22	10/27	10/31	11/3	11/7	11/10	11/15	11/21
9 Bemidji	10/12	10/18	10/23	10/26	10/30	11/2	11/6	11/10	11/16
10 Big Falls	10/6	10/13	10/19	10/23	10/27	10/31	11/4	11/10	11/17
11 Bird Island	10/22	10/28	10/31	11/4	11/7	11/9	11/13	11/16	11/21
12 Brainerd	10/22	10/27	10/30	11/2	11/5	11/8	11/11	11/15	11/19
13 Cambridge	10/22	10/27	10/31	11/4	11/7	11/10	11/14	11/18	11/23
14 Campbell	10/16	10/22	10/26	10/29	11/1	11/5	11/8	11/12	11/18
15 Canby	10/23	10/28	11/1	11/5	11/8	11/11	11/14	11/18	11/24
16 Cloquet	10/11	10/17	10/22	10/26	10/29	11/2	11/6	11/10	11/16
17 Crookston	10/14	10/20	10/24	10/28	10/31	11/4	11/7	11/12	11/17
18 Detroit Lakes	10/16	10/22	10/27	10/30	11/3	11/7	11/10	11/15	11/21
19 Duluth (airport)	10/29	11/2	11/5	11/8	11/11	11/13	11/16	11/19	11/24
20 Duluth (city)	10/26	10/31	11/4	11/7	11/9	11/12	11/15	11/19	11/24
21 Fairmont	11/1	11/6	11/9	11/11	11/14	11/17	11/19	11/22	11/27
22 Faribault	10/28	11/3	11/7	11/11	11/14	11/17	11/21	11/25	12/1
23 Farmington	10/18	10/25	10/30	11/3	11/7	11/11	11/15	11/21	11/27
24 Fergus Falls	10/20	10/25	10/29	11/1	11/5	11/8	11/11	11/15	11/21
25 Fosston	10/14	10/20	10/24	10/28	10/31	11/3	11/7	11/11	11/17
26 Grand Marais	10/26	11/1	11/5	11/8	11/11	11/15	11/18	11/22	11/27
27 Grand Meadow	10/25	10/30	11/3	11/6	11/9	11/12	11/15	11/19	11/24
28 Grand Rapids	10/3	10/11	10/17	10/21	10/26	10/30	11/4	11/10	11/17
29 Gull Lake Dam	10/21	10/26	10/30	11/3	11/6	11/9	11/13	11/17	11/23
30 Hallock	10/10	10/16	10/20	10/23	10/26	10/30	11/2	11/6	11/11
31 Hinckley	10/22	10/28	10/31	11/4	11/7	11/10	11/13	11/17	11/22
32 International Falls	--	--	--	--	--	--	--	--	--
33 Itasca State Park	10/13	10/18	10/22	10/26	10/29	11/1	11/4	11/8	11/13
34 Leech Lake Dam	10/12	10/19	10/23	10/27	10/31	11/4	11/8	11/13	11/19
35 Little Falls	10/21	10/26	10/30	11/3	11/6	11/9	11/13	11/17	11/23
36 Mahoning Mine	10/24	10/28	11/1	11/4	11/6	11/9	11/12	11/15	11/20
37 Maple Plain	10/27	11/1	11/4	11/7	11/10	11/13	11/16	11/20	11/25
38 Meadowlands	10/1	10/9	10/14	10/19	10/24	10/28	11/2	11/8	11/15

Table 12. Percent probability that a temperature of 16°F. or lower will occur on or before a given date in the fall (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	10/20	10/27	10/31	11/4	11/7	11/11	11/15	11/19	11/25
40 Milan	10/21	10/26	10/30	11/3	11/6	11/9	11/13	11/17	11/23
41 Minneapolis	11/3	11/8	11/12	11/15	11/17	11/20	11/23	11/27	12/2
42 Montevideo	10/25	10/30	11/3	11/7	11/10	11/13	11/17	11/21	11/26
43 Moorhead	10/20	10/25	10/29	11/1	11/5	11/8	11/11	11/15	11/21
44 Moose Lake	10/24	10/29	11/1	11/5	11/8	11/11	11/14	11/17	11/23
45 Mora	10/19	10/26	10/30	11/4	11/7	11/11	11/15	11/20	11/27
46 Morris	10/20	10/26	10/30	11/2	11/5	11/8	11/11	11/15	11/21
47 New London	10/22	10/27	10/31	11/4	11/7	11/10	11/13	11/17	11/23
48 New Ulm	10/19	10/25	10/30	11/2	11/6	11/9	11/13	11/17	11/23
49 Park Rapids	10/18	10/23	10/27	10/30	11/2	11/5	11/8	11/12	11/17
50 Pine River Dam	10/14	10/20	10/25	10/29	11/1	11/5	11/9	11/14	11/20
51 Pipestone	10/25	10/30	11/3	11/6	11/9	11/12	11/15	11/18	11/23
52 Pokegama Dam	10/10	10/17	10/22	10/26	10/30	11/3	11/8	11/13	11/20
53 Red Lake Falls	10/11	10/16	10/21	10/24	10/28	10/31	11/3	11/8	11/14
54 Red Lake Indian Agency	10/20	10/26	10/29	11/2	11/5	11/8	11/11	11/15	11/20
55 Redwood Falls	10/26	11/1	11/5	11/8	11/11	11/14	11/17	11/21	11/27
56 Roseau	10/8	10/14	10/19	10/23	10/27	10/30	11/3	11/8	11/15
57 St. Cloud	10/29	11/2	11/6	11/8	11/11	11/13	11/16	11/19	11/24
58 St. Paul	11/4	11/9	11/12	11/15	11/18	11/20	11/23	11/27	12/1
59 St. Peter	10/25	10/31	11/4	11/8	11/11	11/15	11/19	11/23	11/29
60 Sandy Lake Dam Libby	10/16	10/22	10/26	10/30	11/2	11/6	11/9	11/14	11/20
61 Springfield	10/27	11/1	11/6	11/9	11/11	11/15	11/18	11/22	11/27
62 Tracy	10/27	10/31	11/4	11/7	11/9	11/12	11/15	11/18	11/22
63 Two Harbors	10/31	11/5	11/8	11/11	11/13	11/15	11/18	11/21	11/26
64 Virginia	10/19	10/24	10/27	10/30	11/2	11/5	11/8	11/12	11/17
65 Wadena	10/15	10/20	10/25	10/28	10/31	11/3	11/7	11/11	11/17
66 Walker	10/24	10/29	11/1	11/4	11/7	11/10	11/13	11/16	11/21
67 Warroad	10/16	10/22	10/26	10/30	11/2	11/5	11/9	11/13	11/19
68 Waseca	10/23	10/28	11/1	11/5	11/8	11/11	11/15	11/19	11/24
69 Wheaton	10/18	10/24	10/28	11/1	11/4	11/7	11/11	11/15	11/21
70 Wilmar	10/24	10/29	11/2	11/5	11/8	11/11	11/14	11/18	11/23
71 Winnebago	10/28	11/2	11/5	11/9	11/11	11/14	11/17	11/21	11/26
72 Winnibigoshish Dam	10/20	10/26	10/30	11/2	11/5	11/8	11/12	11/16	11/21
73 Winona	11/5	11/10	11/13	11/17	11/19	11/22	11/25	11/28	12/3
74 Worthington	10/25	10/30	11/3	11/7	11/10	11/13	11/16	11/20	11/25
75 Zumbrota	10/21	10/27	11/1	11/5	11/9	11/12	11/16	11/21	11/27

Table 13. Percent probability that a temperature of 20°F. or lower will occur on or before a given date in the fall

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
1 Ada	10/4	10/10	10/15	10/19	10/22	10/26	10/30	11/3	11/9
2 Albert Lea	10/24	10/28	11/1	11/3	11/6	11/9	11/12	11/15	11/20
3 Alexandria	10/14	10/20	10/24	10/28	10/31	11/3	11/7	11/11	11/17
4 Argyle	10/4	10/10	10/15	10/18	10/22	10/25	10/29	11/2	11/8
5 Artichoke Lake	10/11	10/18	10/22	10/26	10/30	11/2	11/6	11/11	11/17
6 Babbitt	10/14	10/19	10/22	10/25	10/27	10/30	11/1	11/5	11/9
7 Baudette	10/3	10/9	10/14	10/17	10/21	10/24	10/28	11/1	11/7
8 Beardsville	9/29	10/6	10/12	10/17	10/22	10/26	10/31	11/5	11/13
9 Bemidji	9/29	10/5	10/9	10/12	10/16	10/19	10/22	10/26	11/1
10 Big Falls	9/27	10/3	10/7	10/11	10/15	10/18	10/22	10/26	11/1
11 Bird Island	10/15	10/20	10/24	10/27	10/30	11/2	11/6	11/9	11/15
12 Brainerd	10/6	10/12	10/16	10/19	10/23	10/26	10/29	11/2	11/8
13 Cambridge	10/12	10/18	10/22	10/26	10/29	11/1	11/5	11/9	11/15
14 Campbell	10/2	10/8	10/14	10/18	10/22	10/26	10/30	11/4	11/11
15 Canby	10/15	10/20	10/24	10/28	10/31	11/3	11/6	11/10	11/15
16 Cloquet	9/29	10/4	10/8	10/12	10/15	10/18	10/22	10/26	10/31
17 Crookston	10/5	10/11	10/15	10/18	10/22	10/25	10/28	11/2	11/7
18 Detroit Lakes	10/5	10/12	10/17	10/21	10/25	10/28	11/1	11/6	11/13
19 Duluth (airport)	10/15	10/21	10/25	10/29	11/1	11/4	11/8	11/12	11/17
20 Duluth (city)	10/19	10/24	10/28	10/31	11/3	11/6	11/9	11/13	11/18
21 Fairmont	10/20	10/25	10/28	11/1	11/3	11/6	11/9	11/13	11/18
22 Faribault	10/20	10/26	10/30	11/3	11/6	11/9	11/13	11/17	11/23
23 Farmington	10/11	10/17	10/22	10/25	10/29	11/2	11/5	11/10	11/16
24 Fergus Falls	10/12	10/17	10/21	10/25	10/28	10/31	11/3	11/7	11/13
25 Fosston	10/5	10/11	10/16	10/19	10/23	10/26	10/30	11/3	11/9
26 Grand Marais	10/22	10/27	10/31	11/3	11/6	11/9	11/13	11/16	11/21
27 Grand Meadow	10/16	10/21	10/25	10/28	10/31	11/3	11/7	11/10	11/16
28 Grand Rapids	9/26	10/2	10/6	10/10	10/13	10/16	10/20	10/24	10/30
29 Gull Lake Dam	10/13	10/18	10/22	10/26	10/29	11/1	11/4	11/8	11/13
30 Hallock	9/26	10/4	10/8	10/13	10/17	10/21	10/25	10/30	11/6
31 Hinckley	10/6	10/12	10/17	10/21	10/25	10/29	11/2	11/7	11/14
32 International Falls	--	--	--	--	--	--	--	--	--
33 Itasca State Park	10/3	10/9	10/13	10/16	10/19	10/22	10/26	10/30	11/4
34 Leech Lake Dam	10/2	10/9	10/14	10/18	10/21	10/25	10/29	11/3	11/9
35 Little Falls	10/10	10/17	10/21	10/25	10/28	11/1	11/5	11/9	11/15
36 Mahoning Mine	10/14	10/20	10/23	10/26	10/29	11/1	11/4	11/8	11/13
37 Maple Plain	10/18	10/23	10/27	10/30	11/2	11/5	11/9	11/13	11/18
38 Meadowlands	9/24	9/30	10/4	10/7	10/10	10/13	10/16	10/20	10/26

Table 13. Percent probability that a temperature of 20°F or lower will occur on or before a given date in the fall (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	10/13	10/18	10/21	10/24	10/27	10/30	11/1	11/5	11/10
40 Milan	10/12	10/16	10/20	10/23	10/26	10/28	10/31	11/4	11/9
41 Minneapolis	10/28	11/2	11/5	11/8	11/11	11/13	11/16	11/19	11/24
42 Montevideo	10/19	10/24	10/28	10/31	11/3	11/6	11/9	11/13	11/18
43 Moorhead	10/13	10/19	10/23	10/26	10/29	11/1	11/5	11/9	11/14
44 Moose Lake	9/29	10/8	10/14	10/20	10/24	10/30	11/4	11/10	11/19
45 Mora	10/12	10/17	10/21	10/24	10/27	10/30	11/3	11/7	11/12
46 Morris	10/10	10/16	10/20	10/24	10/28	10/31	11/4	11/8	11/15
47 New London	10/15	10/20	10/24	10/28	10/31	11/3	11/6	11/10	11/16
48 New Ulm	10/12	10/17	10/21	10/24	10/27	10/30	11/1	11/5	11/10
49 Park Rapids	10/4	10/10	10/14	10/18	10/21	10/25	10/28	11/2	11/7
50 Pine River Dam	9/30	10/7	10/12	10/16	10/20	10/24	10/28	11/2	11/9
51 Pipestone	10/15	10/20	10/24	10/26	10/29	11/1	11/4	11/7	11/12
52 Pokegama Dam	9/30	10/6	10/10	10/14	10/18	10/21	10/25	10/29	11/4
53 Red Lake Falls	10/3	10/9	10/13	10/17	10/21	10/24	10/28	11/1	11/7
54 Red Lake Indian Agency	10/9	10/15	10/20	10/24	10/27	10/31	11/3	11/8	11/14
55 Redwood Falls	10/19	10/24	10/28	10/31	11/3	11/6	11/9	11/13	11/18
56 Roseau	9/30	10/6	10/11	10/15	10/18	10/22	10/26	10/31	11/6
57 St. Cloud	10/19	10/23	10/26	10/29	11/1	11/3	11/6	11/9	11/14
58 St. Paul	10/26	11/1	11/4	11/7	11/10	11/13	11/16	11/20	11/25
59 St. Peter	10/16	10/22	10/26	10/30	11/2	11/5	11/9	11/13	11/19
60 Sandy Lake Dam Libby	10/6	10/13	10/18	10/22	10/25	10/29	11/2	11/7	11/13
61 Springfield	10/17	10/23	10/28	10/31	11/4	11/7	11/11	11/15	11/21
62 Tracy	10/17	10/22	10/26	10/29	11/1	11/4	11/7	11/11	11/16
63 Two Harbors	10/21	10/27	10/31	11/3	11/6	11/9	11/12	11/16	11/22
64 Virginia	10/9	10/14	10/18	10/20	10/23	10/26	10/29	11/1	11/6
65 Wadena	10/1	10/8	10/13	10/18	10/22	10/26	10/30	11/4	11/11
66 Walker	10/14	10/19	10/22	10/26	10/29	11/1	11/4	11/8	11/13
67 Warroad	9/29	10/6	10/11	10/15	10/19	10/23	10/27	11/1	11/8
68 Waseca	10/14	10/20	10/25	10/28	11/1	11/5	11/8	11/13	11/19
69 Wheaton	10/11	10/16	10/21	10/24	10/28	10/31	11/4	11/8	11/14
70 Willmar	10/11	10/18	10/22	10/26	10/29	11/2	11/6	11/10	11/17
71 Winnebago	10/18	10/24	10/28	10/31	11/3	11/6	11/9	11/13	11/19
72 Winnibigoshish Dam	10/14	10/19	10/23	10/26	10/29	11/1	11/5	11/9	11/14
73 Winona	10/25	10/31	11/4	11/8	11/11	11/14	11/18	11/22	11/27
74 Worthington	10/17	10/22	10/26	10/29	11/1	11/3	11/7	11/10	11/15
75 Zumbrota	10/12	10/18	10/23	10/26	10/30	11/3	11/7	11/11	11/17

Table 14. Percent probability that a temperature of 24°F. or lower will occur on or before a given date in the fall

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
1 Ada	9/19	9/25	9/30	10/4	10/8	10/12	10/16	10/31	10/27
2 Albert Lea	10/12	10/17	10/21	10/25	10/28	10/31	11/3	11/7	11/13
3 Alexandria	10/8	10/14	10/18	10/21	10/25	10/28	10/31	11/5	11/10
4 Argyle	9/21	9/27	10/1	10/4	10/7	10/10	10/14	10/18	10/24
5 Artichoke Lake	9/27	10/3	10/8	10/12	10/15	10/19	10/23	10/27	11/3
6 Babbitt	10/1	10/6	10/10	10/13	10/16	10/19	10/22	10/26	11/1
7 Baudette	9/22	9/27	9/30	10/3	10/6	10/9	10/12	10/16	10/21
8 Beardesley	9/25	9/30	10/5	10/8	10/12	10/15	10/18	10/23	10/29
9 Bemidji	9/19	9/24	9/28	10/1	10/3	10/6	10/9	10/13	10/18
10 Big Falls	9/20	9/25	9/28	10/1	10/4	10/7	10/10	10/13	10/18
11 Bird Island	10/6	10/11	10/15	10/18	10/21	10/24	10/27	10/31	11/5
12 Brainerd	9/26	10/2	10/7	10/10	10/14	10/18	10/21	10/26	11/1
13 Cambridge	10/3	10/9	10/13	10/17	10/20	10/23	10/27	10/31	11/6
14 Campbell	9/19	9/25	9/30	10/3	10/7	10/11	10/14	10/19	10/25
15 Canby	10/5	10/11	10/15	10/19	10/22	10/25	10/29	11/2	11/8
16 Cloquet	9/19	9/24	9/28	10/2	10/5	10/8	10/12	10/16	10/21
17 Crookston	9/24	9/29	10/3	10/7	10/10	10/13	10/17	10/21	10/26
18 Detroit Lakes	9/21	9/27	10/2	10/6	10/10	10/14	10/18	10/23	10/29
19 Duluth (airport)	9/30	10/6	10/10	10/14	10/17	10/20	10/24	10/28	11/3
20 Duluth (city)	10/11	10/17	10/21	10/24	10/28	10/31	11/3	11/8	11/13
21 Fairmont	10/11	10/16	10/20	10/24	10/27	10/30	11/2	11/7	11/12
22 Faribault	10/8	10/14	10/18	10/21	10/25	10/28	11/1	11/5	11/11
23 Farmington	10/4	10/10	10/15	10/19	10/22	10/26	10/30	11/4	11/10
24 Fergus Falls	9/28	10/5	10/10	10/14	10/18	10/22	10/27	11/1	11/8
25 Fosston	9/22	9/28	10/2	10/5	10/9	10/12	10/16	10/20	10/26
26 Grand Marais	10/8	10/14	10/18	10/22	10/25	10/29	11/2	11/6	11/12
27 Grand Meadow	10/6	10/11	10/15	10/19	10/22	10/25	10/29	11/2	11/7
28 Grand Rapids	9/15	9/21	9/25	9/29	10/2	10/5	10/9	10/13	10/19
29 Gull Lake Dam	10/1	10/8	10/12	10/16	10/20	10/24	10/28	11/1	11/8
30 Hallock	9/14	9/20	9/25	9/29	10/2	10/5	10/9	10/14	10/20
31 Hinckley	9/26	10/3	10/7	10/11	10/14	10/18	10/22	10/26	11/1
32 International Falls	9/26	10/1	10/5	10/9	10/12	10/15	10/18	10/22	10/27
33 Itasca State Park	9/18	9/23	9/27	10/1	10/4	10/7	10/11	10/15	10/20
34 Leech Lake Dam	9/25	9/30	10/4	10/7	10/10	10/13	10/16	10/20	10/26
35 Little Falls	10/1	10/7	10/11	10/14	10/18	10/21	10/24	10/28	11/3
36 Mahoning Mine	10/6	10/11	10/15	10/18	10/21	10/24	10/27	10/30	11/5
37 Maple Plain	10/9	10/14	10/19	10/22	10/26	10/29	11/1	11/6	11/11
38 Meadowlands	9/15	9/21	9/25	9/28	10/2	10/5	10/8	10/12	10/18

Table 14. Percent probability that a temperature of 24°F. or lower will occur on or before a given date in the fall (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	10/1	10/7	10/11	10/14	10/18	10/21	10/25	10/29	11/4
40 Milan	9/30	10/6	10/10	10/14	10/17	10/20	10/24	10/28	11/3
41 Minneapolis	10/18	10/23	10/27	10/30	11/2	11/5	11/8	11/12	11/17
42 Montevideo	10/6	10/12	10/17	10/20	10/24	10/28	11/1	11/5	11/12
43 Moorhead	9/27	10/3	10/8	10/12	10/16	10/19	10/23	10/28	11/3
44 Moose Lake	9/25	10/1	10/6	10/9	10/13	10/16	10/20	10/25	10/31
45 Mora	9/23	9/30	10/5	10/10	10/14	10/18	10/23	10/28	11/4
46 Morris	9/30	10/6	10/10	10/14	10/17	10/20	10/24	10/28	11/3
47 New London	10/8	10/14	10/18	10/21	10/24	10/27	10/30	11/3	11/9
48 New Ulm	10/6	10/11	10/14	10/17	10/20	10/23	10/26	10/29	11/3
49 Park Rapids	9/20	9/26	10/1	10/5	10/9	10/12	10/16	10/21	10/28
50 Pine River Dam	9/24	9/30	10/4	10/8	10/11	10/14	10/18	10/22	10/28
51 Pipestone	9/29	10/6	10/10	10/14	10/18	10/22	10/26	10/30	11/6
52 Pokegama Dam	9/22	9/27	10/1	10/4	10/7	10/10	10/14	10/17	10/23
53 Red Lake Falls	9/19	9/25	9/29	10/3	10/7	10/10	10/14	10/18	10/24
54 Red Lake Indian Agency	9/29	10/4	10/9	10/12	10/16	10/19	10/22	10/27	11/2
55 Redwood Falls	10/12	10/17	10/21	10/24	10/28	10/31	11/3	11/7	11/12
56 Roseau	9/18	9/24	9/29	10/3	10/6	10/10	10/14	10/18	10/24
57 St. Cloud	10/2	10/8	10/12	10/16	10/19	10/22	10/26	10/30	11/5
58 St. Paul	10/20	10/25	10/28	11/1	11/3	11/6	11/9	11/13	11/18
59 St. Peter	10/6	10/12	10/16	10/19	10/23	10/26	10/29	11/2	11/8
60 Sandy Lake Dam Libby	9/23	9/29	10/3	10/7	10/10	10/13	10/17	10/21	10/27
61 Springfield	10/6	10/12	10/17	10/21	10/24	10/28	11/1	11/5	11/12
62 Tracy	10/12	10/17	10/20	10/23	10/26	10/29	11/1	11/4	11/9
63 Two Harbors	10/16	10/21	10/24	10/28	10/31	11/3	11/6	11/10	11/15
64 Virginia	9/25	9/30	10/4	10/8	10/11	10/14	10/18	10/22	10/27
65 Wadena	9/29	10/5	10/9	10/12	10/15	10/18	10/21	10/25	10/31
66 Walker	10/5	10/10	10/14	10/18	10/21	10/24	10/27	10/31	11/5
67 Warroad	9/21	9/27	10/2	10/6	10/9	10/12	10/16	10/21	10/27
68 Waseca	10/7	10/12	10/16	10/19	10/22	10/25	10/28	11/1	11/6
69 Wheaton	9/27	10/3	10/7	10/11	10/15	10/18	10/22	10/26	11/2
70 Willmar	10/7	10/12	10/16	10/20	10/23	10/26	10/29	11/2	11/8
71 Winnebago	10/11	10/16	10/20	10/23	10/26	10/29	11/1	11/5	11/10
72 Winnibigoshish Dam	10/5	10/11	10/15	10/19	10/23	10/26	10/30	11/4	11/10
73 Winona	10/14	10/20	10/24	10/28	10/31	11/3	11/7	11/11	11/17
74 Worthington	10/5	10/12	10/17	10/21	10/25	10/29	11/2	11/7	11/14
75 Zumbrota	10/3	10/8	10/12	10/16	10/19	10/22	10/26	10/30	11/4

Table 15. Percent probability that a temperature of 28°F. or lower will occur on or before a given date in the fall

Station number and name	Percent probability									
	10	20	30	40	50	60	70	80	90	
1 Ada	9/17	9/21	9/24	9/27	9/30	10/2	10/5	10/8	10/13	
2 Albert Lea	10/6	10/11	10/15	10/18	10/21	10/24	10/28	11/1	11/6	
3 Alexandria	9/22	9/28	10/2	10/5	10/8	10/11	10/15	10/19	10/24	
4 Argyle	9/16	9/20	9/24	9/27	9/29	10/2	10/5	10/8	10/13	
5 Artichoke Lake	9/20	9/26	10/1	10/5	10/8	10/12	10/16	10/21	10/27	
6 Babbitt	9/22	9/27	10/1	10/5	10/8	10/11	10/14	10/18	10/24	
7 Baudette	9/14	9/19	9/22	9/25	9/28	9/30	10/3	10/7	10/12	
8 Beardasley	9/20	9/24	9/27	9/30	10/2	10/4	10/7	10/10	10/14	
9 Bemidji	9/17	9/21	9/24	9/26	9/28	9/30	10/3	10/5	10/9	
10 Big Falls	9/1	9/7	9/11	9/15	9/18	9/21	9/25	9/29	10/5	
11 Bird Island	9/25	9/30	10/4	10/7	10/10	10/13	10/16	10/20	10/25	
12 Brainerd	9/17	9/22	9/25	9/28	9/30	10/2	10/5	10/8	10/13	
13 Cambridge	9/23	9/29	10/3	10/6	10/9	10/12	10/15	10/19	10/25	
14 Campbell	9/16	9/21	9/24	9/27	9/30	10/3	10/6	10/10	10/15	
15 Canby	9/26	10/1	10/5	10/9	10/12	10/15	10/19	10/23	10/28	
16 Cloquet	9/8	9/13	9/17	9/19	9/22	9/25	9/27	10/1	10/5	
17 Crookston	9/16	9/21	9/24	9/27	9/30	10/3	10/6	10/9	10/14	
18 Detroit Lakes	9/14	9/20	9/24	9/27	9/30	10/3	10/6	10/10	10/16	
19 Duluth (airport)	9/19	9/25	9/29	10/3	10/6	10/10	10/13	10/18	10/23	
20 Duluth (city)	9/27	10/3	10/7	10/10	10/14	10/17	10/20	10/24	10/30	
21 Fairmont	9/30	10/6	10/11	10/14	10/18	10/21	10/25	10/30	11/5	
22 Faribault	9/30	10/6	10/10	10/14	10/17	10/20	10/24	10/28	11/3	
23 Farmington	9/23	9/29	10/3	10/7	10/10	10/13	10/17	10/21	10/27	
24 Fergus Falls	9/20	9/26	9/30	10/3	10/6	10/10	10/14	10/17	10/23	
25 Fosston	9/12	9/18	9/23	9/27	9/30	10/4	10/8	10/12	10/18	
26 Grand Marais	9/11	9/22	9/30	10/7	10/13	10/19	10/26	11/3	11/14	
27 Grand Meadow	9/25	10/1	10/5	10/8	10/11	10/14	10/17	10/21	10/27	
28 Grand Rapids	9/9	9/13	9/17	9/19	9/22	9/25	9/27	10/1	10/5	
29 Gull Lake Dam	9/23	9/27	10/1	10/4	10/6	10/9	10/12	10/16	10/20	
30 Hallock	9/12	9/16	9/20	9/23	9/25	9/27	9/30	10/4	10/8	
31 Hinckley	9/12	9/19	9/24	9/29	10/3	10/7	10/11	10/16	10/23	
32 International Falls	9/15	9/20	9/24	9/27	9/30	10/3	10/6	10/9	10/14	
33 Itasca State Park	9/6	9/11	9/15	9/18	9/21	9/24	9/27	10/1	10/6	
34 Leech Lake Dam	9/11	9/17	9/22	9/25	9/28	10/2	10/6	10/9	10/15	
35 Little Falls	9/20	9/26	9/30	10/4	10/7	10/10	10/14	10/18	10/24	
36 Mahoning Mine	9/19	9/24	9/28	10/2	10/5	10/8	10/12	10/16	10/22	
37 Maple Plain	9/25	10/2	10/7	10/10	10/14	10/18	10/22	10/26	11/2	
38 Meadowlands	8/27	9/3	9/8	9/12	9/16	9/20	9/24	9/28	10/6	

Table 15. Percent probability that a temperature of 28°F. or lower will occur on or before a given date in the fall (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	9/19	9/26	9/30	10/4	10/8	10/11	10/15	10/20	10/26
40 Milan	9/20	9/25	9/29	10/2	10/5	10/8	10/11	10/14	10/20
41 Minneapolis	10/9	10/14	10/19	10/22	10/25	10/28	10/31	11/5	11/10
42 Montevideo	9/25	10/2	10/6	10/10	10/13	10/16	10/20	10/24	10/30
43 Moorhead	9/19	9/25	9/30	10/4	10/8	10/12	10/16	10/21	10/28
44 Moose Lake	9/11	9/16	9/20	9/24	9/27	9/30	10/3	10/7	10/13
45 Mora	9/13	9/19	9/24	9/27	10/1	10/5	10/8	10/13	10/19
46 Morris	9/19	9/24	9/28	10/1	10/4	10/7	10/10	10/14	10/19
47 New London	9/26	10/1	10/5	10/9	10/12	10/15	10/19	10/23	10/28
48 New Ulm	9/23	9/28	10/2	10/5	10/8	10/11	10/14	10/18	10/23
49 Park Rapids	9/18	9/23	9/27	9/30	10/3	10/6	10/9	10/12	10/17
50 Pine River Dam	9/13	9/18	9/22	9/25	9/28	10/1	10/4	10/8	10/13
51 Pipestone	9/21	9/27	10/1	10/5	10/8	10/11	10/15	10/19	10/25
52 Pokegama Dam	9/10	9/15	9/19	9/22	9/25	9/28	10/1	10/5	10/10
53 Red Lake Falls	9/16	9/20	9/23	9/25	9/27	9/29	10/1	10/4	10/8
54 Red Lake Indian Agency	9/12	9/18	9/23	9/26	9/30	10/3	10/7	10/12	10/18
55 Redwood Falls	9/26	10/2	10/7	10/11	10/15	10/18	10/23	10/27	11/3
56 Roseau	9/6	9/12	9/16	9/20	9/23	9/27	9/30	10/4	10/10
57 St. Cloud	9/25	10/1	10/5	10/8	10/11	10/14	10/17	10/21	10/27
58 St. Paul	10/12	10/17	10/20	10/24	10/26	10/29	11/1	11/5	11/10
59 St. Peter	9/26	10/1	10/5	10/8	10/12	10/15	10/18	10/22	10/28
60 Sandy Lake Dam Libby	9/11	9/17	9/22	9/26	9/30	10/3	10/7	10/12	10/18
61 Springfield	9/28	10/4	10/8	10/12	10/15	10/19	10/23	10/27	11/2
62 Tracy	9/29	10/4	10/8	10/11	10/14	10/17	10/20	10/24	10/29
63 Two Harbors	9/30	10/6	10/10	10/14	10/17	10/20	10/24	10/28	11/2
64 Virginia	9/18	9/23	9/26	9/29	10/1	10/3	10/6	10/9	10/14
65 Wadena	9/19	9/23	9/26	9/28	9/30	10/2	10/4	10/7	10/11
66 Walker	9/19	9/25	9/30	10/4	10/8	10/12	10/16	10/21	10/27
67 Warroad	9/17	9/22	9/25	9/27	9/30	10/2	10/4	10/8	10/12
68 Waseca	9/23	9/29	10/3	10/7	10/10	10/13	10/17	10/21	10/27
69 Wheaton	9/17	9/22	9/26	9/30	10/2	10/6	10/9	10/13	10/19
70 Willmar	9/19	9/26	9/30	10/4	10/7	10/11	10/14	10/19	10/25
71 Winnebago	10/1	10/6	10/10	10/13	10/16	10/19	10/22	10/26	10/31
72 Winnibigoshish Dam	9/22	9/26	9/30	10/2	10/5	10/7	10/10	10/13	10/17
73 Winona	10/5	10/10	10/14	10/17	10/20	10/23	10/26	10/30	11/4
74 Worthington	9/28	10/4	10/8	10/12	10/15	10/18	10/22	10/26	11/1
75 Zumbrota	9/17	9/23	9/27	10/1	10/4	10/7	10/11	10/15	10/21

Table 16. Percent probability that a temperature of 32°F. or lower will occur on or before a given date in the fall

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
1 Ada	9/7	9/12	9/15	9/18	9/20	9/23	9/26	9/29	10/4
2 Albert Lea	9/20	9/26	9/30	10/3	10/6	10/9	10/13	10/17	10/22
3 Alexandria	9/18	9/22	9/25	9/28	9/29	10/2	10/4	10/7	10/11
4 Argyle	9/4	9/8	9/12	9/14	9/17	9/20	9/23	9/26	9/30
5 Artichoke Lake	9/13	9/18	9/21	9/24	9/26	9/29	10/2	10/5	10/10
6 Babbitt	9/11	9/15	9/18	9/21	9/24	9/26	9/30	10/2	10/7
7 Baudette	8/31	9/5	9/9	9/12	9/15	9/18	9/21	9/25	9/30
8 Beardesley	9/8	9/13	9/17	9/20	9/23	9/26	9/29	10/3	10/8
9 Bemidji	8/26	9/2	9/6	9/10	9/13	9/16	9/19	9/24	9/29
10 Big Fallsq	8/23	8/28	8/31	9/4	9/6	9/9	9/12	9/16	9/21
11 Bird Island	9/18	9/22	9/25	9/28	9/30	10/2	10/5	10/8	10/12
12 Brainerd	9/13	9/17	9/19	9/22	9/24	9/26	9/28	9/30	10/4
13 Cambridge	9/12	9/17	9/21	9/24	9/27	9/30	10/3	10/7	10/12
14 Campbell	9/12	9/16	9/18	9/20	9/22	9/24	9/2	9/29	10/2
15 Canby	9/18	9/22	9/25	9/28	9/30	10/2	10/5	10/8	10/12
16 Cloquet	8/10	8/19	8/25	8/30	9/4	9/9	9/14	9/20	9/29
17 Crookston	9/9	9/13	9/16	9/19	9/21	9/23	9/26	9/29	10/3
18 Detroit Lakes	9/4	9/9	9/13	9/16	9/19	9/22	9/25	9/29	10/4
19 Duluth (airport)	9/11	9/16	9/19	9/21	9/24	9/26	9/29	10/2	10/7
20 Duluth (city)	9/19	9/24	9/27	9/30	10/3	10/6	10/9	10/13	10/18
21 Fairmont	9/23	9/28	10/2	10/5	10/8	10/11	10/14	10/18	10/23
22 Faribault	9/22	9/27	9/30	10/3	10/5	10/8	10/11	10/14	10/18
23 Farmington	9/20	9/24	9/26	9/29	10/1	10/3	10/6	10/9	10/13
24 Fergus Falls	9/13	9/17	9/20	9/23	9/25	9/27	9/30	10/3	10/7
25 Fosston	8/30	9/5	9/9	9/12	9/16	9/19	9/22	9/27	10/4
26 Grand Marais	8/25	9/6	9/15	9/22	9/29	10/6	10/13	10/22	11/2
27 Grand Meadow	9/6	9/14	9/19	9/24	9/29	10/4	10/9	10/14	10/22
28 Grand Rapids	8/23	8/29	9/2	9/5	9/8	9/11	9/14	9/18	9/24
29 Gull Lake Dam	9/16	9/19	9/21	9/24	9/26	9/28	9/30	10/2	10/6
30 Hallock	8/30	9/4	9/8	9/11	9/14	9/17	9/20	9/24	9/29
31 Hinckley	9/8	9/14	9/17	9/21	9/24	9/27	9/30	10/4	10/9
32 International Falls	8/25	9/2	9/8	9/13	9/17	9/22	9/27	10/3	10/11
33 Itasca State Park	8/20	8/26	8/31	9/4	9/8	9/12	9/16	9/21	9/27
34 Leech Lake Dam	8/31	9/6	9/9	9/13	9/16	9/18	9/22	9/25	9/30
35 Little Falls	9/15	9/19	9/21	9/24	9/26	9/28	9/30	10/3	10/6
36 Mahoning Mine	9/12	9/16	9/19	9/22	9/24	9/27	9/30	10/3	10/7
37 Maple Plain	9/22	9/26	9/30	10/2	10/5	10/7	10/10	10/14	10/18
38 Meadowlands	8/7	8/15	8/21	8/26	8/31	9/5	9/10	9/16	9/24

Table 16. Percent probability that a temperature of 32°F. or lower will occur on or before a given date in the fall (continued)

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
39 Milaca	9/11	9/16	9/19	9/22	9/25	9/28	9/30	10/4	10/8
40 Milan	9/12	9/16	9/20	9/22	9/25	9/28	9/30	10/4	10/8
41 Minneapolis	9/28	10/3	10/7	10/10	10/13	10/16	10/19	10/23	10/28
42 Montevideo	9/17	9/22	9/26	9/28	10/1	10/4	10/7	10/10	10/15
43 Moorhead	9/17	9/21	9/23	9/26	9/28	9/30	10/2	10/5	10/8
44 Moose Lake	8/25	8/31	9/5	9/9	9/13	9/16	9/20	9/25	10/1
45 Mora	9/5	9/10	9/15	9/18	9/21	9/24	9/27	10/2	10/7
46 Morris	9/11	9/16	9/19	9/22	9/25	9/28	10/1	10/4	10/9
47 New London	9/19	9/23	9/26	9/29	10/1	10/3	10/6	10/9	10/13
48 New Ulm	9/16	9/21	9/24	9/27	9/29	10/1	10/4	10/7	10/12
49 Park Rapids	9/8	9/12	9/15	9/18	9/20	9/22	9/25	9/28	10/2
50 Pine River Dam	8/30	9/5	9/9	9/13	9/16	9/19	9/23	9/27	10/3
51 Pipestone	9/14	9/19	9/23	9/27	9/30	10/3	10/7	10/11	10/16
52 Pokegama Dam	8/28	9/2	9/5	9/8	9/11	9/13	9/16	9/19	9/24
53 Red Lake Falls	9/1	9/6	9/10	9/13	9/16	9/19	9/22	9/26	9/30
54 Red Lake Indian Agency	9/5	9/11	9/16	9/20	9/23	9/26	9/30	10/5	10/11
55 Redwood Falls	9/18	9/24	9/27	9/29	10/3	10/6	10/10	10/13	10/18
56 Roseau	8/30	9/4	9/7	9/10	9/13	9/15	9/18	9/21	9/26
57 St. Cloud	9/12	9/17	9/21	9/24	9/27	9/30	10/3	10/7	10/12
58 St. Paul	9/23	9/29	10/3	10/6	10/9	10/12	10/16	10/20	10/25
59 St. Peter	9/18	9/22	9/25	9/27	9/30	10/2	10/4	10/8	10/12
60 Sandy Lake Dam Libby	9/6	9/10	9/14	9/16	9/18	9/21	9/24	9/27	10/1
61 Springfield	9/24	9/28	10/2	10/6	10/7	10/10	10/13	10/16	10/21
62 Tracy	9/19	9/24	9/28	10/1	10/4	10/7	10/10	10/14	10/19
63 Two Harbors	9/20	9/25	9/29	10/2	10/5	10/8	10/12	10/16	10/21
64 Virginia	9/3	9/8	9/11	9/14	9/17	9/20	9/23	9/26	10/1
65 Wadena	9/6	9/11	9/14	9/17	9/20	9/23	9/26	9/29	10/4
66 Walker	9/15	9/19	9/22	9/25	9/28	9/30	10/3	10/6	10/11
67 Warroad	9/6	9/10	9/15	9/17	9/19	9/22	9/24	9/28	10/3
68 Waseca	9/15	9/19	9/22	9/25	9/27	9/29	10/2	10/5	10/9
69 Wheaton	9/12	9/16	9/20	9/22	9/25	9/27	9/30	10/4	10/8
70 Willmar	9/17	9/21	9/24	9/26	9/29	10/1	10/3	10/6	10/10
71 Winnebago	9/22	9/26	9/30	10/3	10/5	10/7	10/10	10/14	10/18
72 Winnibigoshish Dam	9/16	9/20	9/22	9/25	9/27	9/29	10/1	10/4	10/7
73 Winona	9/20	9/26	10/1	10/5	10/8	10/11	10/15	10/20	10/26
74 Worthington	9/21	9/26	9/29	10/2	10/5	10/8	10/11	10/14	10/19
75 Zumbrota	9/11	9/17	9/20	9/23	9/26	9/29	10/2	10/5	10/11

Table 17. Percent probability that a temperature of 36°F. or lower will occur on or before a given date in the fall

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
11 Bird Island	9/5	9/10	9/14	9/17	9/20	9/23	9/26	9/30	10/5
13 Cambridge	9/3	9/8	9/11	9/14	9/17	9/20	9/23	9/26	10/1
15 Canby	9/5	9/9	9/13	9/15	9/18	9/21	9/23	9/27	10/1
16 Cloquet	7/10	7/20	7/27	8/2	8/8	8/14	8/20	8/27	9/6
17 Crookston	8/28	9/2	9/6	9/9	9/12	9/15	9/18	9/22	9/27
18 Detroit Lakes	8/18	8/25	8/30	9/4	9/8	9/12	9/17	9/22	9/29
27 Grand Meadow	9/4	9/9	9/13	9/16	9/19	9/22	9/25	9/29	10/4
28 Grand Rapids	7/25	8/4	8/11	8/16	8/22	8/28	9/2	9/9	9/19
30 Hallock	7/24	8/4	8/12	8/18	8/24	8/30	9/5	9/13	9/24
32 International Falls	8/3	8/14	8/22	8/29	9/4	9/10	9/17	9/25	10/6
33 Itasca State Park	7/19	7/29	8/6	8/12	8/18	8/24	8/30	9/7	9/17
41 Minneapolis	9/16	9/22	9/26	9/29	10/2	10/5	10/8	10/12	10/18
45 Mora	8/26	8/31	9/4	9/8	9/11	9/14	9/18	9/22	9/27
46 Morris	8/30	9/5	9/9	9/13	9/16	9/19	9/23	9/27	10/3
47 New London	9/9	9/14	9/17	9/20	9/23	9/26	9/29	10/2	10/7
48 New Ulm	9/3	9/8	9/12	9/15	9/18	9/21	9/24	9/38	10/3
50 Pine River Dam	8/12	8/20	8/25	8/30	9/3	9/7	9/12	9/17	9/25
51 Pipestone	9/4	9/9	9/12	9/15	9/18	9/21	9/24	9/27	10/2
57 St. Cloud	9/4	9/9	9/13	9/16	9/19	9/22	9/25	9/29	10/4
62 Tracy	9/11	9/16	9/19	9/22	9/25	9/28	10/1	10/4	10/9
64 Virginia	7/30	8/10	8/17	8/23	8/29	9/4	9/10	9/17	9/28
65 Wadena	8/26	8/31	9/4	9/7	9/10	9/13	9/16	9/20	9/25
68 Waseca	9/2	9/7	9/11	9/14	9/17	9/20	9/23	9/27	10/2
71 Winnebago	9/14	9/18	9/21	9/24	9/26	9/28	10/1	10/4	10/8
73 Winona	9/14	9/19	9/23	9/26	9/29	10/2	10/5	10/9	10/14
74 Worthington	9/10	9/15	9/18	9/21	9/23	9/25	9/28	10/1	10/6
75 Zumbrota	8/30	9/4	9/8	9/11	9/14	9/17	9/20	9/24	9/29

Table 18. Percent probability that a temperature of 40°F. or lower will occur on or before a given date in the fall

Station number and name	Percent probability								
	10	20	30	40	50	60	70	80	90
11 Bird Island	8/28	9/1	9/5	9/7	9/10	9/13	9/15	9/19	9/23
13 Cambridge	8/20	8/26	8/31	9/3	9/7	9/11	9/14	9/19	9/25
15 Canby	8/29	9/3	9/6	9/9	9/11	9/13	9/16	9/19	9/24
16 Cloquet	6/25	7/3	7/9	7/14	7/19	7/24	7/29	8/4	8/12
17 Crookston	7/25	8/4	8/11	8/17	8/23	8/29	9/4	9/11	9/21
18 Detroit Lakes	7/15	7/26	8/4	8/10	8/17	8/24	8/30	9/8	9/19
27 Grand Meadow	8/22	8/28	9/1	9/5	9/8	9/11	9/15	9/19	9/25
28 Grand Rapids	6/26	7/6	7/13	7/19	7/25	7/31	8/6	8/13	8/23
30 Hallock	7/3	7/14	7/21	7/28	8/3	8/9	8/16	8/23	9/3
32 International Falls	7/12	7/22	7/29	8/4	8/10	8/15	8/21	8/28	9/7
33 Itasca State Park	7/13	7/16	7/19	7/21	7/23	7/25	7/27	7/30	8/2
41 Minneapolis	9/7	9/12	9/15	9/18	9/21	9/24	9/27	9/30	10/5
45 Mora	8/9	8/16	8/21	8/25	8/29	9/2	9/6	9/11	9/18
46 Morris	8/10	8/18	8/24	8/29	9/3	9/8	9/13	9/19	9/27
47 New London	8/26	9/1	9/5	9/8	9/11	9/14	9/17	9/21	9/27
48 New Ulm	8/17	8/24	8/29	9/2	9/6	9/10	9/14	9/19	9/26
50 Pine River Dam	7/16	7/26	8/2	8/8	8/14	8/20	8/26	9/2	9/12
51 Pipestone	8/17	8/25	8/31	9/5	9/9	9/13	9/18	9/24	10/2
57 St. Cloud	8/25	8/30	9/3	9/7	9/10	9/13	9/17	9/21	9/26
62 Tracy	9/2	9/7	9/10	9/13	9/16	9/19	9/22	9/25	9/30
64 Virginia	7/6	7/17	7/25	8/2	8/8	9/14	8/22	8/30	9/10
65 Wadena	8/4	8/13	8/19	8/24	8/29	9/3	9/8	9/14	9/23
68 Waseca	8/18	8/25	8/30	9/3	9/7	9/11	9/15	9/20	9/27
71 Winnebago	8/30	9/5	9/9	9/12	9/15	9/18	9/21	9/25	10/1
73 Winona	9/3	9/8	9/12	9/15	9/18	9/21	9/24	9/28	10/3
74 Worthington	8/23	8/30	9/4	9/8	9/12	9/16	9/20	9/25	10/2
75 Zumbrota	8/10	8/17	8/22	8/27	8/31	9/4	9/9	9/14	9/21

Table 19. Average date of last occurrence of 50°F. before July 1 and after June 30

Station number and name	Before	After	Station number and name	Before	After
	July 1	June 30		July 1	June 30
11 Bird Island	6/20	7/20	47 New London	6/19	7/23
13 Cambridge	6/22	7/17	48 New Ulm	6/19	7/23
15 Canby	6/19	7/22	50 Pine River Dam	6/25	7/7
16 Cloquet	6/29	7/2	51 Pipestone	6/21	7/20
17 Crookston	6/25	7/11	57 St. Cloud	6/20	7/24
18 Detroit Lakes	6/25	7/7	62 Tracy	6/19	7/21
27 Grand Meadow	6/23	7/16	64 Virginia	6/27	7/5
28 Grand Rapids	6/28	7/5	65 Wadena	6/26	7/13
30 Hallock	6/27	7/6	68 Waseca	6/22	7/20
32 International Falls	6/27	7/4	71 Winnebago	6/17	7/30
33 Itasca State Park	6/28	7/4	73 Winona	6/15	8/5
41 Minneapolis	6/15	8/15	74 Worthington	6/19	7/21
45 Mora	6/22	7/12	75 Zumbrota	6/23	7/11
46 Morris	6/22	7/17			

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