# CLIMATE OF MINNESOTA

## Part XV—Normal Temperatures (1951-1980) and Their Application

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# Climate of Minnesota Part XV:

# Normal Temperatures (1951-80) and Their Application

by

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## INTRODUCTION

This study was made to provide both a climatology of air temperature and basic information relative to the spatial and temporal distribution of temperature and temperature-derived quantities such as growing and heating degree days in the state of Minnesota. This was also the subject of an earlier bulletin in this series: Climate of Minnesota Part III. Temperature and Its Application (Baker and Strub, 1965). There are three important differences between that bulletin and this one: first, this one is based on the temperature normals for the period 1951-1980 instead of 1931-1960; second, all data have been adjusted to a uniform observation time, an improvement that is explained in another section; and third, this bulletin is based on a total of 159 stations, 85 within the state and the remainder along the Minnesota border in adjoining states. Only 65 Minnesota stations were available for the 1965 bulletin.

All data in this bulletin are based on temperatures measured within the standard temperature shelter: a louvered, white, double-roofed, wooden structure whose base stands four and one-half feet above ground. Despite precautions taken to provide adequate ventilation and to guard the thermometers from the effects of radiational heating or cooling, a protection provided by and large with the shelter, there are objections to this data source.

The height of the shelter that houses the temperature sensors is for the convenience of the observer. It represents a compromise between what the climatologist finds desirable and what the agriculturist wishes. Climatologists ordinarily prefer a measurement taken higher so it is less influenced by the immediate surface and is more regional in character. Agriculturists, on the other hand, frequently find that the thermometers are well above the environment in which most organisms live and where the immediate interests of agriculture are found. Large temperature gradients can exist between the height of the temperature shelter and the soil or crop surface. In addition, the housing itself is an artifical environment, often quite unlike that of the natural environment. Nevertheless, the temperature shelter remains the best device yet established for general use in terms of convenience and uniformity of conditions. There are no other long-term statewide standardized temperature measurements available.

The basic data were collected and compiled by the U.S. National Weather Service (NOAA, 1982). We are, therefore, indebted to the National Weather Service and, particularly, to the volunteer weather observers who constitute the great majority of the observers within the National Weather Service climatological network.

## METHODOLOGY

### Normal Period

The World Meteorological Organization, of which the U.S. National Weather Service is a member, has established a common averaging period so that temperatures between stations can be fairly compared. A 30-year period was determined as being of acceptable longevity. And, recognizing that there are changes with time in both the climate and the stations, the 30-year period is advanced each decade. Currently, the normal period for which the averages are calculated and to which monthly and annual averages are compared is 1951-1980. This period will remain as the averaging or normal period for the 1981-1990 decade, after which the new normal period will become 1961-1990.

As noted earlier, the previous bulletin on Minnesota temperatures was based on the average of the 1931-1960 normal period. Thus, although the mean temperatures for 1951-1980 have not changed greatly from the 1931-1960 period, they are more representative of the current period. One important reason why this is true is that the 30-year averages have often shown marked variations with time as, for example, when a cold period is succeeded by a warm one or vice versa. Although the 30-year average or normal period for worldwide comparisons was established only about 25 years ago, it is interesting to see how one series of 30-year means has varied with time. One unique Minnesota record permits comparisons to be made over an extended period. This record, shown in Figure 1, is a combination of the Ft. Snelling and Farmington 3NW records, began in October 1819 and continues to this day. It has been corrected for errors and certain adjustments have been applied to make it as true a record as possible (Baker et al., 1985).

Figure 1 provides a glimpse of the climatic variation that eastern Minnesota has experienced in the 164 years (1820-1983) represented by the plotted values. Since each plotted value is the mean of 30 years, the temperature variation is greatly smoothed. The smoothing essentially eliminates short-term annual variations, making apparent the major trends that have occurred during the 164-

year record. At first there was a declining trend with the low point reached in the 1859-1888 period. This was followed by a rising trend that reached its maximum in the 1930-1959 30-year period, only to be in turn succeeded by the current declining trend. The range of the 30-year averages has amounted to a surprising 2.8°F. Figure 1 illustrates well that the climate is not stable. Rather, it is dynamic.

In general the current normals are often superior to those representing 1931-1960, since in the late 1930s and the 1940s a number of first order weather stations in the United States were shifted from their original downtown locations to their current airport locations; that is, from typically urban to essentially rural environments. As a result, an artificially induced decrease in the temperature record of these stations can be found at certain locations, since an urban environment is ordinarily warmer (also less humid, less windy, and with less solar radiation) than a rural one. In Minnesota this kind of shift occurred at the first order National Weather Service stations of Duluth and Minneapolis-St. Paul.

At Duluth the weather station was moved from the downtown site to the airport on June 6, 1941, resulting in an altitude change from 1128 to 1428 feet. At the airport the temperature sensors were initially adjacent to the terminal building. On June 22, 1961, they were moved to the present airport runway site.

The move at the Minneapolis-St. Paul airport station was made from downtown Minneapolis to the airport in 1937. Observations, however, were made from roof sites or within a complex of large buildings until January 1, 1960. From that time, observations have been made in an open field along the airport runway.

There is another reason for the improved representativeness with a current normal period. Due to the trends and fluctutations in temperature, some of which are shown in Figure 1, the most recent past usually is a better predictor of the near future than is a longer-term record. That is, even though there is an overall upward trend in the long-term eastern Minnesota record, there are superimposed upon it fluctuations of varying duration. It is these variations that can be more closely followed if the normal period is kept current and is not too long. To be of value, therefore, the normal period should be long enough to be reasonably stable but short enough so that it can be used as a predictor for the near future. For predictive purposes, Sabin and Shulman (1985) found little difference between normals of 10 years and those of longer duration, and Enger (1959) found that in general a 15-25 year temperature normal was the most efficient predictor of the following year. With the eastern Minnesota record for 1820-1983 as the test, it was found that after an 8-10 year period, there was little advantage to be gained in increasing the length of the normal period. Periods tested ranged from 2 to 80 years.

The 30-year normal that has been established as a worldwide standard for climatic comparisons is in effect a compromise between the much shorter periods suitable for equable maritime climates and the longer ones required in highly variable continental climates such as Minnesota experiences. It also is a compromise between the two climatic elements most often measured and compared: temperature and precipitation. A longer time period is required for an adequate sample of precipitation amounts than for temperature stability.

Another reason for the 30-year period is that, although many stations have records of this duration, their numbers decline rapidly beyond 30 years.

## Observation Time Selection

A seemingly simple but generally unappreciated factor has limited the value of almost all temperature comparisons that are made between stations, even when they are made over the same time periods. This is the bias introduced when the observation time is not the same. Differences occur because the majority of the National Weather Service climatological observers are volunteers who take their observations at a time convenient for them. For example, the daily observation at one station may be taken at 5 p.m., but at a neighboring station it might be taken at 8 a.m. Although the observations are recorded for the same day, the 24-hour day that each observation represents differs. And neither corresponds to the true calendar day used by the National Weather Service stations such as Duluth, Fargo, Minneapolis-St. Paul, Rochester, or Sioux Falls.

As explained by Baker (1975), the differing observation times create an artificial difference in the mean daily temperature. When mean temperatures are summed over a season, as is the case with growing degree days (GDD) and heating degree days (HDD), variations between stations with different

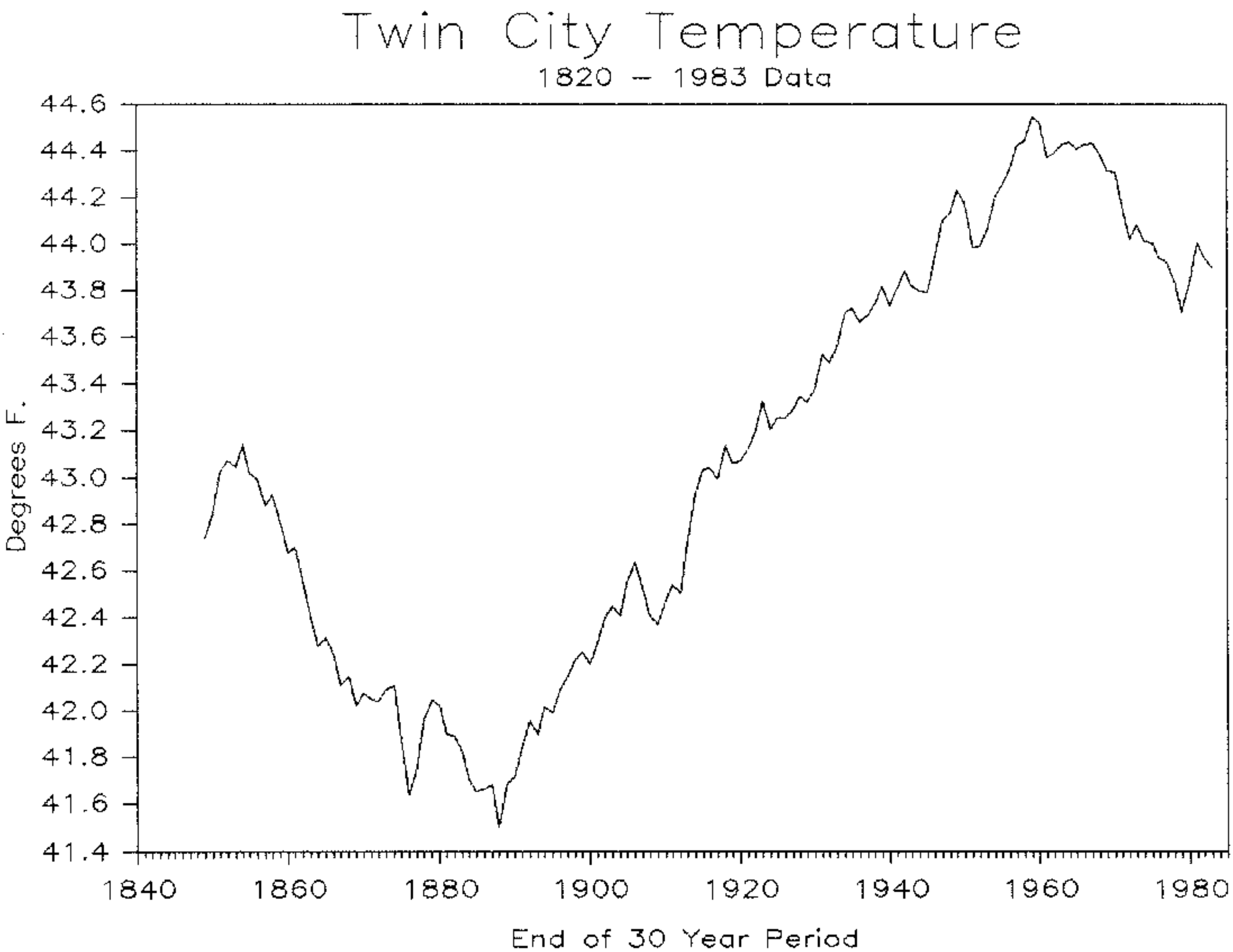


Figure 1.

Thirty-year averages of the eastern Minnesota temperature record, 1820-1983. The averages are plotted at the end of each 30-year period. Data from Baker et al., 1985.

observation times are magnified. Differences in GDD totals due simply to variations in observation time between stations can more than equal some of the proposed hybrid corn varietal differences in GDD totals that the plant requires to reach maturity. For example, a seasonal (May-September) total difference of more than 300 GDD could result at the same site simply because of different observation times as, for example, from 3 p.m. to 6 a.m. This number of GDD is equivalent to about 14 percent of the May-September total GDD across much of southern Minnesota. Resultant errors for seasonal total HDD due to differing observation times can be equally large.

The variation in mean temperatures created by differing observation times has been the subject of several research papers, including those by Bigelow (1909), Byrd et al. (1983), Felch et al. (1972), Mitchell (1958), Rumbaugh (1934), Baker (1975), Schall and Dale (1977), and Weaver and Miller (1970). To our knowledge, however, this is the first time that temperature normals for a large area such as Minnesota have been adjusted to a uniform observation time. The adjustment factors vary from month to month as shown in Table 1. The variation is largely a function of the daily heating cycle, which in turn is a function of day length.

Table 1 contains the observation time adjustments derived by Baker (1975) from his study of hourly temperatures measured over a three-year period at the University of Minnesota St. Paul campus weather station. They have not been published before but were used in a study by Winkler et al. (1981). A recent investigation by Byrd (1985) using New York data makes it appear likely that the adjustment factors are very similar in temperate zone regions of continental climates. Also, the correction values listed in Table 1 agree closely with the Bismarck, N.D., and Columbus, Ohio, values shown by Mitchell (1958) in his Table 1. An analysis of the variation in the time of observation adjustments across the North Central Region (from the Dakotas eastward to Ohio) by Head (1985) indicated that factors do not vary appreciably; as a result the factors shown in Table 1 and derived from the St. Paul campus weather station data can be applied across the state.

Table 1. Correction factors in °F. for adjusting to an 8 a.m. observation time.*

| Hour | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -0.9 | -0.8 | -0.2 | 0.0 | 0.5 | 0.7 | 0.3 | 0.3 | 0.3 | 0.1 | -0.2 | -0.6 |
| 2 | -0.7 | -0.6 | 0.0 | 0.2 | 0.7 | 0.9 | 0.4 | 0.5 | 0.5 | 0.2 | -0.1 | -0.5 |
| 3 | -0.4 | -0.4 | 0.2 | 0.3 | 0.8 | 1.0 | 0.6 | 0.7 | 0.6 | 0.4 | 0.1 | -0.4 |
| 4 | -0.3 | -0.2 | 0.3 | 0.5 | 1.0 | 1.1 | 0.8 | 0.9 | 0.8 | 0.5 | 0.2 | -0.3 |
| 5 | -0.1 | 0.0 | 0.5 | 0.9 | 1.1 | 1.1 | 0.8 | 1.0 | 1.0 | 0.6 | 0.2 | -0.1 |
| 6 | 0.0 | 0.1 | 0.6 | 0.9 | 0.7 | 0.6 | 0.4 | 0.7 | 1.0 | 0.8 | 0.3 | 0.0 |
| 7 | 0.0 | 0.2 | 0.5 | 0.5 | 0.3 | 0.2 | 0.1 | 0.2 | 0.5 | 0.6 | 0.3 | 0.0 |
| 8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | -0.4 | -0.5 | -0.5 | -0.3 | -0.3 | -0.1 | -0.0 | -0.1 | -0.3 | -0.3 | -0.4 | -0.1 |
| 10 | -0.9 | -1.1 | -1.0 | -0.7 | -0.7 | -0.2 | -0.1 | -0.2 | -0.5 | -0.5 | -0.8 | -0.5 |
| 11 | -1.5 | -1.7 | -1.4 | -1.0 | -1.0 | -0.5 | -0.3 | -0.5 | -0.7 | -0.9 | -1.1 | -0.8 |
| 12 | -2.0 | -2.2 | -1.8 | -1.2 | -1.3 | -0.8 | -0.6 | -0.8 | -1.0 | -1.2 | -1.5 | -1.2 |
| 13 | -2.5 | -2.6 | -2.1 | -1.6 | -1.5 | -1.1 | -0.8 | -1.1 | -1.4 | -1.7 | -1.8 | -1.4 |
| 14 | -2.8 | -3.0 | -2.3 | -1.8 | -1.8 | -1.3 | -1.0 | -1.4 | -1.6 | -2.0 | -1.9 | -1.6 |
| 15 | -2.8 | -3.1 | -2.4 | -2.0 | -1.9 | -1.4 | -1.1 | -1.4 | -1.6 | -2.0 | -1.9 | -1.5 |
| 16 | -2.7 | -3.0 | -2.4 | -2.0 | -1.9 | -1.4 | -1.0 | -1.3 | -1.5 | -1.8 | -1.6 | -1.4 |
| 17 | -2.5 | -2.8 | -2.3 | -1.9 | -1.8 | -1.3 | -0.8 | -1.1 | -1.2 | -1.3 | -1.2 | -1.1 |
| 18 | -2.4 | -2.5 | -2.1 | -1.6 | -1.4 | -1.1 | -0.5 | -0.7 | -0.7 | -0.8 | -0.9 | -0.9 |
| 19 | -2.2 | -2.2 | -1.8 | -1.3 | -1.0 | -0.8 | -0.3 | -0.3 | -0.3 | -0.7 | -0.7 | -0.7 |
| 20 | -2.0 | -1.9 | -1.7 | -1.1 | -0.6 | -0.7 | -0.0 | -0.1 | -0.1 | -0.5 | -0.5 | -0.6 |
| 21 | -1.8 | -1.6 | -1.5 | -0.9 | -0.4 | -0.6 | 0.1 | 0.1 | 0.0 | -0.3 | -0.4 | -0.5 |
| 22 | -1.6 | -1.4 | -1.4 | -0.7 | -0.3 | -0.4 | 0.2 | 0.3 | 0.2 | -0.2 | -0.3 | -0.4 |
| 23 | -1.4 | -1.1 | -1.3 | -0.6 | -0.1 | -0.3 | 0.3 | 0.4 | 0.4 | 0.0 | -0.1 | -0.2 |
| 24 | -1.1 | -1.0 | -1.1 | -0.5 | 0.0 | 0.0 | 0.4 | 0.3 | 0.7 | 0.3 | -0.1 | -0.1 |

* An adjustment between any of the above times is made by determining the algebraic sum of the two correction factors.

The mean temperatures for all stations used in this bulletin were adjusted to an 8 a.m. observation time except as noted. This time was selected for three reasons: it is the common time for the weather data used in agricultural advisories prepared during the growing season by the University of Minnesota's Agricultural Extension Service, it is a fairly popular time for observations (see Table 2), and the adjustment using an 8 a.m. observation results in a temperature close to the midnight or calendar day observation used by National Weather Service first order stations.

Table 2. Time when temperature observations are taken by Minnesota observers as of November 1983 (U.S. Dept. of Commerce, 1983).

| | Time of Observation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Midnight | 7 a.m. | 8 a.m. | 9 a.m. | 1 p.m. | 3 p.m. | 4 p.m. | 5 p.m. | 6 p.m. | 7 p.m. | 9 p.m. | Total |
| Number | 15 | 11 | 27 | 4 | 1 | 2 | 11 | 37 | 21 | 8 | 1 | 138 |
| Percent | 11 | 8 | 20 | 3 | <1 | 1 | 8 | 27 | 15 | 6 | <1 | 100 |

## DISCUSSION

### Factors Affecting Air Temperature

There are a number of factors that determine the temperature of a station. The primary one is the latitude. Other factors, ordinarily all of less importance, serve to modify the general orientation of isotherms (lines of equal temperature) around the globe. These factors include the kind and condition of the surface (oceanic versus continental, for example); the variation in topography, which includes a) the slope and aspect (facing direction) effects, b) the change in pressure, and thus temperature, that occurs in the ascent or descent of a parcel of air about a topographic feature, c) the effect of cold air draining into low areas, and d) the obstruction to air movement that may be brought about by either buildings or natural features like shrubs, trees, and hills; and finally, the degree of urbanization, a factor of increasing importance today.

#### Latitude and Geographic Location

There is a generally decreasing trend in temperatures from south to north (in the northern hemisphere) that is apparent in almost all temperature maps. It is for this reason that the isotherms are in general oriented east-west around the world. Large-scale departure from a global east-west orientation is due to the proximity to major water bodies (oceans) and to major topographic features (mountains).

#### Surface

Air temperature is a reflection of the underlying surface, so major considerations are whether the surface is land or water and whether snow is present. Over land on which vegetation is growing and in the presence of adequate soil moisture the major means by which the available energy at the earth's surface (both solar and horizontally transported energy in the air) is consumed is termed evapotranspiration. A smaller fraction of energy is consumed in heating the air and the soil, and an even smaller amount in photosynthesis. Over open water by far the major amount is consumed in evaporation, only a small amount in heating the air and water, and virtually none in photosynthesis. As a result, in the presence of water bodies during the growing season, air temperature is lower than otherwise, and is often much lower, as in the case of large and deep bodies such as Lake Superior.

The amount of surface occupied by water in Minnesota is very great. There are 15,291 lakes with an area of 10 acres or more. Exclusive of Lake Superior they equal 3,411,200 acres or 5330 square miles. This amounts to 6.3 percent of the surface area of the state (Waters Section, 1968). Within just the three extreme northeastern counties, St. Louis, Lake, and Cook, there are 870 square miles of open water. These are impressive figures. Although it is difficult to assess what air temperature would be in the absence of the lakes, their influence is obviously great.

The land versus water effect is most apparent in Minnesota when Lake Superior and its immediate margin (as at Duluth, Two Harbors, and Grand Marais) is compared with land surfaces at the same latitude but some distance in from the lake. Lake Superior is so large and so deep that its maximum surface temperature occurs in August, at least a month after maximum temperatures have been reached over most land surfaces. For example, the mean monthly air temperature at Duluth airport reaches a maximum of 65.5°F in July. The Lake Superior mean temperature, as measured at 47.2°N and 90.8°W (north and west of the Apostle Islands along a shipping lane), reaches a maximum of 56.4°F in August (U.S. Dept. of Commerce, 1975). The largest difference in temperature between Lake Superior and the air temperatures over land occurs in December. At this time the water temperature near the Apostle Islands averages 24.4°F warmer than the air temperature at the Duluth airport, as shown in Table 3.

The lake effect virtually disappears with the appearance of ice cover, which on Lake Superior is found from about mid- to late January until sometime in April. The effect of Lake Superior on Minnesota temperatures is generally restricted as a result of both the upland found along the north shore of the lake, and the general west to east wind flow. The prevailing (i.e., most common) winds at Duluth, and probably elsewhere along the lake, are from the east. However, the resultant or vector winds (which take into account the wind speed and direction) blow mainly from the north or west (Baker, 1983).

Table 3. Temperature difference between the air and water of Lake Superior in °F.

| | Month 1/ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Location | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Mean |
| Duluth 2/ | 38.6 | 49.4 | 59.0 | 65.6 | 64.1 | 54.4 | 45.3 | 28.4 | 14.4 | 46.6 |
| Lake Superior 3/ | 35.0 | 36.5 | 39.7 | 48.1 | 56.4 | 55.2 | 47.4 | 41.9 | 38.8 | 44.3 |
| Difference | 3.6 | 12.9 | 19.3 | 17.5 | 7.7 | -0.8 | -2.1 | -13.5 | -24.4 | 2.3 |

1/ Data for January-March are not available, but, because of the ice cover during those months, there is probably little difference between surface temperatures at the two locations.

2/ Measured at the Duluth airport (U.S. Dept. of Commerce, 1979).

3/ Mean water temperature measured at 47.2°N and 90.8°W (U.S. Dept. of Commerce, Environmental Data Service, 1975), which is near the Apostle Islands and along a shipping lane.

On the scale of the maps shown in this bulletin the other lakes in Minnesota are either too small to create an appreciable influence in the configuration of the isotherms or else the stations are situated so that the lake effect is not apparent.

The snow effect arises largely from the high reflectance of solar radiation from a snow surface compared to all other surfaces. The reflectance of snow ranges from about 90 percent or more on fresh snow to about 40-50 percent on aged and dirty snow. Almost every other natural surface reflects 25 percent or less, and, except at low sun angles, the reflectance from still water is only about 5 percent of the incident solar radiation.

## Topography

As already noted, a feature that interrupts the natural east to west orientation of the isotherms is topography. The effects of topography can be diverse and complicated. One effect is the result of the forced ascent or descent of air as it passes over a topographic feature. On moving up a slope the air enters a region of lower air pressure and thus expands. The expansion results in a cooling of the air at a constant rate equal to 5.5°F for each 1000 feet (or 10°C per 1000 m) rise in elevation as long as condensation does not occur.

Upon descent the air is compressed and it warms at the same rate, 5.5°F per 1000 feet or 10°C per 1000 m decrease in elevation. This process is known as adiabatic cooling when air is forced to ascend and adiabatic heating when air descends. On the lee or downwind side of certain topographic features, the downslope or adiabatic heating can be dramatic. The associated warm winds have been given names that are particular to certain parts of the globe: chinook on the east side of the Rockies, foehn in the Alps, and Santa Ana in southern California near Los Angeles.

There are several topographic features of sufficient size to induce the degree of adiabatic heating and cooling required to be apparent on a scale like that used for the maps in this bulletin. They are shown in Figure 2. One of the most prominent of these is Buffalo Ridge, also known as Coteau des Prairies, which is oriented northwest to southeast in the southwestern corner of the state. A "tongue" of cold air extending southeastward from South Dakota coincides with the ridge. It is due to winds being forced to move up and over the ridge with the air cooled as it rises. The elevation change from southwest of Buffalo Ridge to its crest is about 800 feet (250 m); from the ridge crest northeast to the Minnesota River valley the drop in elevation is about 1000 feet (310 m). The maximum effect of the ridge occurs, of course, when winds blow at right angles to its alignment. For example, with southwest winds forced to rise over the crest, a decrease of about 4.5°F (2.5°C) can be expected from the base to the top of Buffalo Ridge and about a 5.5°F (3.1°C) increase in going downslope from the ridge top to near the Minnesota River valley. Thus, a tongue of warm air is located on the north side of the ridge (on the downslope side for southwest winds) and is parallel to but about 35 miles (58 km) northeast of the center line of Buffalo Ridge. Since southwest winds are common during the summer months, this elevation effect is most apparent at that time of year. But, because the wind blows from other directions as well, the ridge effect found on the monthly normal maps is less than the temperature change examples just given.

Another area of high terrain is found east of the Red River valley and is known as the Alexandria Moraine. It is shown in Figure 2 also. It begins south of Alexandria and continues northward through the Itasca State Park area. From the Red River valley floor to Itasca State Park the elevation increases about 800 feet (250 m); the eastern and usually downwind side of this highland falls only about 400 feet (125 m). Although a distinctly cooler area is associated with the Itasca State Park region, as shown in the temperature maps, the downslope warming east of this highland is not as apparent as in the case of Buffalo Ridge. This is so because of the lesser elevation difference and the greater irregularity of the Alexandria Moraine highland. The adiabatically warmed area (due to the air moving downslope) is oriented approximately northeast to southwest and extends from extreme southeastern Ottertail County through parts of Todd, Wadena, Cass, Aitkin, and Itasca counties and into St. Louis County. This feature also is apparent in the temperature maps.

As already noted, there is a general increase in elevation from the Red River valley eastward, with the highest elevation located in the Itasca Park area (Figure 2). There also is an appreciable elevation increase in eastern North Dakota that begins about 30 miles (50 km) west of the north-south oriented Red River. As a result of the downslope warming to the west of the Red River in North Dakota and the upslope cooling that occurs to the east of the river (with westerly winds), there is a marked "tongue" of higher temperatures extending northward in the Red River valley area; it is shown in all the maps. It is especially noticeable in winter when westerly winds are most prevalent.

The elevation change from the highlands west of Lake Superior down to the lake level varies from about 500 to 1200 feet (155-375 m) along the north shore (Figure 2). With downslope winds (most effective with winds from the northwest) the temperature increase would be considerable. The effect, however, is certainly not observable on the monthly normal maps. During the summer months it is largely negated by the cool water temperatures of Lake Superior; in early winter when the lake is still ice-free the effect is masked by the warmer than land temperatures.

Topographic features also can restrict air movement, serving to keep the air warmer than otherwise under one set of circumstances and cooler than otherwise at other times. Valleys frequently show this feature. The warming effect is dominant if a good southern exposure to the sun is afforded. The isotherm configurations in the Mississippi River valley (at Red Wing and Winona) are due esentially to this feature and show temperatures to be higher than expected for their latitudinal position in the state. The warmer temperatures in the Mississippi valley just noted also may be due to the somewhat higher atmospheric humidity in the immediate area. This influence, however, probably is minor.

The valley effect certainly occurs in other parts of the state such as in the St. Croix and Minnesota river valleys, but due to the scale involved as well as to the location of stations, it is not generally apparent elsewhere on the maps.

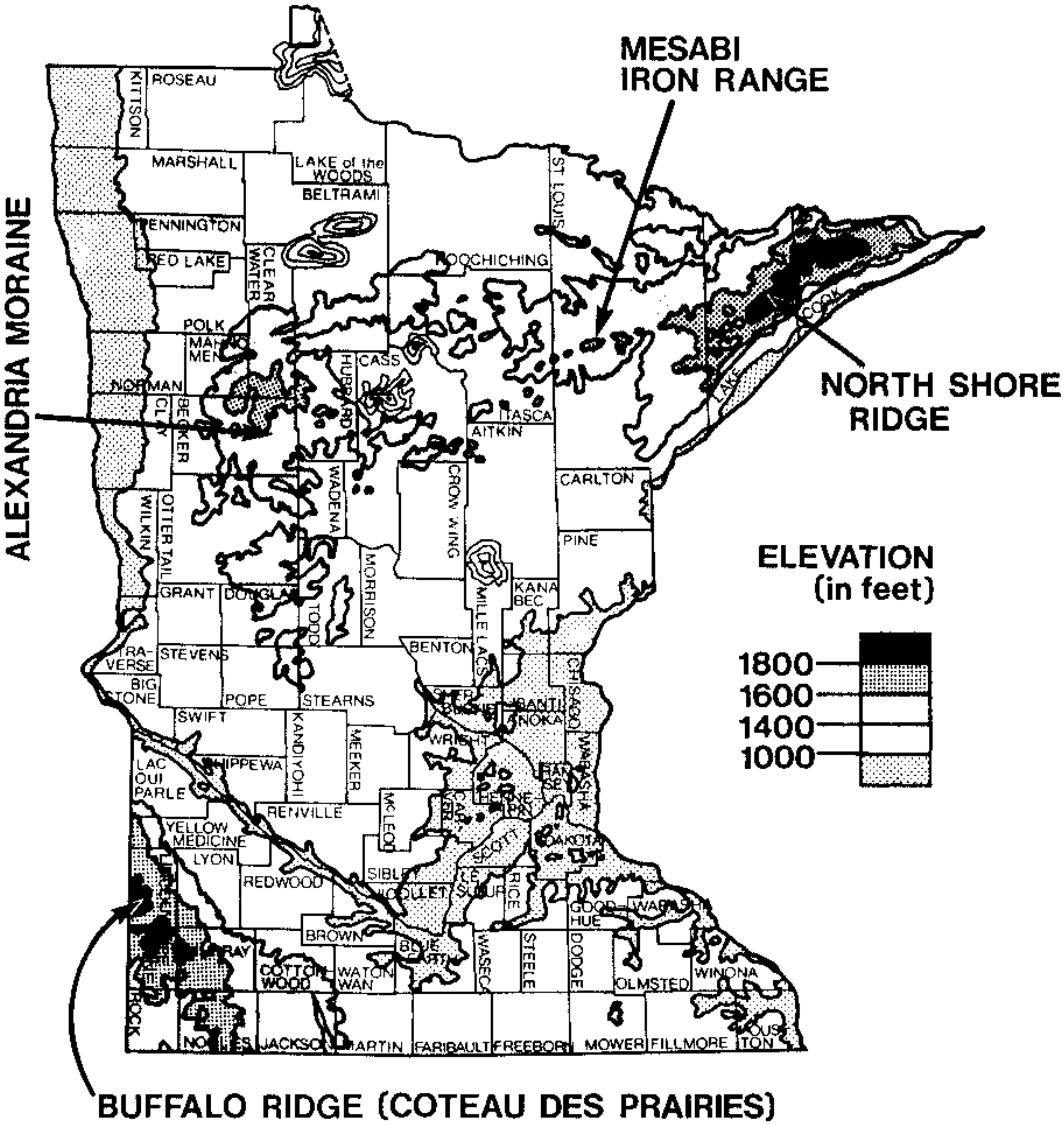


Figure 2.

Topographic map of Minnesota.

Topographic influence upon air temperature also includes the effect of cold air drainage. Under conditions of light winds, dry air, and cloud-free skies the earth loses heat rapidly at night and the coldest air forms and collects at the surface of the earth given the opportunity. The colder and thus denser air will move downslope under the influence of gravity and collect in low spots. This condition can dramatically affect vegetation; such places are often termed "frost pockets." Any influence due to adiabatic heating as the air moves downslope is ordinarily negligible because the movement is usually over short distances and because the air is relatively cold to begin with. As a result of air drainage, temperatures at some stations may be colder than expected, although this effect may not occur frequently enough to be observed in long-term averages such as the 30-year normals dealt with here.

Urbanization

Even in Minnesota, urbanization has been such that its effect is evident in certain local climates. Probably the major urbanization factor is the alteration of the surface; the heat generated within an urban community is of secondary importance. The areal extent of the roads, parking lots, roofs of houses and buildings, and other "artificial" surfaces provides a surface that usually absorbs more solar radiation than does a vegetation covered surface. The lower reflectance or albedo is credited particularly to the vertical extent and canyon-like character of a city, which results in multiple reflection and a greater likelihood of absorption, and during winter also to a combination of dirtier snow and earlier snow removal (Munn, 1966). In addition, these urban surfaces increase the rate at which precipitation is removed from the urban area. As a result, instead of a large portion of the absorbed solar energy being consumed in evaporation, as in rural areas, a greater share is available to heat urban surfaces and the air.

Temperature measurements in most urban areas are made at airport sites, so the full effect of urbanization may not be evident. Even at airport sites, however, the effect of the adjacent urban area can be found. The Twin Cities of Minneapolis and St. Paul have reached the point where their effect can be measured (Winkler et al., 1981).

## Monthly, Seasonal, and Annual Mean Temperatures

### Monthly Mean Temperatures

The monthly, seasonal, and annual mean temperatures are shown in Figures 3-23 and Appendix Table 1. The maps depicting the monthly mean temperatures all exhibit similar features that are controlled essentially by latitude, topography, lake effect, or urbanization or by some combination of these factors.

Temperature Variation. The temperature gradient shows a maximum intensity in January with a difference of 16°F between the northwestern and southeastern corners of the state. It is nearly as great in June because Lake Superior depresses the temperatures so much along its margin. The least difference across the state occurs in September and October with only 8° and 7°F, respectively, separating the northern and southern boundaries.

Both the relative and absolute variation in temperature at a given station is greatest in the winter. Table 4 shows the absolute variation in terms of the standard deviation. The lowest values are generally found in July and August and the highest in January. At most stations the summer

Table 4. Standard deviation of 1951-1980 normal monthly temperatures at selected stations.

| Station | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Duluth | 4.87 | 4.74 | 4.58 | 3.50 | 3.08 | 2.13 | 2.28 | 2.58 | 2.69 | 3.90 | 3.77 | 4.89 |
| Fargo | 5.85 | 6.05 | 6.24 | 4.20 | 3.85 | 2.85 | 2.56 | 2.87 | 3.04 | 4.01 | 4.40 | 5.80 |
| International Falls | 5.86 | 5.35 | 5.48 | 3.73 | 4.14 | 2.88 | 2.52 | 2.62 | 2.50 | 3.82 | 4.16 | 5.77 |
| LaCrosse | 5.51 | 5.23 | 4.87 | 3.47 | 3.45 | 2.64 | 2.54 | 2.32 | 2.44 | 3.97 | 3.62 | 4.81 |
| Minneapolis-St. Paul | 5.35 | 5.33 | 5.32 | 3.87 | 3.51 | 2.68 | 2.85 | 2.50 | 2.88 | 3.80 | 3.55 | 5.00 |
| Rochester | 6.02 | 5.80 | 5.24 | 3.62 | 3.40 | 2.78 | 2.68 | 2.23 | 2.16 | 4.01 | 3.71 | 5.23 |
| St. Cloud | 5.12 | 5.16 | 5.67 | 3.74 | 3.37 | 2.61 | 2.38 | 2.40 | 2.58 | 3.74 | 3.74 | 5.28 |
| Sioux Falls | 5.77 | 6.05 | 6.00 | 3.57 | 3.30 | 3.10 | 3.07 | 2.57 | 2.95 | 3.69 | 3.69 | 4.82 |

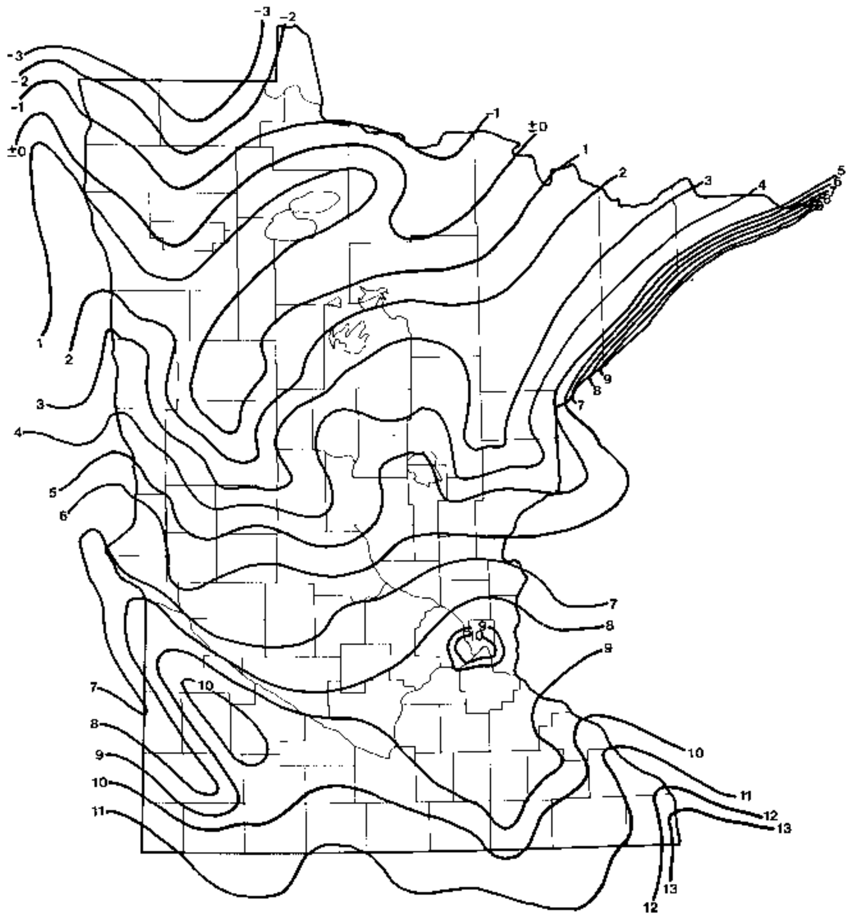

Figure 3.

January normal temperatures, °F.

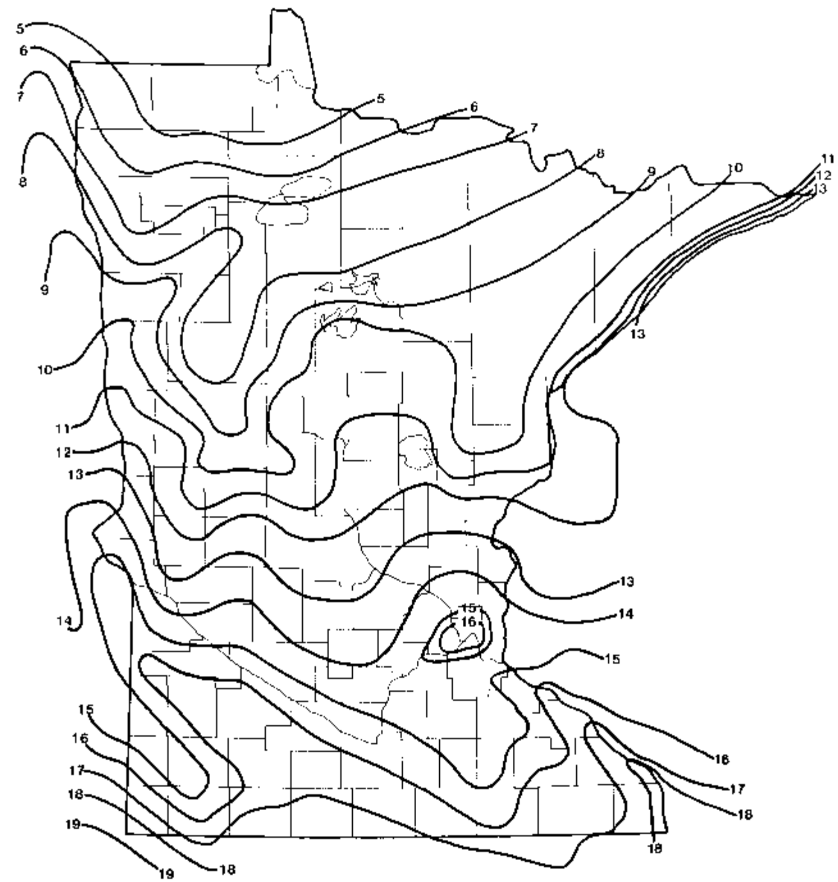

Figure 4.

February normal temperatures, °F.

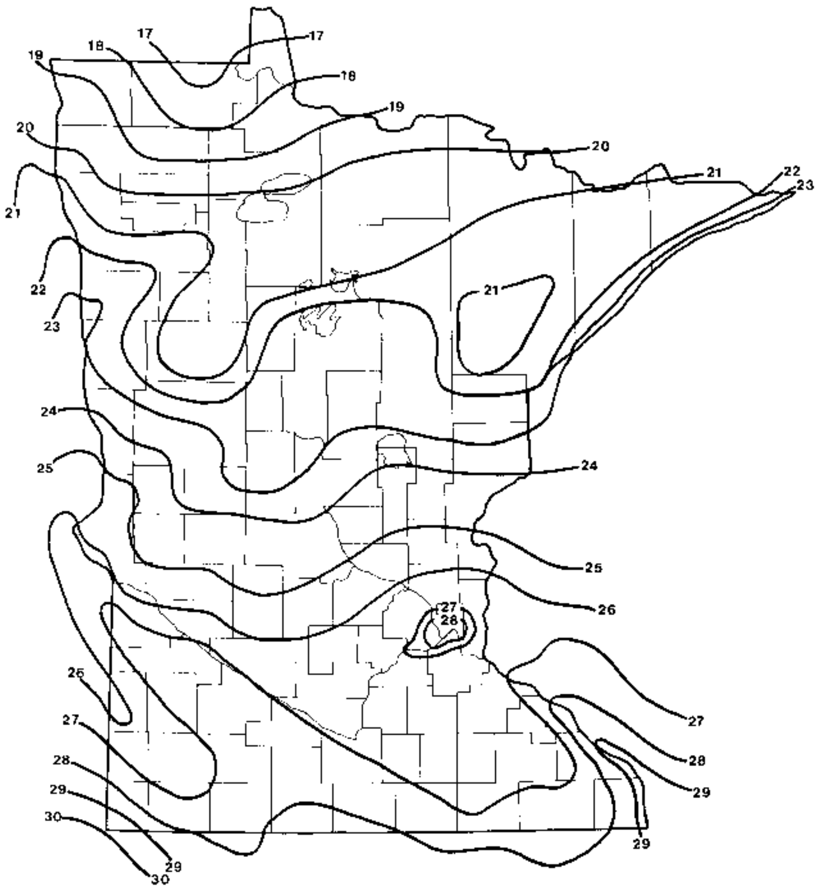


Figure 5.

March normal temperatures, °F.

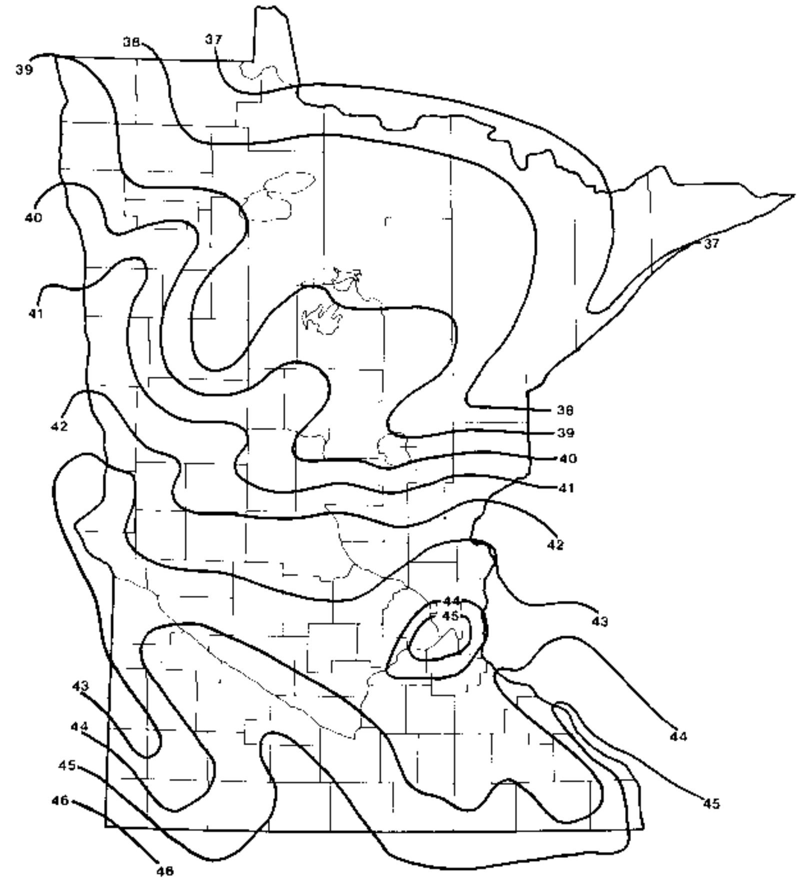


Figure 6.

April normal temperatures, °F.

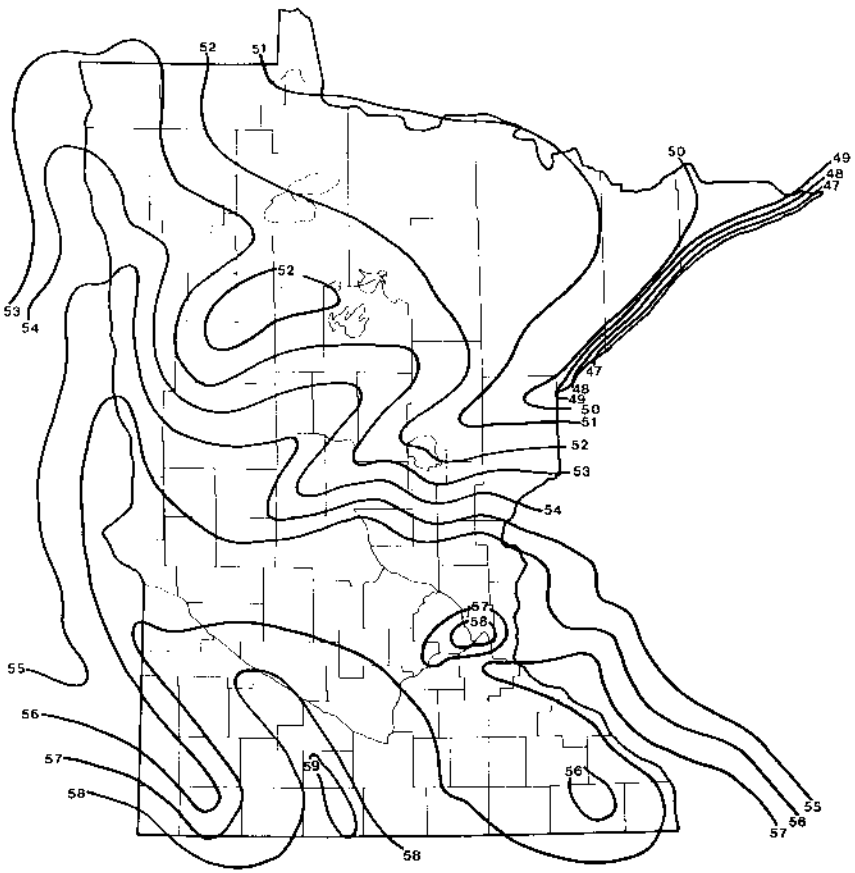


Figure 7.

May normal temperatures, °F.

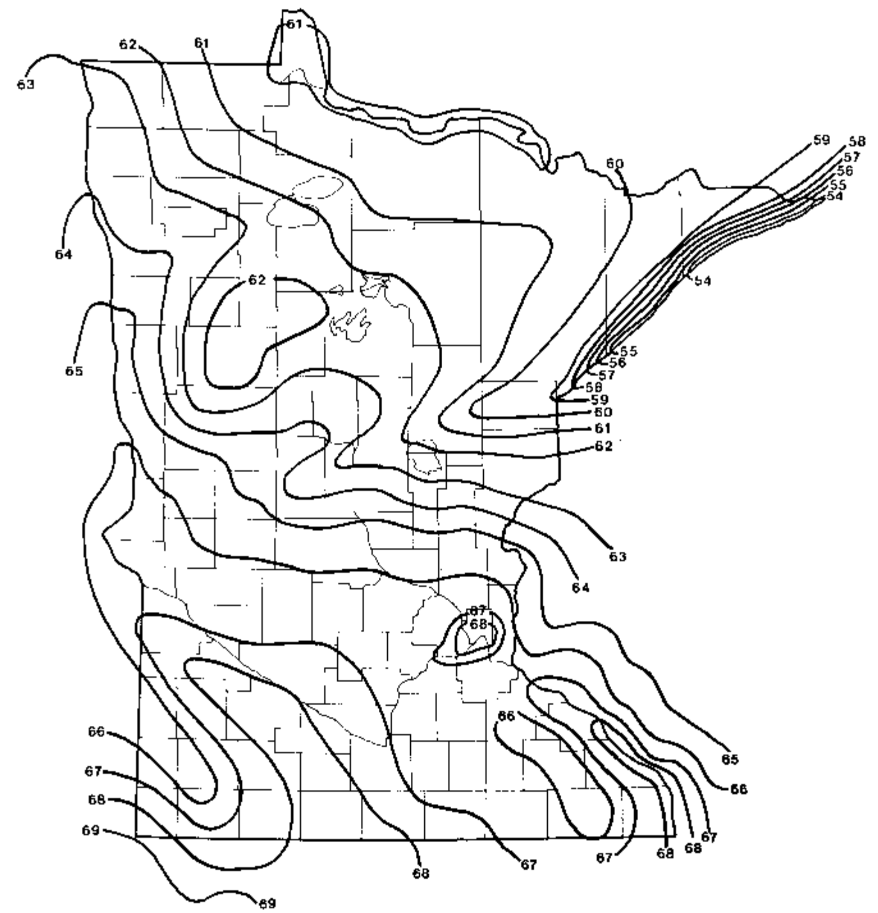


Figure 8.

June normal temperatures, °F.

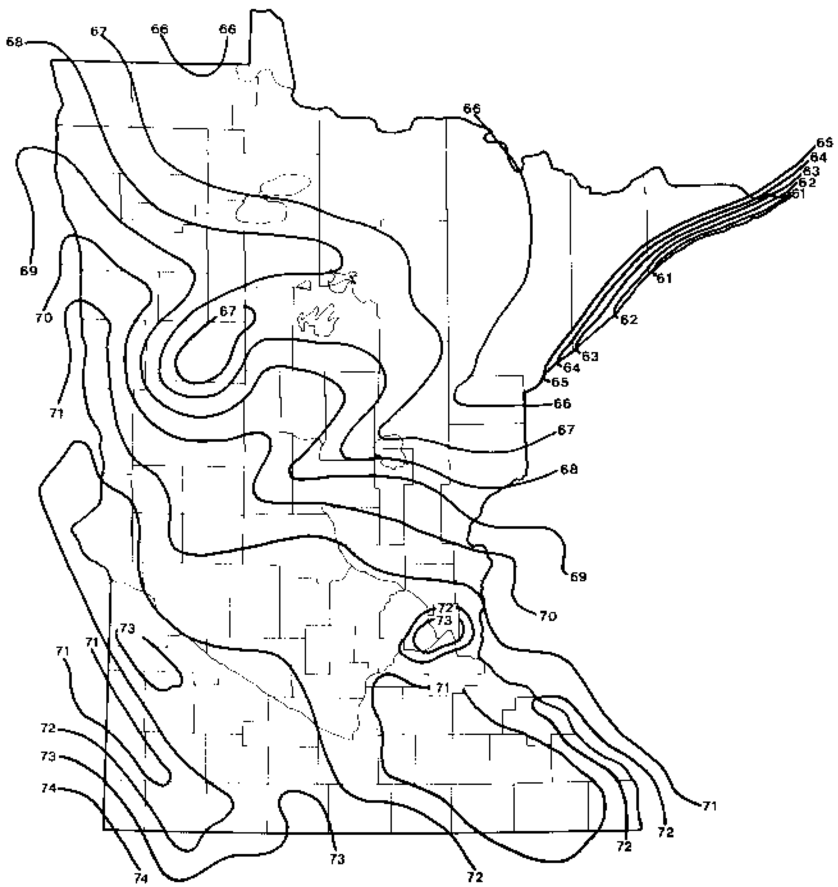


Figure 9.

July normal temperatures, °F.

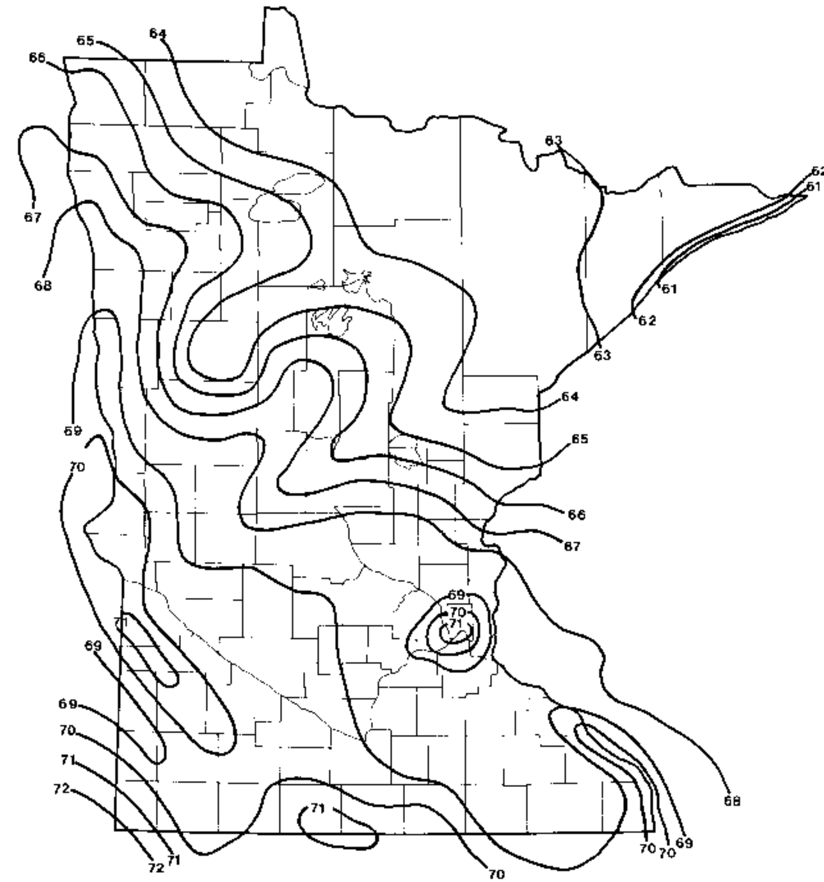


Figure 10.

August normal temperatures, °F.

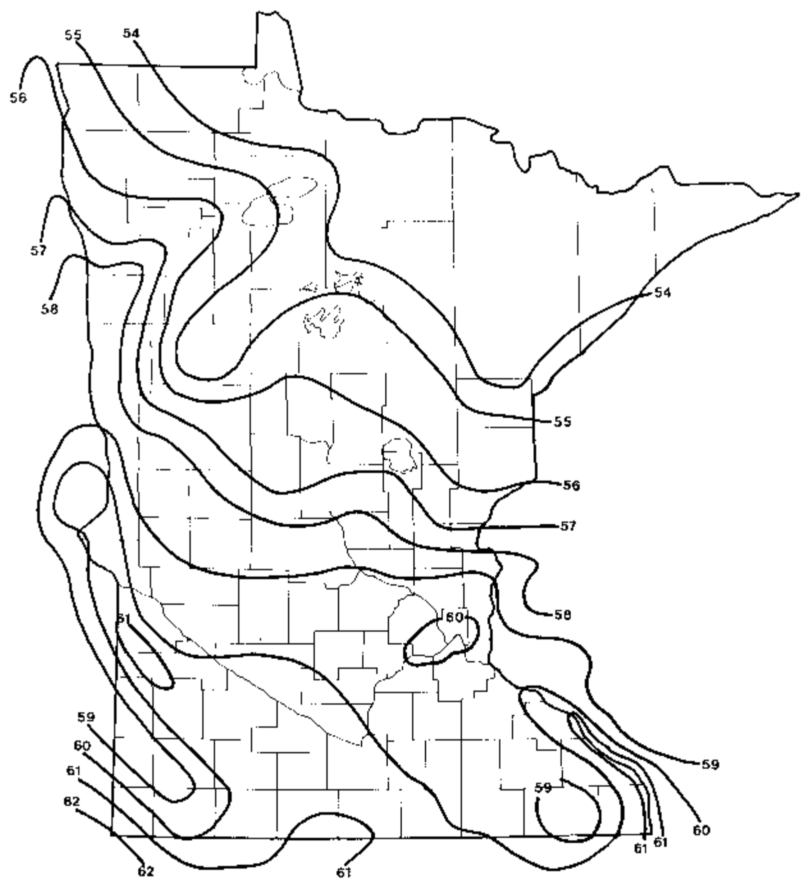


Figure 11.

September normal temperatures, °F.

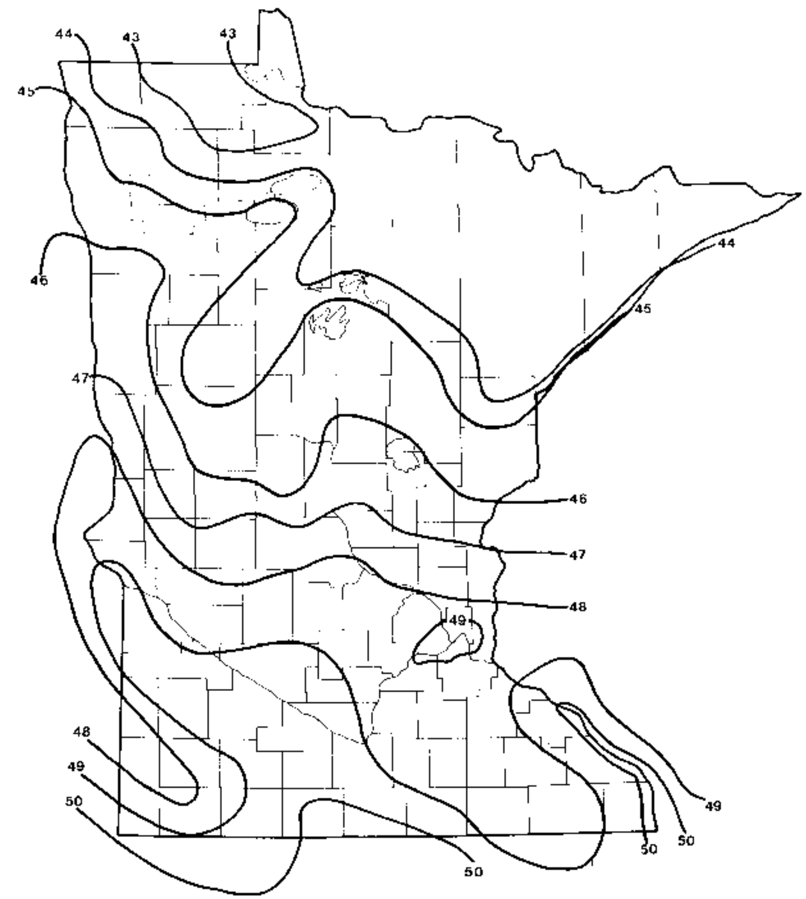


Figure 12.

October normal temperatures, °F.



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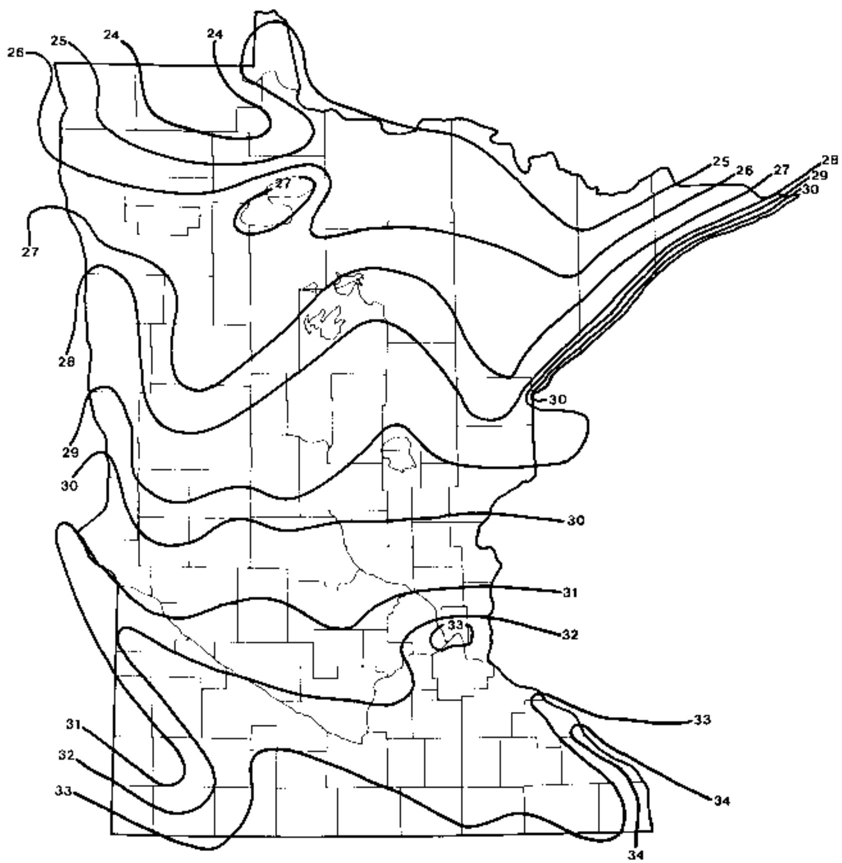


Figure 13.

November normal temperatures, °F.

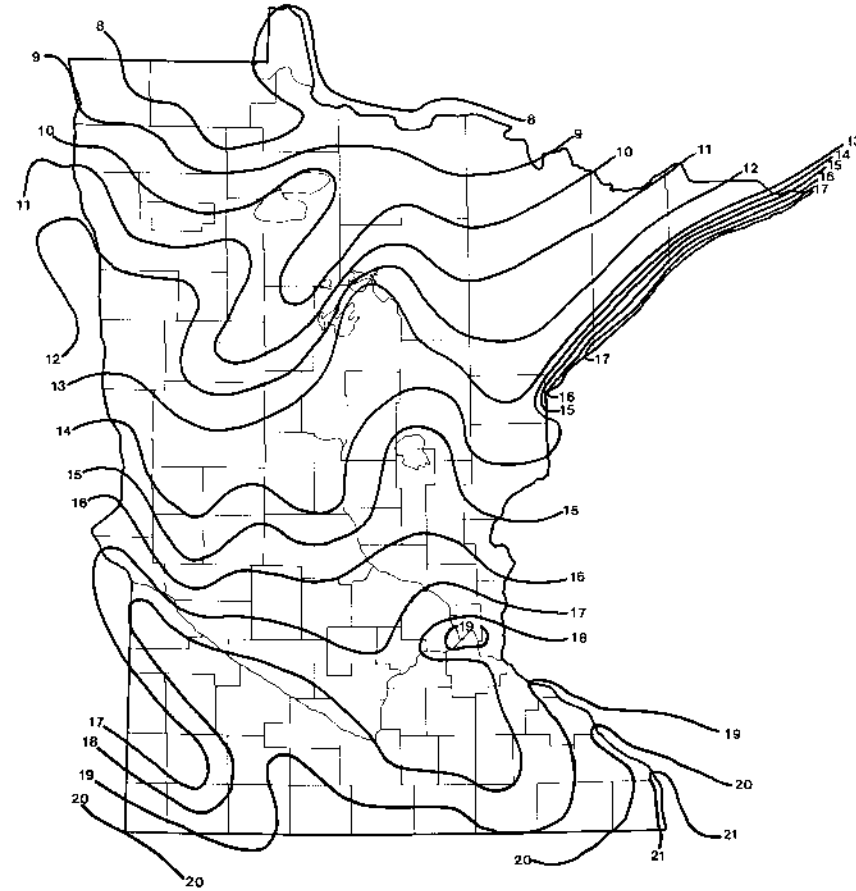


Figure 14.

December normal temperatures, °F.

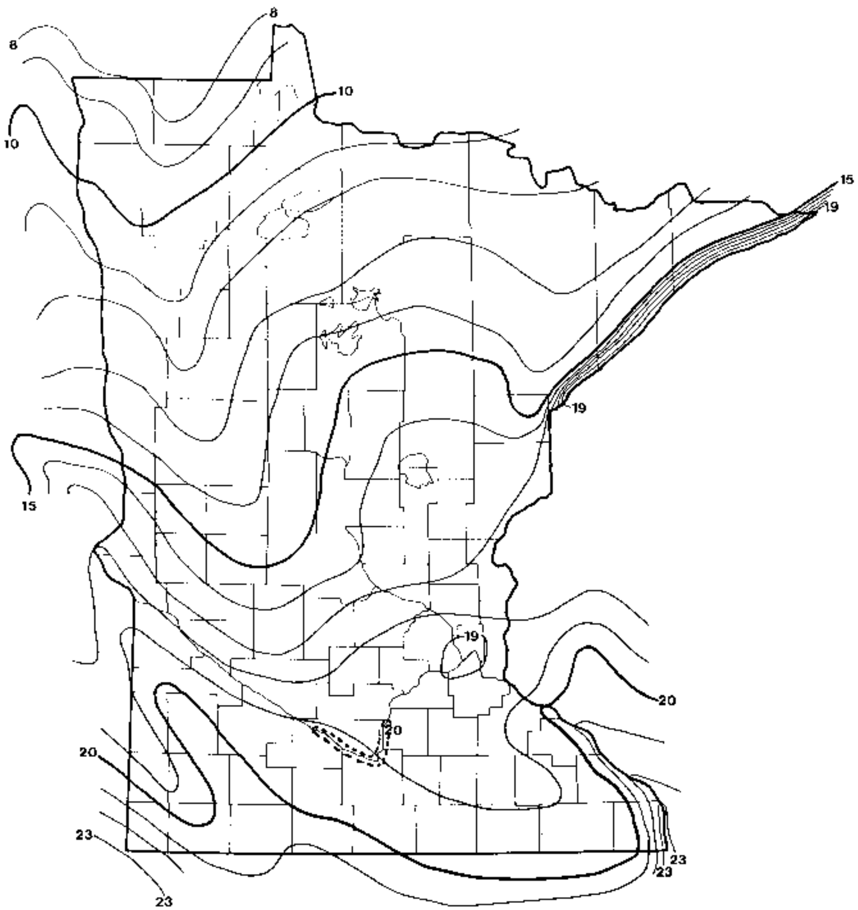


Figure 15.

January normal maximum temperatures, °F.

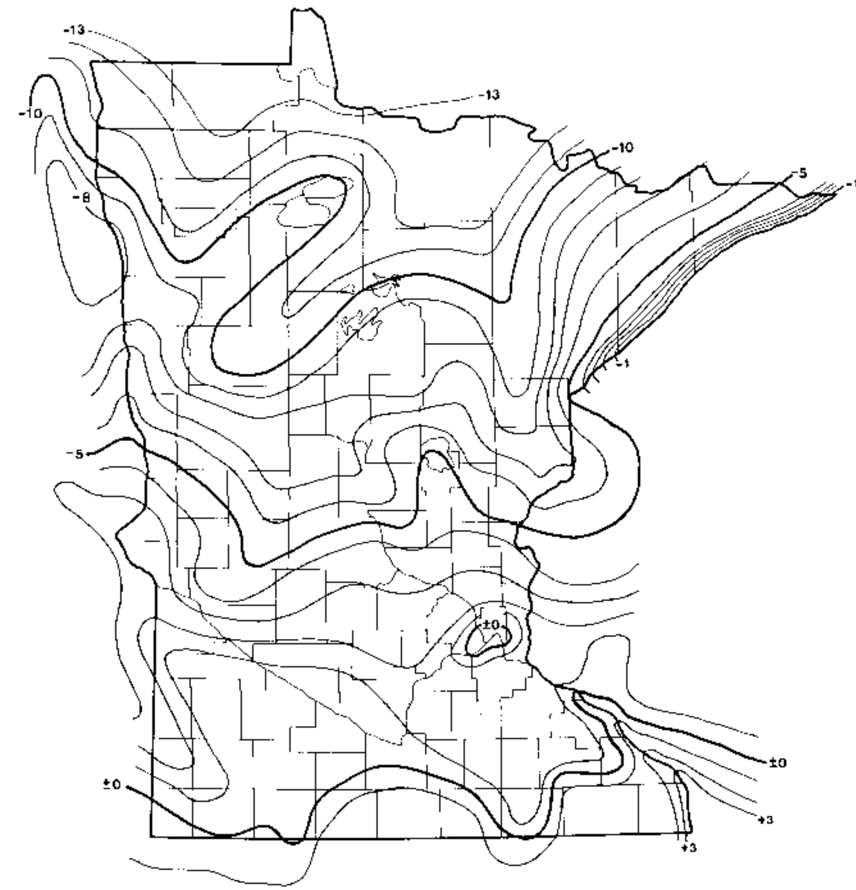


Figure 16.

January normal minimum temperatures, °F.

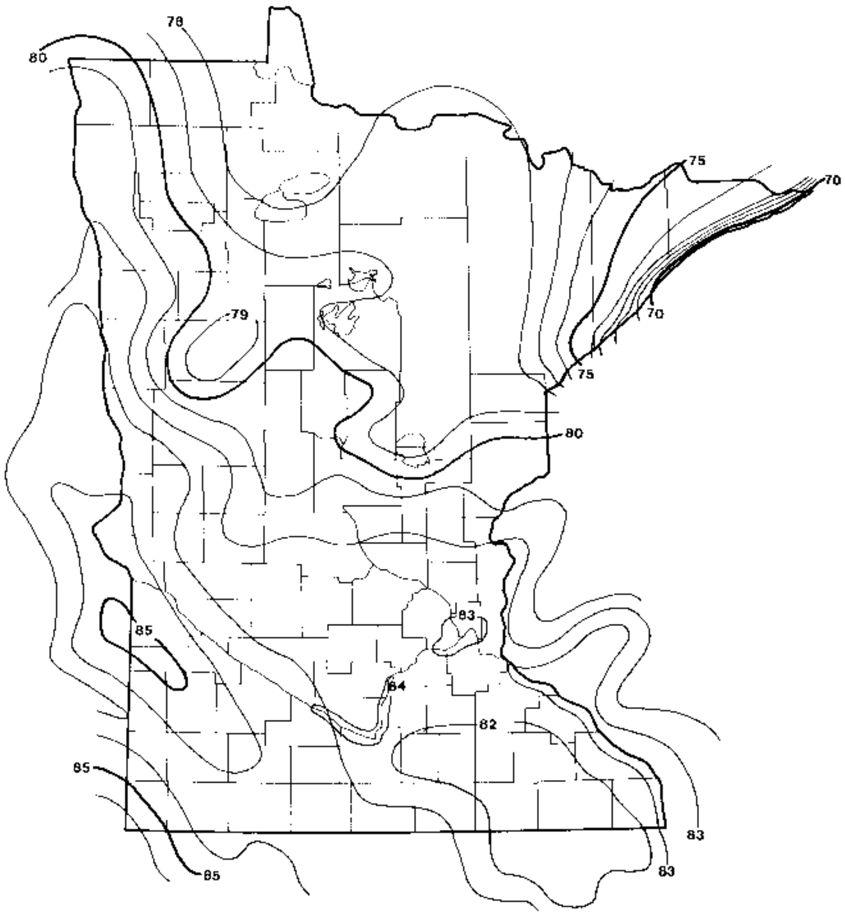


Figure 17.

July normal maximum temperatures, °F.

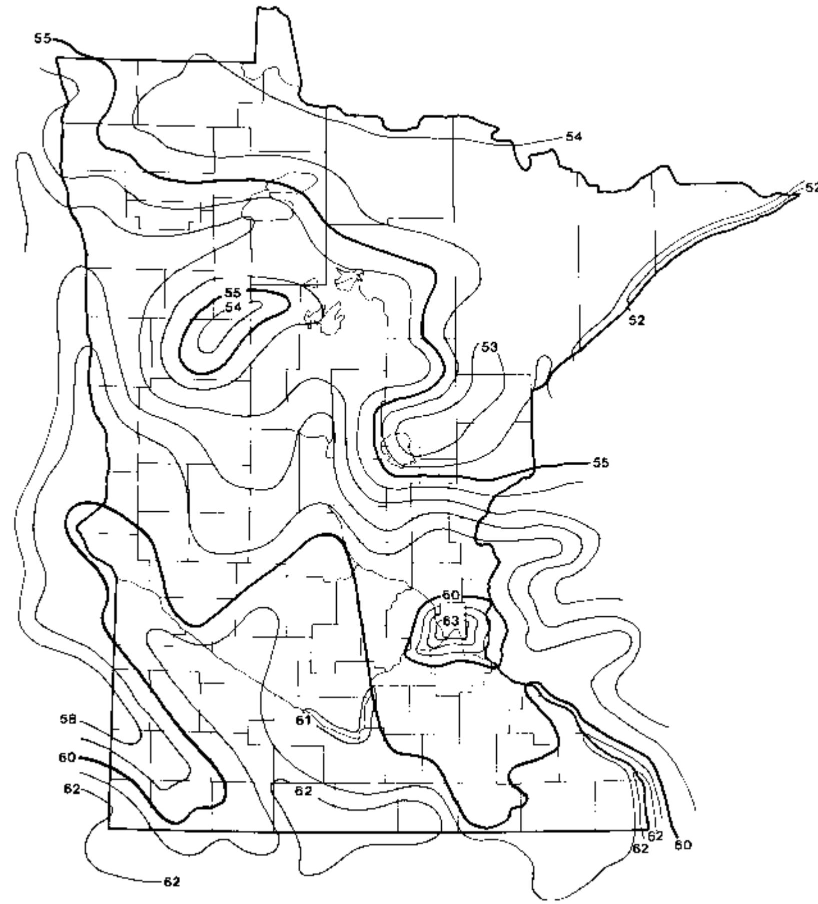


Figure 18.

July normal minimum temperatures, °F.

variation is about half that of winter. The temperature variation exhibits the continentality of the Minnesota climate: a large annual range coupled with high variability of the temperature. Variations in the daily temperatures show a similar seasonal difference; they are about two to two and one-half times greater than the monthly values shown in Table 4.

The probability that a monthly mean temperature will fall within a certain temperature range can be calculated from the mean temperatures in Appendix Table 1 and the standard deviations in Table 4. Since 68 percent of the temperatures will fall within ±1 standard deviation, 95 percent within ±2 standard deviations, and 99 percent within ±3 standard deviations, the probability of a given temperature range can be estimated readily. For example, from Appendix Table 1 the July mean at International Falls is 66.1°F and from Table 4 the July standard deviation is 2.52°F. Thus, there is a 68 percent probability that the temperature will be between 63.6 to 68.6°F, 95 percent probability of a range within 61.1° to 71.1°F, and 99 percent probability that 58.5 to 73.7°F will include the expected July mean temperature.

In Table 4 the smaller deviations at Duluth are a consequence of the lake effect; the greater winter than summer variation at all stations is an indication of greater climatic instability during winter. This instability is a result of the variable snow cover and, in particular, a result of the greater temperature difference during the low sun (winter) period.

January and July Maximums and Minimums. The average extremes that can be encountered are shown in the mean maximum and minimum temperature maps for January and July (Figures 15-18). The most dramatic of the four maps are those showing the mean minimums (Figures 16 and 18). This is so because the minimum temperature most often occurs in the early morning hours at about sunrise, when wind speed usually is at its lowest for the day. With relatively still air and thus little atmospheric mixing, the diverse underlying surfaces can have their greatest influence. In contrast, maximum temperature most often occurs during the afternoon, when the wind reaches its maximum speed for the day (Baker, 1983). Increased air motion results in greater atmospheric mixing, which in turn decreases any temperature differences created by different surfaces. A good example is the increased intensity of the urban heat island produced by the Twin Cities. It is obvious in both the January and the July minimum maps, whereas on the two maximum temperature maps (Figures 16 and 18) it is barely evident. Similarly the temperature differentials in the Mississippi valley in the extreme southeast and along the Alexandria Moraine in the northwest are much more evident on the July minimum map than they are on the July maximum map.

The temperature differential along the margin of Lake Superior is greater on the July maximum map than on the July minimum map (Figures 17 and 18). As described earlier this is due to the difference between land and water heating characteristics. Because of these characteristics, the land warms faster than the water does, and the difference between land and water is accentuated due to the longer warming than cooling period in July (longer days and shorter nights). Comparing the July minimum map (Figure 18) with Table 3, the land minimum air temperature along the margin of Lake Superior averages only about 4-5°F higher than the water temperature in that month.

On the same July minimum map (Figure 18) there exists a steep temperature gradient in a 50 mile zone about half way between Duluth and the Twin Cities. The gradient equals about 1°F per 10 miles. Since there are no sharp topographic or surface differences that occur in this area, the explanation must rest upon other features. An important one may be an outflow of cool air from the Lake Superior basin southwestward. Although this movement of the air is unusual due to the generally eastward movement of the weather systems, it must occur frequently enough to set up the observed temperature gradient. Given proper air movement from the lake, there are no obstacles to halt its flow southwestward into the St. Louis River valley. Except, however, for the Duluth station, which shows a prevailing east wind in May, June, and August, there are no other station records available between Minneapolis-St.Paul and Duluth to confirm the southwestward transport of cool lake-derived air. An example of a situation in which this did occur is discussed in the following section.

Annual and Seasonal Mean Temperatures

The temperature distributions for the four seasons and the annual period are shown in Figures 19-23. Each is similar in terms of the several high and low temperature areas depicted: the heat island of the Twin Cities, the warm Mississippi valley in the southeast, the Lake Superior influence in the northeast, and the cool highlands associated with the Buffalo Ridge in the southwest, the Alexandria Moraine in the northwest, and the North Shore Ridge paralleling Lake Superior.

The 14°F winter gradient between the northern and southern borders of the state is a maximum for the four seasons. The least gradient occurs in the summer, when there is only an 8°F difference if

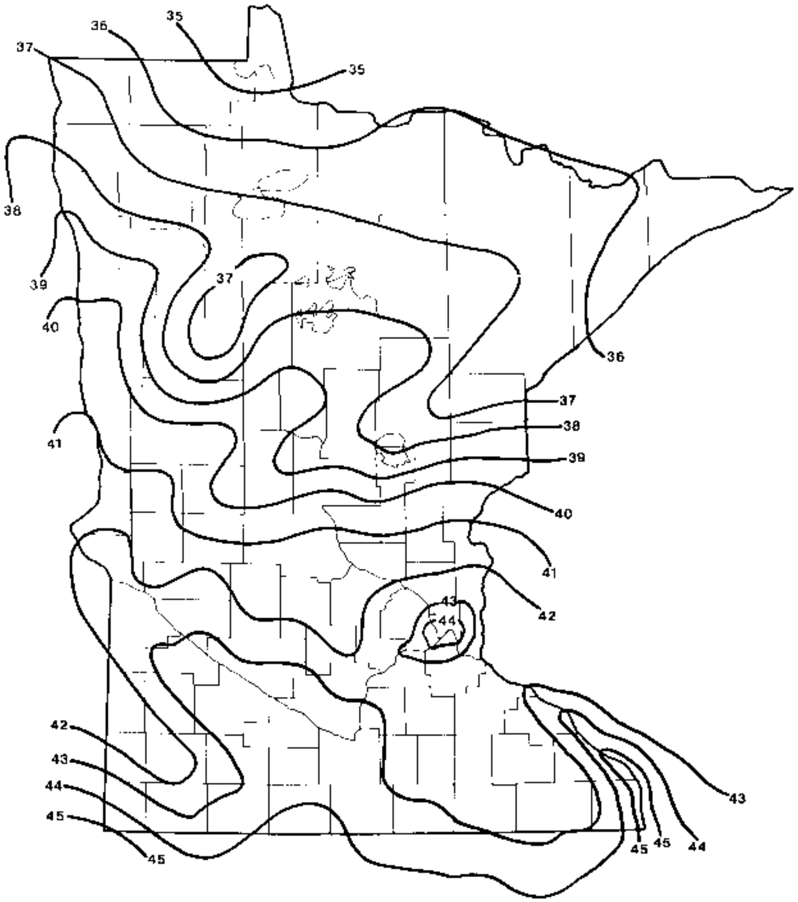


Figure 19.

Spring (March-May) normal temperatures, °F.

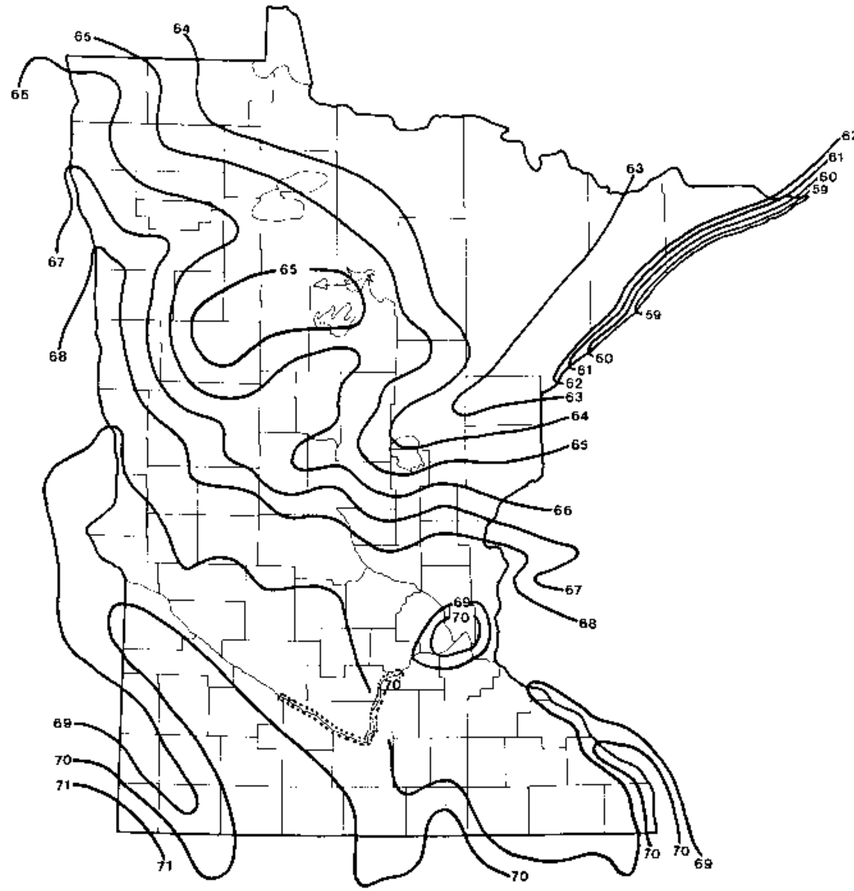


Figure 20.

Summer (June-August) normal temperatures, °F.

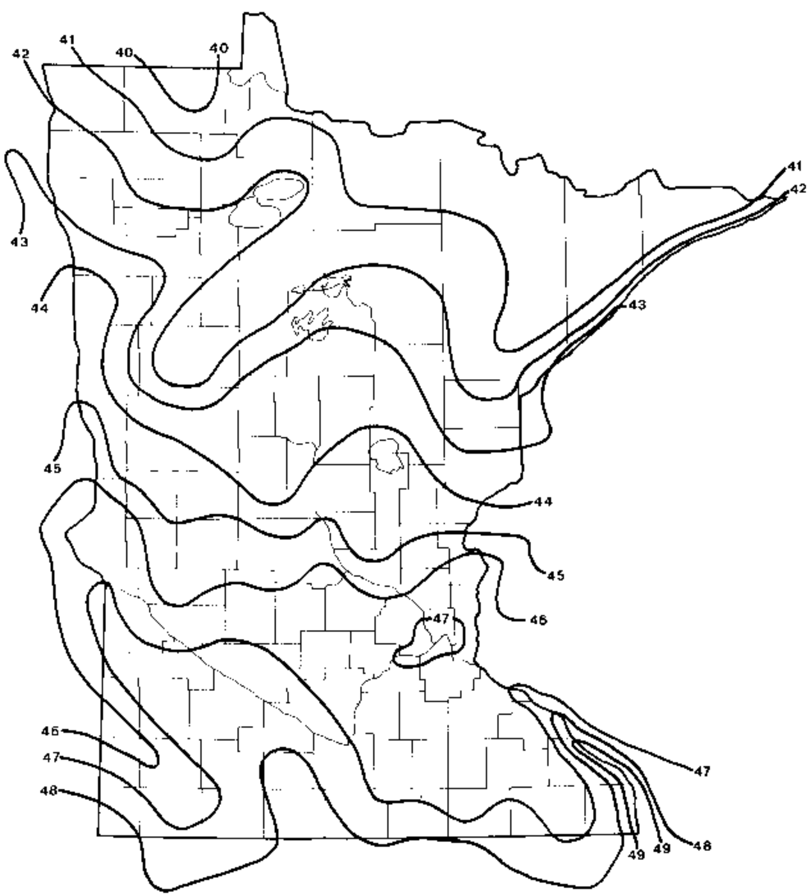


Figure 21.

Fall (September-November) normal temperatures, °F.

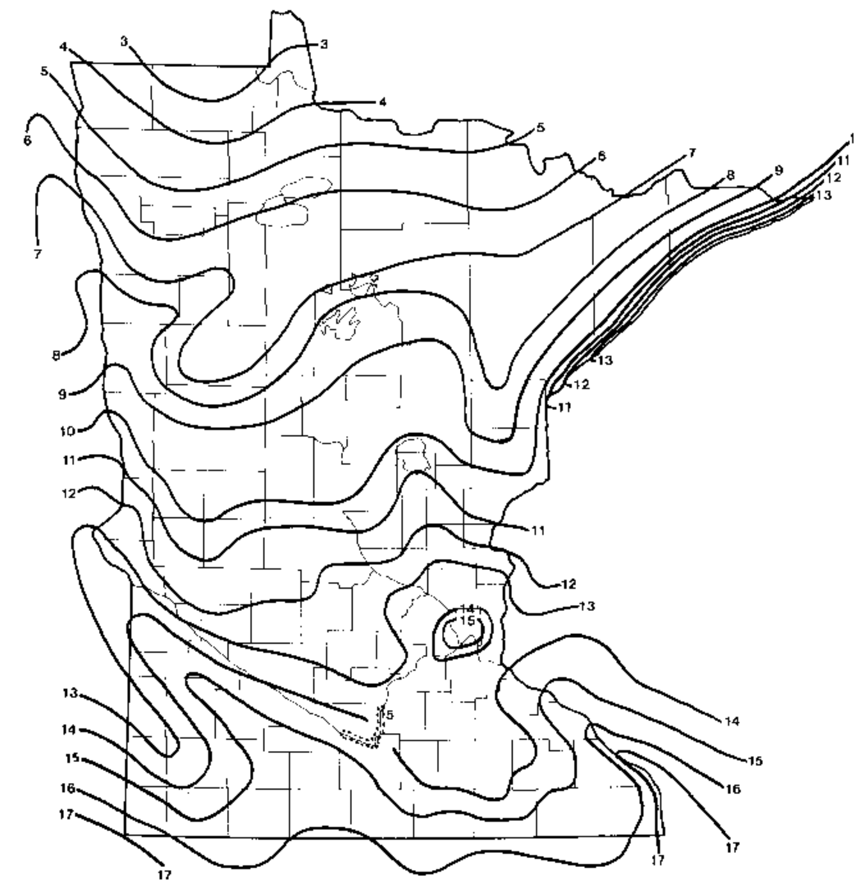


Figure 22.

Winter (December-February) normal temperatures, °F.

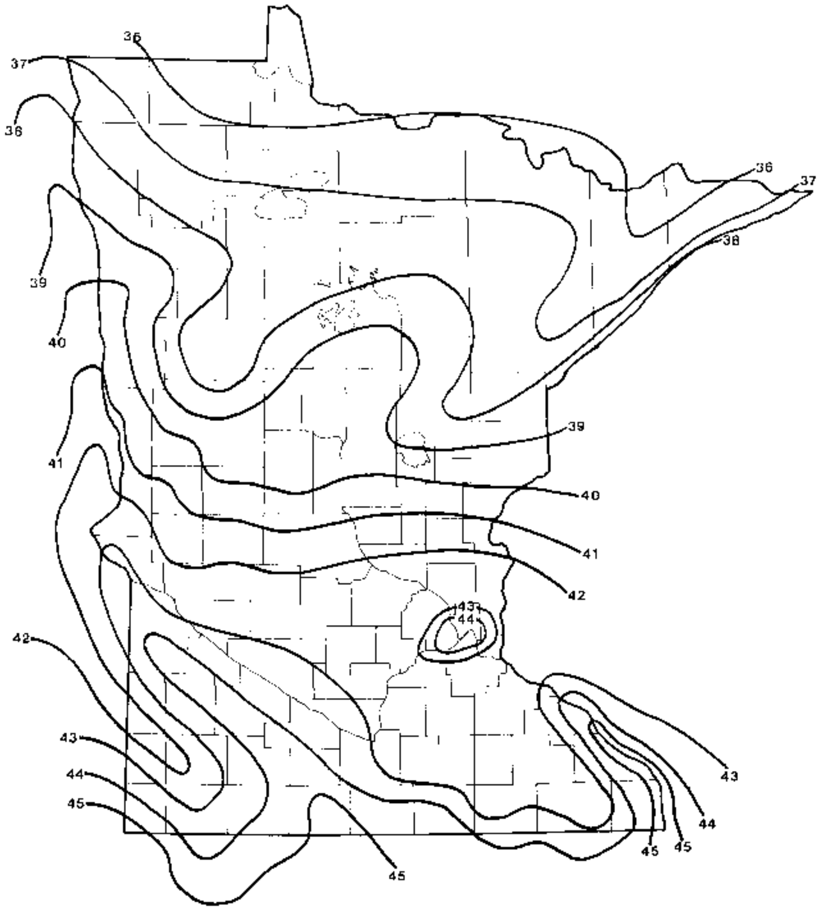


Figure 23.

Annual normal temperatures, °F.

the cool lakeshore temperatures of Lake Superior are excluded. The fall differential between the corners of the state is only 9°F even when the Lake Superior effect is counted. The spring difference across the state is 10°F; during this season the lake-land difference is at a minimum.

The summer mean temperature map (Figure 20) shows several features that distinguish it from the annual map (Figure 23). An obvious difference is the general northwest to southeast orientation of the isotherms, which arises from a combination of factors. The primary factors are the path of the storm centers and the presence of Lake Superior. The main position of the polar front is essentially north of Minnesota. The weather systems from Canada still move southeastward, but they are displaced farther north. Thus warm air intrusions from the south are more frequent in western Minnesota, whereas the southeast directed storm path plus the cool lake serve to "tilt" the isotherms into a more northwest-southeast orientation. Both air mass analysis (Bryson, 1966) and resultant wind analysis indicate that such an orientation is to be expected (Borchert, 1948; Baker, 1983). The presence of Lake Superior, a large, cool air source in the summer, in combination with the upland immediately to the west of it forces isotherms far south in northeastern Minnesota. This effect is particularly noticeable because there is nothing comparable in the northwestern corner of the state. The influence of these climatic parameters and the general isotherm orientation also help to explain a similar orientation of the native vegetation zones of the state.

With respect to local summer features, the cool area associated with the Alexandria Moraine shown in the annual map (Figure 23) is enlarged eastward in summer to include Leech, Cass, and Winnibigoshish lakes. The summer coolness of this area is due both to the higher elevations present and to the lakes themselves, which are numerous, constituting about 215,000 acres or nearly 336 square miles.

Another special summer feature is the cooling effect created by the apparent funneling of Lake Superior air across parts of eastern Minnesota that lie southwest of the lake. As noted earlier the Great Lakes, and Lake Superior in particular, present during the summer a surface that is much cooler than adjacent land surfaces. During May-August the southern part of Lake Superior averages about 12°F (6.7°C) cooler than the air over land. Thus any weather system that is located in such a position as to cause a westward movement of the cool air from Lake Superior toward Minnesota during May-August (such as a high pressure system centered to the north or northwest of the lake, or a low pressure system to the south of Lake Superior) will move the surface air in an easterly direction. As the air moves westward it is channeled southwestward, due to the North Shore Ridge along the northern margin of Lake Superior, with the outlet being the low terrain southwest of Duluth-Superior. Occasionally the cool air of the Lake Superior basin reaches Mille Lacs Lake; such an occurrence appears to reinforce the flow of cool air. The advection or transport of the cool lake air into parts of eastern Minnesota probably reaches a peak in May and June when the combination of the frequency of winds from the east, as measured at Duluth, and the temperature differential between land and water is at a maximum.

These cold air intrusions within a relatively narrow band through Carlton County and lower Aitkin County can have such a profound effect upon crops that chances for a thriving agriculture are greatly reduced. The lowered temperatures reduce the seasonal total of growing degree days and may also increase the risk of late spring and early fall frosts.

That this differential between the lake and the land can be dramatic is demonstrated by conditions experienced by one of the authors on a drive from St. Paul to Two Harbors, about 175 miles north-northeast of St. Paul, via Hinckley and Duluth on July 9, 1983. A large high pressure was located between Lake Superior and Hudson Bay, producing winds that blew from east to west across the lake. A weather front or major discontinuity between the lake air, 62°F (16.7°C) at Two Harbors, and land air, 80°F (26.7°C) at St. Paul, began at Willow River. Between there and Cloquet, a distance of 24 miles, the temperature dropped 12°F (6.7°C). Within this temperature discontinuity clouds were low and constituted a complete cover, while it was partly sunny both to the north and to the south of this zone. With a somewhat stronger general circulation or wind flow, the cool air would soon be carried southwestward into east-central Minnesota.

## Temperature Profiles

To determine a quantitative measure of the two major causes of the temperature variation observed, latitude (northward displacement) and altitude (excluding the important but essentially localized effect of Lake Superior), a multiple linear regression equation was calculated for two south to north profiles. The results are shown in Table 5. The latitude effect is shown in terms of the horizontal distance northward from the Iowa border. Due to the large effect of Lake Superior the data in Table 5 for the south to north temperature profile across eastern Minnesota are only for that portion running from the Iowa border to Duluth.

Table 5. Temperature changes associated with an increase in elevation and an increase in distance from Iowa to the Canadian border (compare with Figures 24 and 25).

| Location | Period | Elevation Effect in °F per 100 Feet | Distance Effect in °F per 100 Miles |
|---|---|---|---|
| South to north (western Minnesota, see Figure 24) | July | -0.44 | -2.27 |
| | Summer | -0.42 | -2.17 |
| | Winter | -0.48 | -4.23 |
| | January | -0.45 | -4.39 |
| South to north (eastern Minnesota, see Figure 25) | July | -0.65 | -2.72 |
| | Summer | -0.64 | -3.02 |
| | Winter | * | -2.86 |
| | January | * | -2.83 |

* No apparent effect due to change in elevation.

As shown in Table 5, the temperature gradient in winter is greater than in the summer in the western temperature profile. This is a feature common to most parts of the world. But the seasonal difference in the eastern profile shows a greater contrast in summer than winter because the lake effect that is present in summer is at least partially eliminated in winter due to ice cover. In summer Lake Superior air is very cold compared to land temperatures. Since some of this cold air occasionally "spills out" of the immediate area and is moved to the southwest, the result is that a larger than expected summer temperature differential can develop between the Iowa border and Duluth.

The temperature decrease introduced by an increase in altitude is another interesting feature evident in Table 5. The decrease is about 0.1°F less than the theoretical value for adiabatic cooling (0.55°F per 100 feet) associated with rising air in the western Minnesota profile. The values shown for the two profiles in Table 5 seem reasonable. The indicated changes of -0.65 and -0.64°F in July and summer, respectively, in the eastern profile are greater than the predicted rate. The explanation must rest with the fact that the change in elevation, which occurs principally in the Twin Cities area, is confounded with the urban heat island effect. Both features act to make the Twin Cities area warmer than the surrounding area. The combination of the warm Twin Cities temperatures and the lake-influenced cool temperatures of Duluth serves to produce a temperature change greater than the elevation-induced decreases.

The two temperature and altitude profiles associated with Table 5 that extend south to north across the state are shown in Figures 24 and 25. In each case the associated elevation profile is depicted at the base of the figure. The temperature profiles shown are for the temperature normals of four periods: July, summer (mean of June, July, and August), winter (mean of December, January, and February), and January.

A general decreasing trend in temperatures from south to north is the most evident feature in Figures 24 and 25. The northward rate of temperature decrease, ordinarily greater in winter than summer, is modified by several factors, with variation in elevation being the most important and obvious one. The marked temperature decrease at Pipestone (Figure 24) can be explained by its position on Buffalo Ridge, some 320 feet (98 m) higher than Sioux Falls to the south and 570 feet (174 m) higher than Marshall, located to the north-northeast.

Of major importance in northeastern Minnesota is Lake Superior (Figure 25), as evidenced by the temperatures at the two lakeside stations, Two Harbors and Grand Marais. The effect of the lake is present in the winter and January profiles of these stations. The relatively high temperatures are the result of the lake being ice-free, particularly in December and early January, while nearby land surfaces are considerably colder and usually are snow covered.

Another factor whose influence probably is evident in the eastern Minnesota transect from south to north is the urban effect of the Twin Cities (Figure 25). Due to the urbanization and industrialization of the Twin Cities, with the attendant heat production and heat absorbing building materials of the city, a marked increase in temperature frequently can be observed. In this temperature profile of eastern Minnesota the urban effect, or "heat island," is added to the warming effect due to the decrease in elevation at the Minneapolis-St. Paul airport station. Although the

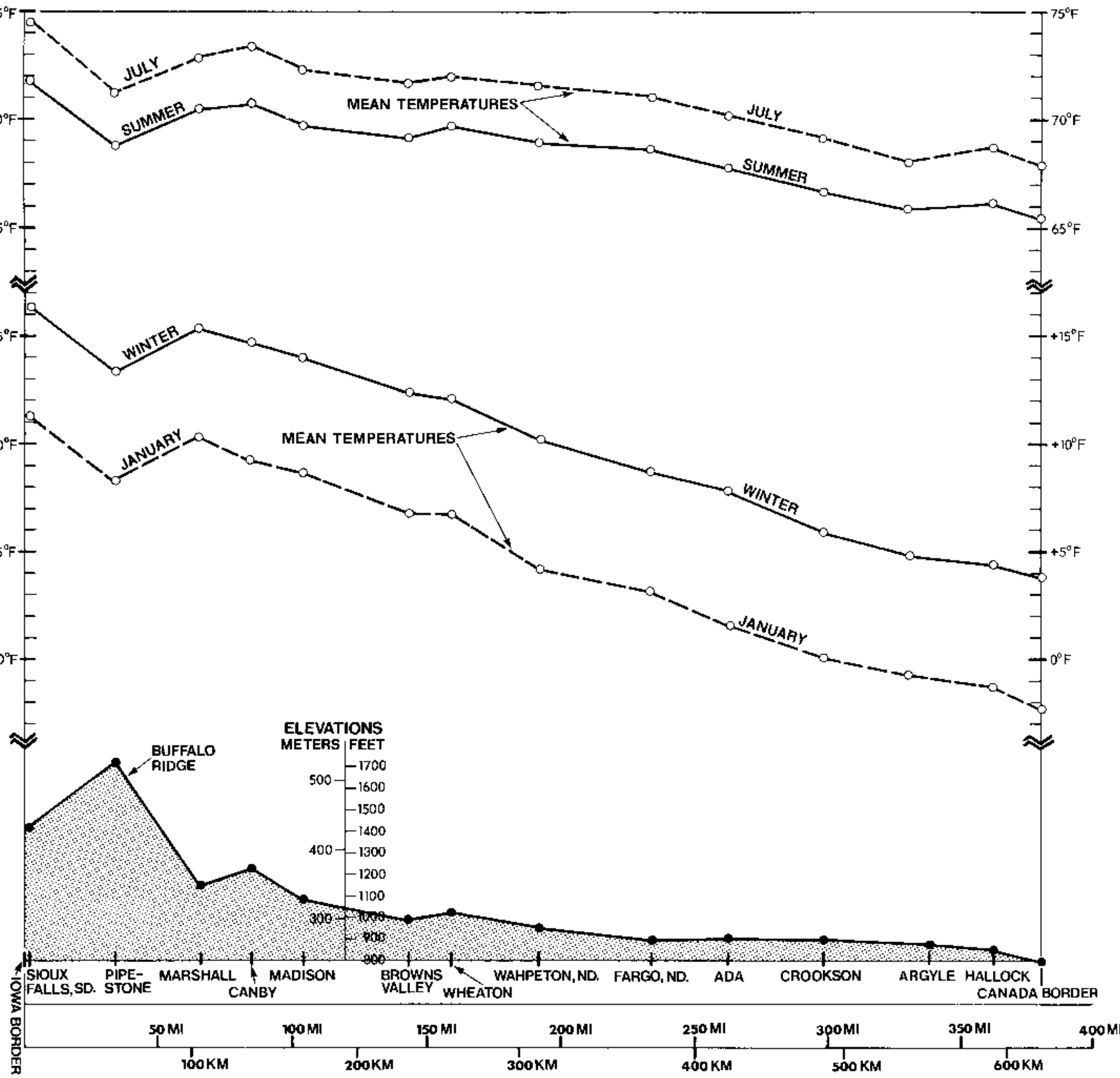


Figure 24.

South to north temperature (July, summer, winter, and January) and altitude profiles across western Minnesota from Iowa to the Canadian border.

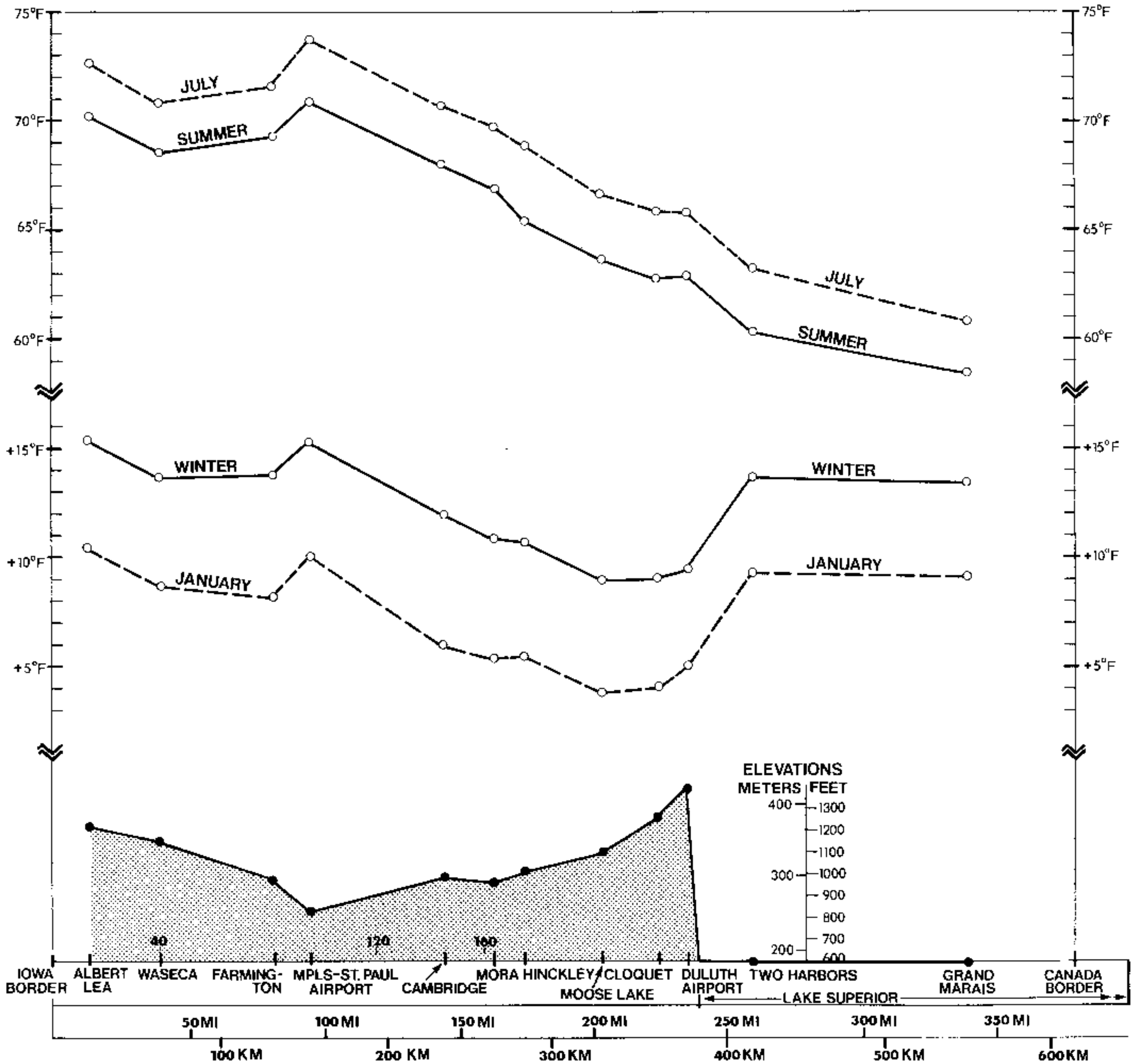


Figure 25.

South to north temperature (July, summer, winter, and January) and altitude profiles across eastern Minnesota from Iowa to the Canadian border.

airport is not in the heart of the heat island (Winkler et al., 1981), the temperatures, which are higher than those at Farmington just to the south of the Twin Cities, cannot be attributed just to the decrease in elevation.

Two additional temperature and altitude profiles are shown in Figures 26 and 27. Both show west to east profiles, with the former across the northern part of the state and the latter across the south.

The profiles across northern Minnesota (Figure 26) show the marked seasonal effect typical of large bodies of water, an effect that is out of phase with the land. In July and summer there is a general decrease in temperature as the lake is approached, whereas in winter and January there is a general increase. The elevation effect is sharpest between Itasca Park and Park Rapids in July and summer. The large topographic change along the western and eastern sides of the Red River valley is hardly apparent in the temperature profile, probably because the winds do not commonly blow at right angles to this depression.

Across southern Minnesota there is a marked decrease in elevation from west to east (Figure 27). Except at Waseca and the Mississippi River valley, however, there is virtually no corresponding temperature variation. The altitude and distance effects upon the two west to east profiles are shown in Table 6. The major change found in the northern and southern transects is that in moving west to east across the state, temperatures decrease in summer and July but increase in winter and Jaunary. This is partially due to Lake Superior, since it is still open in December and a part of January. A part of the decrease in temperature also is due to the fact that centers of the Canadian cold air masses usually enter North Dakota or northwestern Minnesota first. As a result, by the time an air mass reaches eastern Minnesota, some amelioration in the air temperature has taken place. For these two reasons, then, temperatures in the eastern portion of the transects are somewhat warmer in the winter and cooler in the summer.

Table 6. The temperature changes associated with a change in elevation and increase in distance from the Dakotas to the Wisconsin border (compare with Figures 26 and 27).

| Location | Period | Elevation Effect in °F per 100 feet | Distance Effect in °F per 100 Miles |
|---|---|---|---|
| West to east (northern Minnesota, see Figure 26) | July | -0.44 | -1.41 |
| | Summer | -0.38 | -1.67 |
| | Winter | -0.33 | 1.10 |
| | January | -0.43 | 1.54 |
| West to east (southern Minnesota, see Figure 27) | July | -0.31 | -0.89 |
| | Summer | -0.31 | -0.90 |
| | Winter | -0.21 | 0.11 |
| | January | -0.19 | 0.22 |

* Superior, Wisconsin, is not included.

Other factors, usually minor and very local, do play a part in modifying the temperatures from what might be expected. Such factors usually are unique to a given station. As noted earlier they include the location of the temperature shelter housing the instruments relative to nearby obstructions to air movement and to minor and localized variations in both topography and surface.

## The Application of Temperatures

### Degree Days

An interesting and frequently useful means of predicting certain physical or biological events is through the application of degree days. The basis for success is that within a given temperature range many biological and physical systems react directly to a temperature increase or decrease. That is, once a certain base or threshold temperature has been reached the rate of change of the system under consideration closely approximates the summation of the temperature. Depending on the application, the temperature threshold can be reached with either rising or falling temperatures.

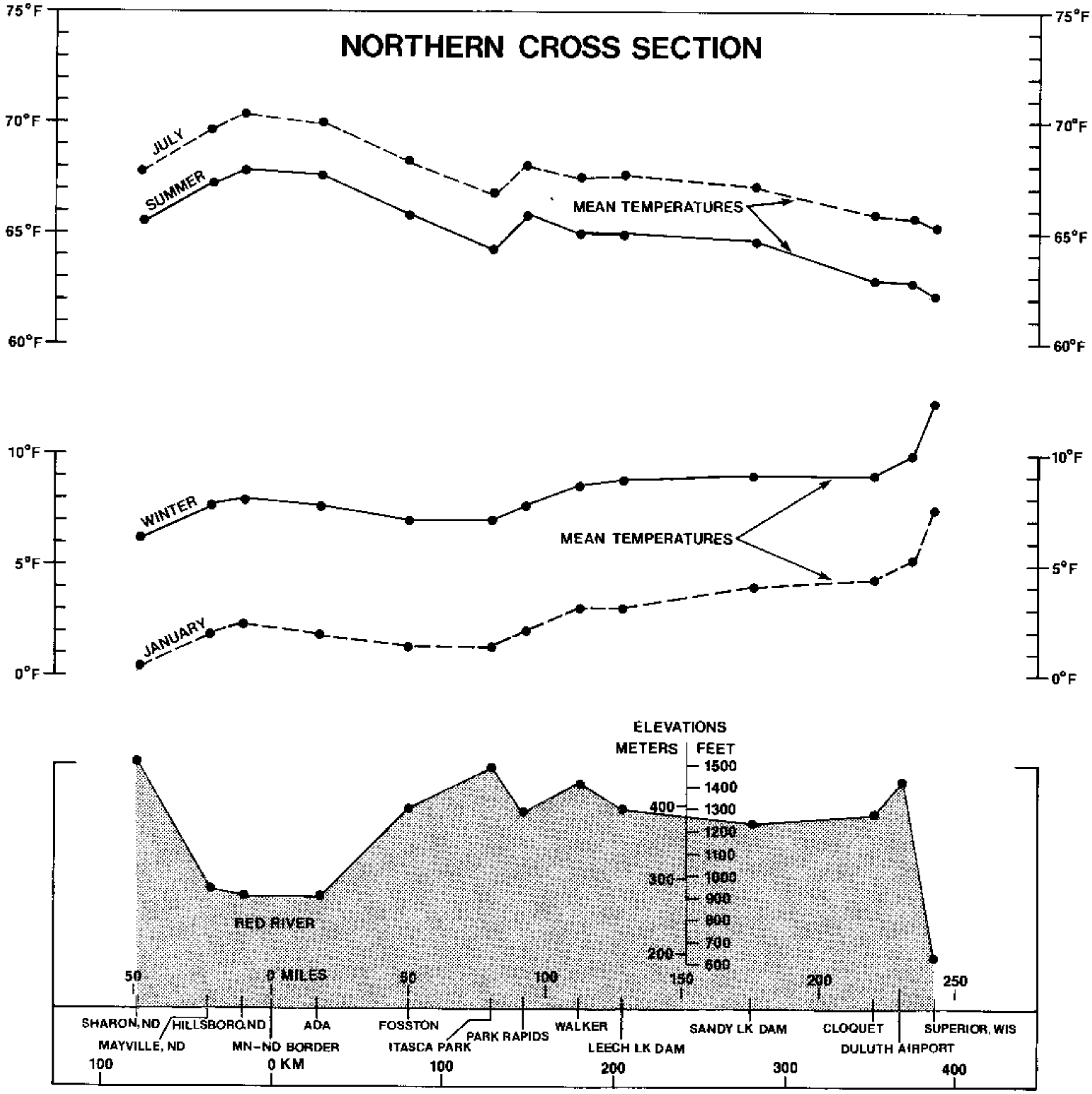


Figure 26.

West to east temperature (July, summer, winter, and January) and altitude profiles across northern Minnesota from Sharon, N.D., to Superior, Wis.

# SOUTHERN CROSS SECTION

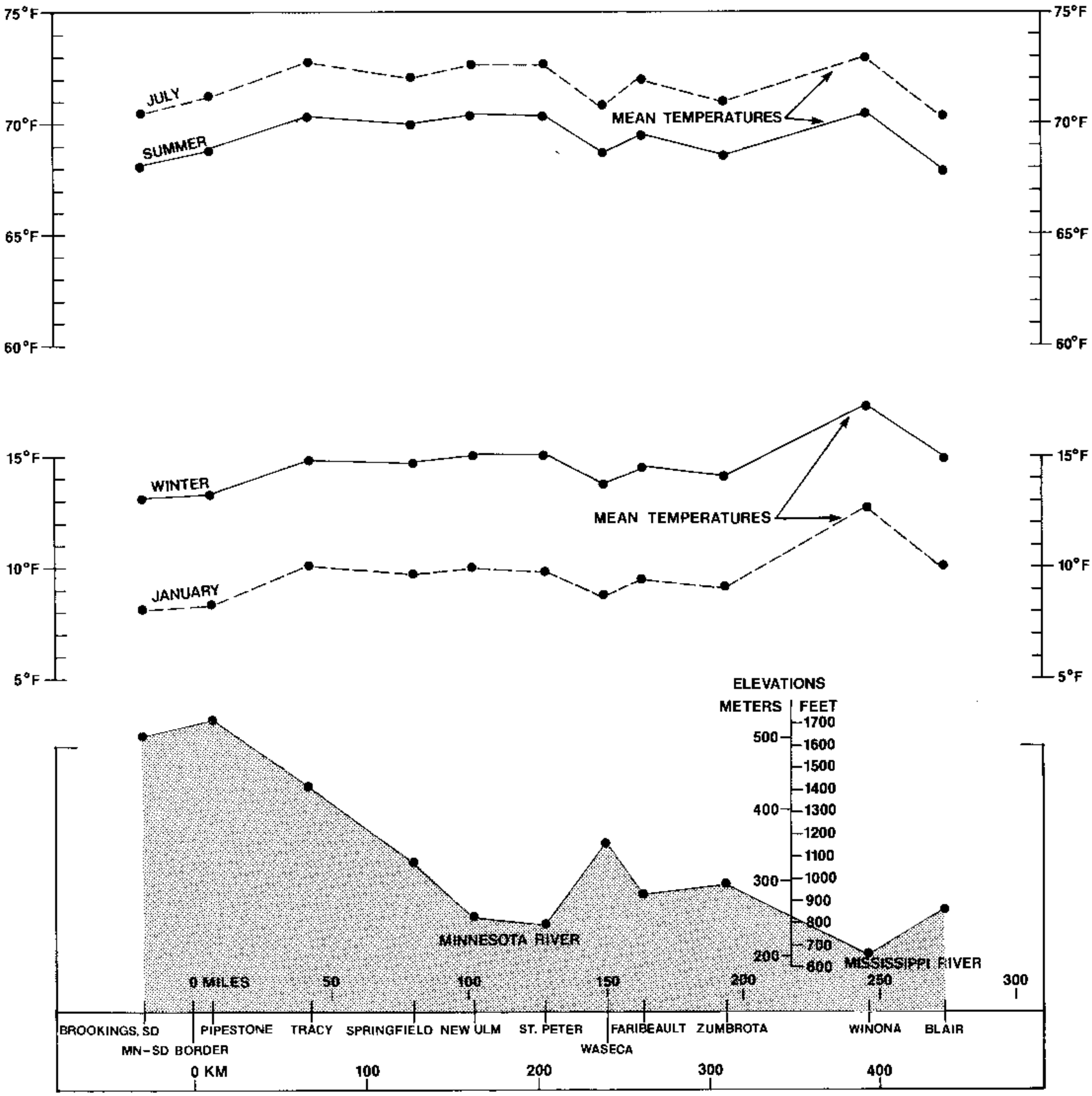


Figure 27.

West to east temperature (July, summer, winter, and January) and altitude profiles across southern Minnesota from Brookings, S.D., to Blair, Wis.

For application to biological systems, such as the growth and development of crops, the threshold or base temperature is reached with rising temperatures. The calculation for this kind of degree days (DD) is:

$$DD = \Sigma (\bar{T} - T_b)$$

$\bar{T}$ = the average daily temperature, which is one-half of the sum the daily maximum and minimum temperatures.

$T_b$ = the base or threshold temperature; the temperature that must be exceeded before growth or development commences.

$\Sigma$ = the symbol indicating that the difference between $\bar{T}$ and $T_b$ is to be summed day by day; negative values are not counted.

Occasionally, hourly temperatures are used in place of the average daily temperature $\bar{T}$ (Lana and Haber, 1951). The degree day total or, more correctly, the total of the degree hours assigned to a particular event or stage, then has to be revised accordingly.

For expediency the formula sometimes is altered to:

$$DD = \Sigma[(\bar{T}m - T_b) \times N]$$

$\bar{T}m$ = average monthly temperature; $T_b$ = base temperature; N = number of days in the month; $\Sigma$ indicates that the value obtained within the brackets is to be summed.

Degree days also can be calculated when the base temperature is reached with descending temperatures. This kind of degree day usually finds frequent application in physical systems and is used, for example, to estimate fuel consumption or the freezing rate of soil. It also can be applied to biological systems in which insects or plants require a certain number of chill units before development can proceed. It is discussed in detail in a following section. The calculation method is similar to the degree days just described except that the mean temperature ($\bar{T}$) is subtracted from the base temperature ($T_b$), with the daily differences summed as usual. Symbolically the formula is:

$$DD = \Sigma (T_b - \bar{T}).$$

Degree days in this bulletin were computed from the monthly temperature normals rather than from daily temperatures. Ordinarily such a method is not recommended because daily variations are then masked. Thom (1954), however, developed a method that permits the use of monthly normals by taking daily variations into account. Thom's method, which permits an estimation of monthly totals of degree days based on the mean and standard deviation of the monthly temperatures, was modified and improved by Zandlo (1985) for computer use. Zandlo's method was used to calculate the monthly totals of degree days required for determining the several kinds of degree days shown in this bulletin.

Growing Degree Days (GDD). Because of the relative ease with which degree days can be calculated (see the two formulas for DD above) and because so many things are temperature regulated, degree days can be applied to a number of biological and physical events. The most obvious and earliest application was to the development of agricultural crops. The concept of degree day is not a new one; it was suggested as early as the late 18th century by Reaumur (Went, 1957), a French scientist who also developed the thermometer and temperature scale that bear his name. It was another Frenchman, de Candolle, who in 1855 first subtracted a minimum temperature from the daily average (Went, 1957). This minimum, now termed the base or threshold temperature, was presumably the temperature level below which no growth occurred. Besides being known as GDD and thermal time, degree days also are referred to as day degrees, heat sums, and the remainder index.

An example that applies GDD to sweet corn can be used to explain this method more clearly. If $\bar{T}$, the average temperature for the day, is 80°F and $T_b$ is 50°F, the base temperature frequently used for sweet corn, then the total GDD for this day equal the difference between 80° and 50°F or 30 GDD. The accumulation of about 1750-2000 GDD from planting to harvest (canning) time usually is required for sweet corn varieties grown in Minnesota.

Of course, canning companies, which are the most frequent users of this method, do not depend on this method alone to determine proper harvesting time. After a certain sum has been reached during a season, field inspections are greatly increased; the decision to harvest is based on these inspections. As one canning company official stated, "The growing degree day method is a yardstick, not a micrometer."

Canning companies frequently use the GDD method for another practical purpose: to schedule plantings so that harvest does not occur within too brief a period and overload the canning facilities. Because temperatures for the growing period are unknown at planting time, schedules are based on GDD calculated from the normal or average temperature for the area. At least one canning company even uses this method to estimate root growth of corn for determining when to cease cultivation.

Within usually acceptable limits, a certain number of GDD can be allotted to various stages of growth and development for plants (as used by Baker et al., 1984), for example, or for insects. In other words, rate of development and rate of growth are closely tied to environmental conditions, particularly temperature. Indeed, the accumulation of degree days frequently is superior to number of calendar days as a measure of growing time. For example, we can all remember occasions when plant growth virtually ceased during low temperature periods only to resume when temperatures rose. The degree days that elapse during such low temperature periods are few in number, while the calendar days continue to increase. Consequently, the use of degree days to indicate the passage of "time" and to replace calendar days is now fairly common. Applied in this manner, degree days have been termed "thermal time."

An area of temperature application that has yet to be comparably exploited is insect development. Nevertheless, according to Lablans, et al. (1980), the influence of temperature is so important with respect to certain insect populations that it should be used in mathematical models as an essential variable that drives populations, a so-called forcing function. They also state that with "adequate food and tolerable humidity" the growth rate of insects is mainly a function of two things: temperature and the genetic constitution of the individual.

The application of degree days has been tested in entomological studies. Results indicate that insects do not follow a linear development or growth rate, an accepted part of degree day use. Rather, insect growth rates are better described by curvilinear equations (see, for example, studies by Berkett et al., 1976, and Tanigoshi et al., 1975a and 1975b). Inspection of several studies, however, indicates no great loss of accuracy if a linear equation is accepted instead of the curvilinear one. For example, Berkett et al. (1976) found in the regression of temperature against the rate of apple budmoth development that the nonlinear model resulted in $R^2 = 0.90$ compared to $R^2 = 0.82$ using a linear degree day model. The linearity of degree days in modeling insect development usually can be considered acceptable when it is understood that the application normally will be in the uncontrolled environment of the field and that the temperature data source may be several miles away. In other words, laboratory accuracy cannot be expected under field conditions.

The temperatures of greatest concern to entomologists often have been temperatures in the range marking the zone of essentially linear insect development. The determinations have been made under constant rather than varying temperatures as in the field. As a result, threshold or base temperatures have yet to be fully established under field conditions. Some can be cited directly or estimated from certain studies. The degree days are calculated and the $T_b$'s are used as previously described for plant GDD.

Baker et al. (1984) found that for the European corn borer the $T_b$ ranges from 37°F for first instar larvae to about 44°F for fifth instar larvae. These temperatures explain a commonly observed phenomenon: corn borer larvae are active during periods too cool for active corn growth, for which 50°F is the generally accepted base temperature.

In a study on developmental rates of the tufted apple budmoth, Berkett et al. (1976) found there was still a 1 percent development rate per day at the lowest temperature used in their study. From their temperature versus rate curve, the $T_b$ can be estimated as between 55-60°F, since at 60°F development from egg hatch to adult emergence requires about 100 days.

Extrapolating to zero the various developmental curves shown in a study on the McDaniel spider mite by Tanigoshi et al. (1975a), the estimated $T_b$ is about 40°F. This or a slightly lower temperature is probably the $T_b$ for the pear psylla also, since more than 100 days are required at 50°F for its development from egg to adult (Asquith et al., 1980).

Base temperatures suggested for the alfalfa weevil and grasshopper are 48° and 50°F, respectively (Ruesink, 1981). With these base temperatures Ruesink found that the best spray date for the weevil occurred in Illinois after about 450 GDD had accumulated and that nearly 25 percent of the grasshopper hatch occurred by 500 GDD. For the northern corn rootworm the $T_b$ is approximately 44°F. The egg hatch begins in Illinois at about 800 GDD, peak larval feeding begins at 1350 GDD, and adult emergence commences at about 1850 GDD (Ruesink, 1981).

For some other insects, notably the black cutworm, the green cloverworm, and the bean leaf beetle, GDD are accumulated following an observed initial event. Following that event, GDD are then summed with the $T_b$ equal to 50°F for each of the three insects. The initial event for the black cutworm and green cloverworm is the moth flight, whereas for the bean leaf beetle it is the time of planting (Ruesink, 1981).

Despite concern over the proper base temperature, predictions of various developmental stages for a number of economically important insects can be made using a general base of 50°F. This temperature probably is a close approximation of the correct $T_b$ for many insects as well as for a number of host plants. In addition, degree days do not accumulate fast at low temperatures. Table 7 is composed of a number of events for which the indicated degree day totals with a $T_b$ = 50°F have given acceptable results in Michigan.

In general, adult mosquitoes do not actively breed when the monthly mean temperature is less than 60-65°F. They seem to be best suited to monthly mean temperatures in the range of 70-77°F (Landsberg, 1969). Of course, adequate moisture is a necessity, and low wind speeds are also a favored condition.

A 1970 study by Trpis and Shemanchuk indicated that a more precise $T_b$ for a mosquito common to Minnesota (*Aedes vexans*) was 47°F. Under laboratory conditions 120 GDD were required for development from egg hatch to pupation and an additional 58 GDD were required to reach the adult stage. Krafsur et al. (1985) found the face fly of cattle (*Musca autumnalis* De Geer, Duptera: Muscidae) to have a $T_b$ of 54°F and that 126 degree days were required for the laying of the first spring eggs.

Table 7. Total GDD ($T_b$ = 50°F) required for the indicated stage or event under Michigan environmental conditions (after Gage and Smitley, 1985).

| Total GDD | Pest | Host | Stage/Event |
|---|---|---|---|
| | VEGETABLES | | |
| 569-834 | European corn borer | Corn | First larvae |
| 1527-1700 | European corn borer | Pepper, tomato | First egg masses |
| | FIELD CROPS | | |
| 569-834 | European corn borer | Corn | First larvae |
| 1059-1266 | Western corn rootworm | Corn | First adults |
| | FRUIT | | |
| 14-43 | Pear psylla | Pears | First eggs |
| 22-70 | Tentiform leafminer | Apples | First adults |
| 25-78 | Redbanded leafroller | Apples | First adults |
| 73-177 | Oriental fruit moth | Stone fruits | First adults |
| 142-183 | Obliquebanded leafroller | Apples | First larvea |
| 201-340 | Codling moth | Apples | First adults |
| 223-326 | White apple leafhopper | Apples | First nymphs |
| 356-480 | Lesser peachtree borer | Peaches | First adults |
| 460-662 | Cherry fruit fly | Cherries | First adults |
| | ORNAMENTALS | | |
| 142-183 | Obliquebanded leafroller | Many | First larvae |
| 167-228 | Redbanded leafroller | Many | First larvae |

A mean daily temperature of 70°F also can be taken as the threshold temperature of summer days, and the accumulation of degree days above 70°F can be considered a measure of what might be termed the "intensity of summer".

Some typical values of $T_b$ and total GDD calculated from planting to maturity or harvest are shown in Table 8. Often the GDD values established for crops or insects within one state or region are not acceptable elsewhere. The major factor limiting the application of GDD to crops apparently is day length. Weather, soil fertility, and varietal differences also may play a part (Katz, 1952). Thus errors made with an east to west transfer of the GDD totals are not as serious as with a north to south transfer, which introduces the day length factor. Experience is the best method for determining whether a given set of GDD values is suitable for a particular area. GDD do not work well with soybeans because their development is much more closely tied to day length than is the development of crops like corn.

Table 8. Values frequently assigned to base temperature ($T_b$) and total GDD required to reach maturity for selected crops or indicated stage for insect development.

| Crop | $T_b$ (°F) | Total GDD, planting to harvesting |
|---|---|---|
| | CROPS | |
| Peppers, chili | 60 | ------------- |
| Corn, field | 50-55 | 2200-2600 ($T_b$ = 50°F) |
| Corn, sweet | 49-50 | 1750-2000 ($T_b$ = 40°F) |
| Soybeans | 50-55 | 2000-2400 ($T_b$ = 50°F) |
| Tomatoes | 50-53 | ------------- |
| Beans, lima | 50-53 | ------------- |
| Snapbeans | 50 | ------------- |
| Barley | 40-43 | 2000-2400 ($T_b$ = 40°F) |
| Flax | 40 | 1900-2200 ($T_b$ = 40°F) |
| Oats | 40-43 | 2100-2500 ($T_b$ = 40°F) |
| Wheat, spring | 40-43 (or 32) | 2000-2400 ($T_b$ = 40°F) |
| Asparagus | 40 | ------------- |
| Peas, canning | 40 | 1200-1800 ($T_b$ = 40°F) |
| Native vegetation | 32 | ------------- |
| | INSECTS | |
| Mosquito (adult activity) | 60-65 | ------------- |
| (larval development) | 47 | Egg hatch to adult stage 178 GDD |
| Stethorus punctum (mite predator) | 65 | ------------- |
| Tufted apple budmoth | 55-60 | ------------- |
| Face fly | 54 | First eggs 126 GDD |
| Grasshopper | 50 | Grasshopper hatch 500 GDD |
| Metaseivlus occidentalis (mite) | 50 | ------------- |
| Alfalfa weevil | 48 | Suggested alfalfa weevil application 450 GDD |
| Corn rootworm | 44 | Corn rootworm egg hatch 800 GDD |
| McDaniel spider mite | 40 | |
| European corn borer | 37 increasing to 44 | Instar 1 to instar 5 |

Threshold values other than those shown in Table 8 are sometimes used. For example, recent work seems to indicate that a temperature lower than the indicated 40°F may be more appropriate for spring wheat (Baker and Gallagher, 1983; Davidson and Campbell, 1983). Both investigations concluded that 32°F is a more correct base or threshold temperature. Note, however, that the total GDD accumulated will not vary greatly from the figures shown in Table 8 with a base temperature of either 32° or 40°F.

Although GDD are a very useful and practical guide, they are not a research tool. It is questionable whether seeking improvement in this method deserves further effort. As Went (1957) stated, it is amazing that this method works as well as it does, since growth is not a straight line function with temperature as the formula indicates. Admittedly, this method is a tempting one; knowing only the base and maximum and minimum temperatures, any stage of plant development supposedly can be estimated.

In Minnesota, success in applying this method to plant development and growth is greatest when it is limited to the period from spring planting until early July because soil moisture normally remains adequate only through this period. After early July soil moisture reserves and precipitation ordinarily cannot meet the evapotranspiration demands of crops. So proportionally less energy is expended in evapotranspiration and more is available for heating the air and soil. The resulting high air temperatures, and the corresponding increase in GDD, seemingly indicate a proportional increase in plant growth. But, as experienced growers know, the high temperatures that develop often exceed the optimum levels and growth can even be retarded. To apply the method more satisfactorily a correction factor can be introduced to reduce the accumulated GDD to correspond more closely to actual growth and development during high temperature periods. If sufficient soil moisture is provided by precipitation or irrigation, however, the available energy is more uniformly divided between evapotranspiration and heating the air. In this case the expected relationship between the plant and temperature will continue to hold.

Total annual GDD were calculated using base temperatures of 32°F and five-degree increments from 40° to 70°F. Eight different base temperatures were chosen because of the wide variety of uses to which degree days can be applied. Of course, not all of them are related to agriculture. Table 8 shows that even for the relatively limited kinds of crops grown in Minnesota there is a wide range of base temperatures to be applied that extend from around 32°F for many native plants, and perhaps wheat, to 60°F for peppers. Insects run the gamut from 37° to 70°F. The accumulation of temperatures above the 65°F base is used for cooling degree days (CDD) and 70°F is used for certain mosquitoes and as a measure of summer days.

Annual total degree days for various $T_b$'s are listed in Appendix Table 2; in Appendix Table 3 the mean first and last date of occurrence of related temperatures are given along with duration between the dates.

The number of degree days that normally accumulate at 10-day intervals throughout a season are given in Appendix Tables 4-10. These tables permit a determination of the rate at which the degree days normally accumulate. They are especially useful in comparing a particular year with the tabled value to see if the season is in advance, behind, or equal to the normal season.

Detailed information with respect to four common and useful DD is provided in Appendix Table 3: GDD with base temperatures of 32°, 40°, and 50°F in addition to HDD (heating degree days) below 65°F. Information in this table includes the date when the average daily temperature first exceeds the indicated $T_b$ in the spring, the last date when the same base temperature normally occurs at the end of the season, the duration between these two dates, and the total degree days accumulated between the same dates for a normal season. Figures 30-31 illustrate the first date when the normal daily temperature reaches the base temperatures of 40° and 50°F.

A 40-year record of phenological observations compiled by Prof. A. C. Hodson (Hodson and Kuehnast, 1981) in the Minneapolis-St. Paul area showed a marked coincidence between elderberry bud opening and the blooming of soft maple, April 3 and 5, respectively, and the mean date of occurrence of a 40°F average temperature, April 5, as shown in Appendix Table 3. In the same record the apple tip green stage was found to average about April 23, coinciding with the first occurrence of a mean daily temperature of 50°F, April 22, at Minneapolis-St. Paul (Appendix Table 4). These events also can be tied closely elsewhere around the state to the accumulation of a set number of degree days from the nearest weather station.

A remarkable feature in terms of the warming of the state is evident from comparing Figure 28 with Figures 30 and 31. A great many more calendar days are required for all of the state to reach a mean daily temperature of 50°F than is required to reach either 32° or 40°F. Table 9 summarizes the differences between the four corners of the state. That the greatest interval exists between the southeast and northeast corners can be attributed to the effect of Lake Superior. That the temperature intervals (32° to 40° and 40° to 50°) are not equal is a minor factor.

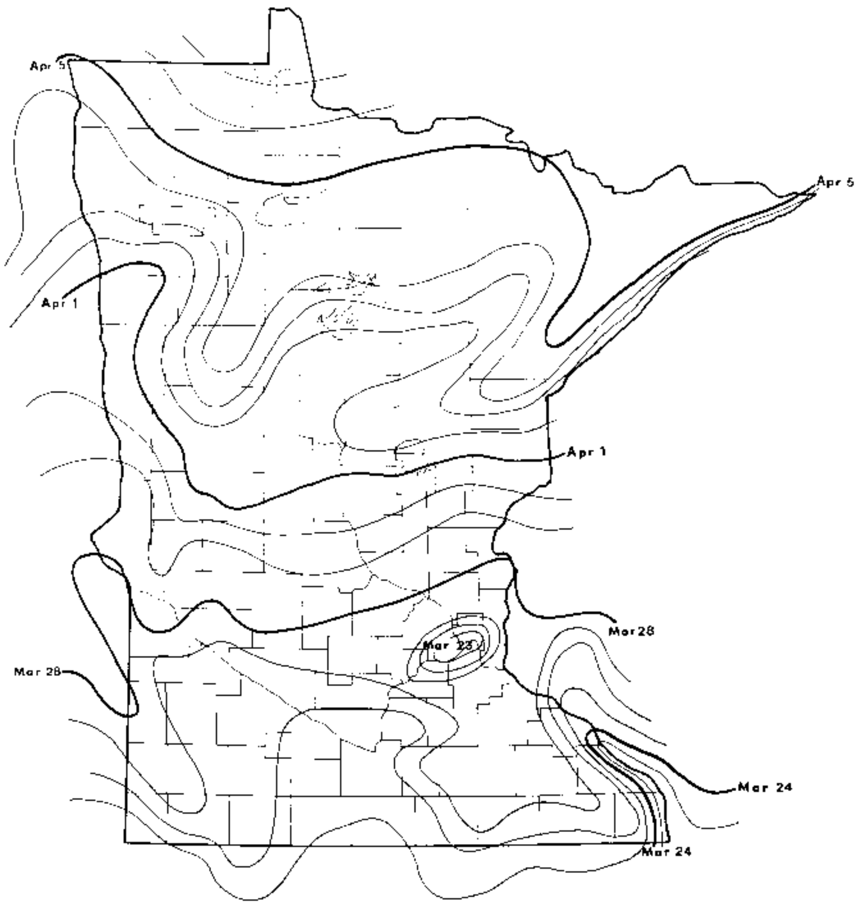


Figure 28.

Date of the first 32°F normal daily temperature.

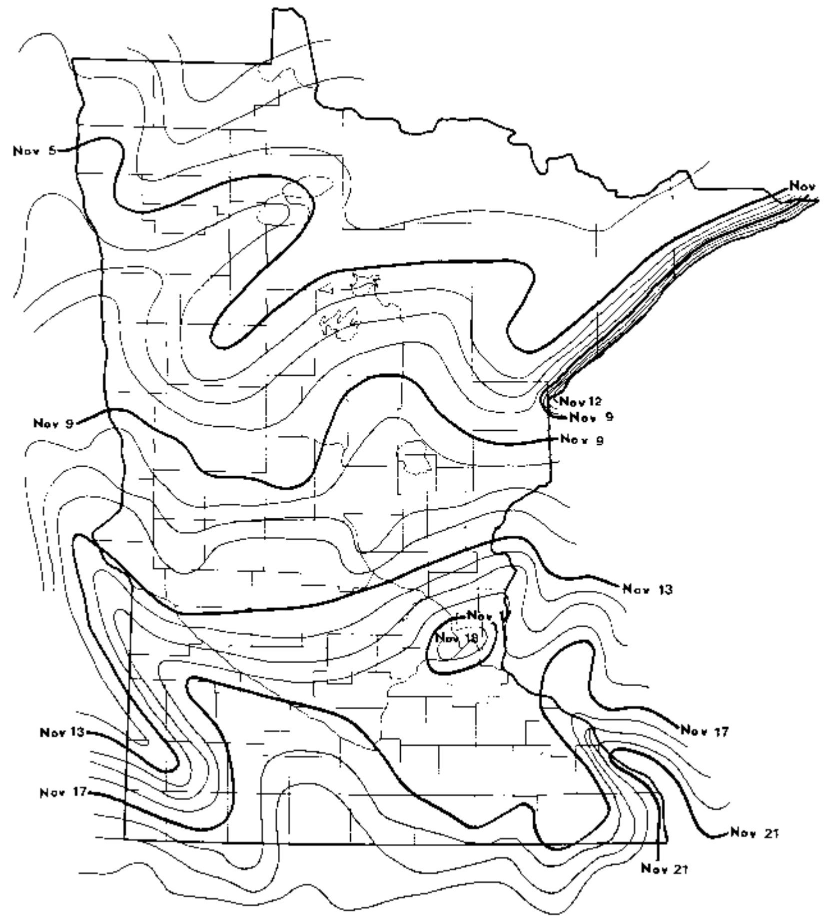


Figure 29.

Date of the last 32°F normal daily temperature.

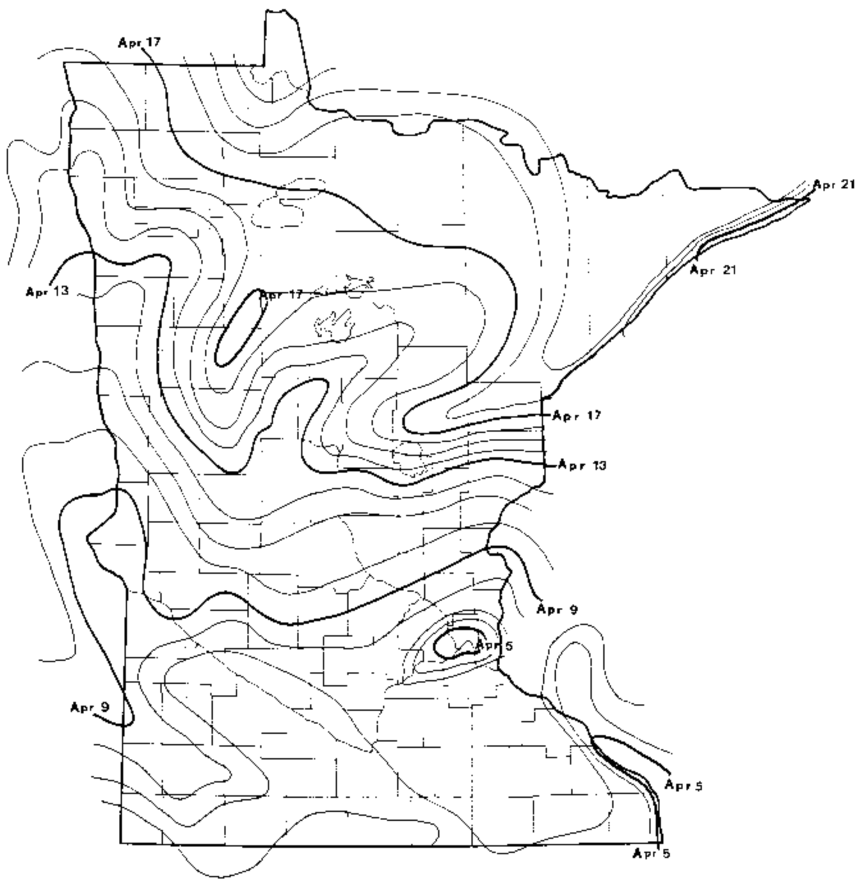


Figure 30.

Date of the first 40°F normal daily temperature.

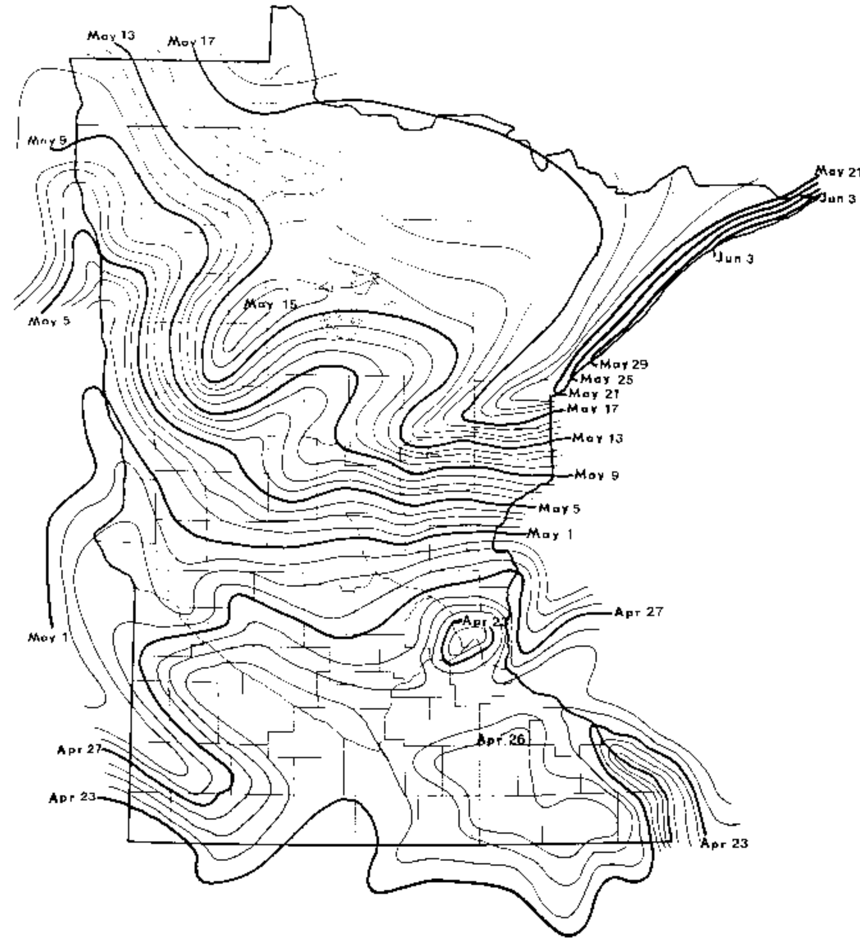


Figure 31.

Date of the first 50°F normal daily temperature.

Table 9. Interval in calendar days required for a mean daily temperature of 32°, 40°, and 50°F to be reached across the state.

| Corner of State | Interval 32°F | 40°F | 50°F |
|---|---|---|---|
| From the southeast to the northwest corner | 12 | 11 | 20 |
| From the southeast to the northeast corner | 11 | 16 | 44 |
| From the southwest to the northwest corner | 11 | 10 | 17 |
| From the southwest to the northeast corner | 10 | 15 | 41 |

As evident from Table 9, the rate of temperature increase once 40°F is reached differs dramatically between the northeastern and southern parts of the state.

The next set of maps (Figures 32-39) have been drawn to show the distribution of the various degree day annual totals across the state. Each of the maps shows the now familiar configuration of the isolines (lines of equal value): distortions of the isolines created by Lake Superior, the urban effect of the Twin Cities, the Mississippi valley in southeastern Minnesota, and the topographic effect of the three major uplands in the southwestern, northwest-west central, and northeastern parts of the state.

Profiles of the annual total number of GDD, $T_b$ = 50°F, from the Iowa border northward across western and eastern Minnesota are illustrated in Figures 40 and 41. The major difference between the two figures is the sharper and more continuous GDD decrease that begins in eastern Minnesota a short distance north of the Twin Cities. In the second 100 miles north of the Iowa border the contrast between the western and eastern transects of the state becomes great. In the east between St. Paul and Moose Lake the GDD decrease from 2400 to 1530. In western Minnesota over the same distance and latitude, from 10 miles south of Willmar to Wadena, the GDD decrease from 2240 to 1880. This is a difference of only 360 GDD per 100 miles compared to a 870 GDD decrease along the eastern transect. By the time Cloquet is reached, there are only about 1400 GDD that will have accumulated by the end of a normal season, hardly enough for even the production of fodder corn.

Melting Degree Days. The summation of temperatures above 32°F has application in both the biological and physical realms. As noted earlier, 32°F has been suggested as the base temperature for spring wheat, and it may be an acceptable base temperature for the initiation of growth of some native vegetation. When applied to the physical realm these degree days are often termed melting degree days (MDD) or thawing degree days (TDD) and are used in various formulations to estimate the thawing rate of the snow pack or of the soil. The first and last dates and the duration of melting degree days are shown in Figures 28-29 and Appendix Table 3. Totals for selected dates during a normal season are listed in Table 14.

Cooling Degree Days. The purely physical applications for which degree days have been used are related to energy consumption and freezing rates. In many parts of the United States a good correlation exists between the energy consumed in cooling homes and buildings and cumulative degree days. Cooling degree days (CDD) were developed for this application. They are defined as:

$$CDD = \Sigma (\bar{T} - T_b)$$

The calculation is the same as with GDD. The base temperature ($T_b$) usually assigned is 65°F because it is when air temperature averages just above 65°F that electrical energy begins to be consumed for air conditioning. Normal total values at regular intervals during the year are listed in Appendix Table 9 and total annual distribution is shown in Figure 38.

Heating Degree Days. Another use of degree days, one that has been used by utility and power companies, is heating degree days (HDD). The calculation is:

$$HDD = \Sigma (T_b - \bar{T})$$

Here $T_b$ usually is assigned the value of 65°F. Only positive values are summed, and the HDD season begins July 1 rather than January 1. Totals at periodic intervals are listed in Appendix Table 11 and annual totals are illustrated in Figure 42.

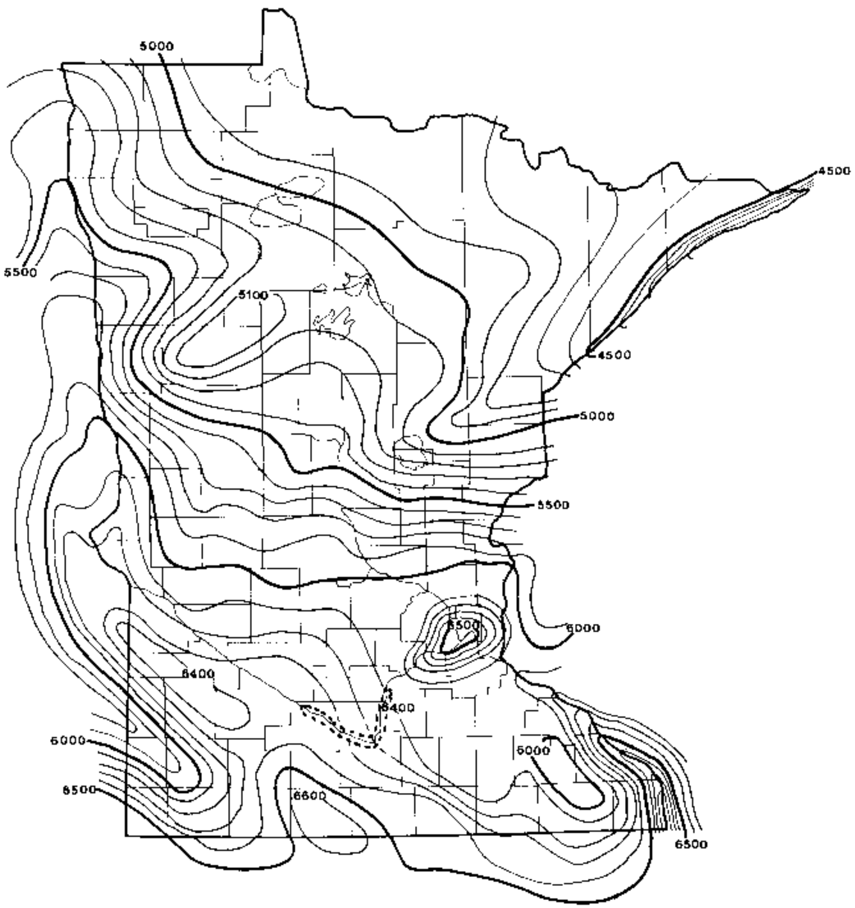


Figure 32.

Normal total annual melting (growing) degree days, $T_b$ = 32°F, corrected to an 8 a.m. observation.

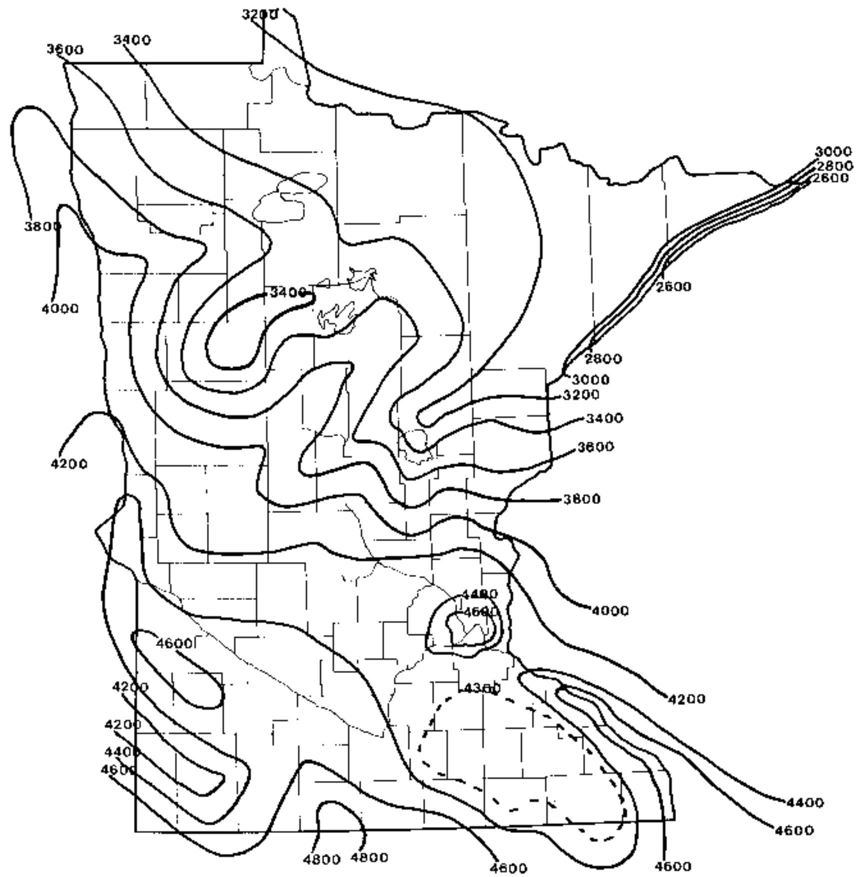


Figure 33.

Normal total annual growing degree days, $T_b$ = 40°F, corrected to an 8 a.m. observation.

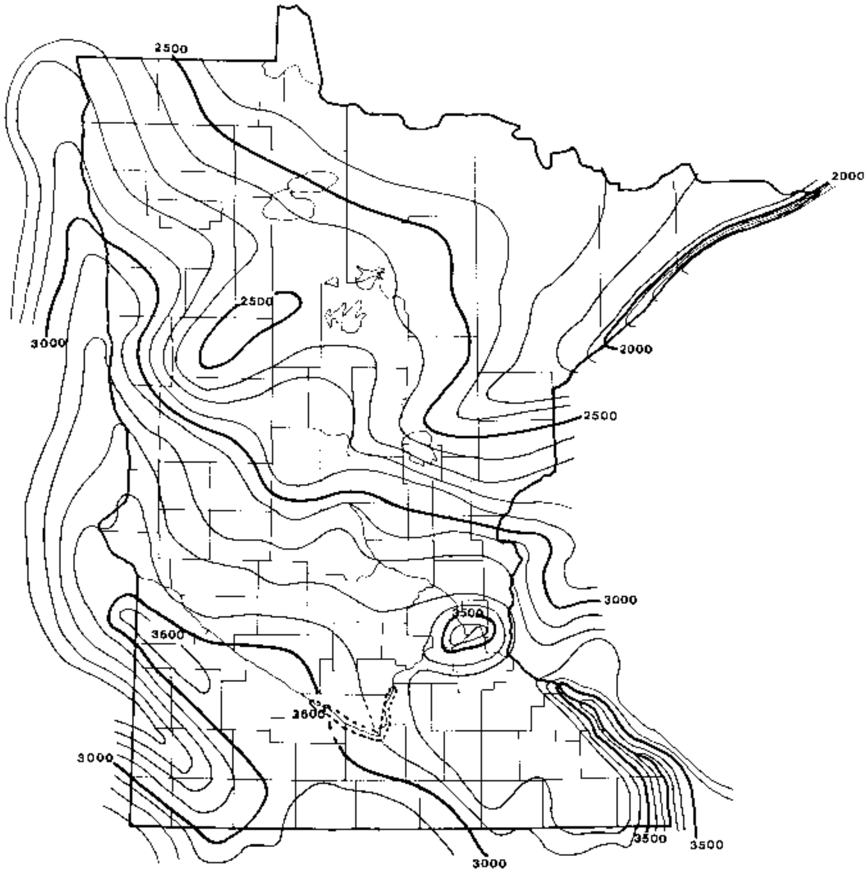


Figure 34.

Normal total annual growing degree days, $T_b$ = 45°F, corrected to an 8 a.m. observation.

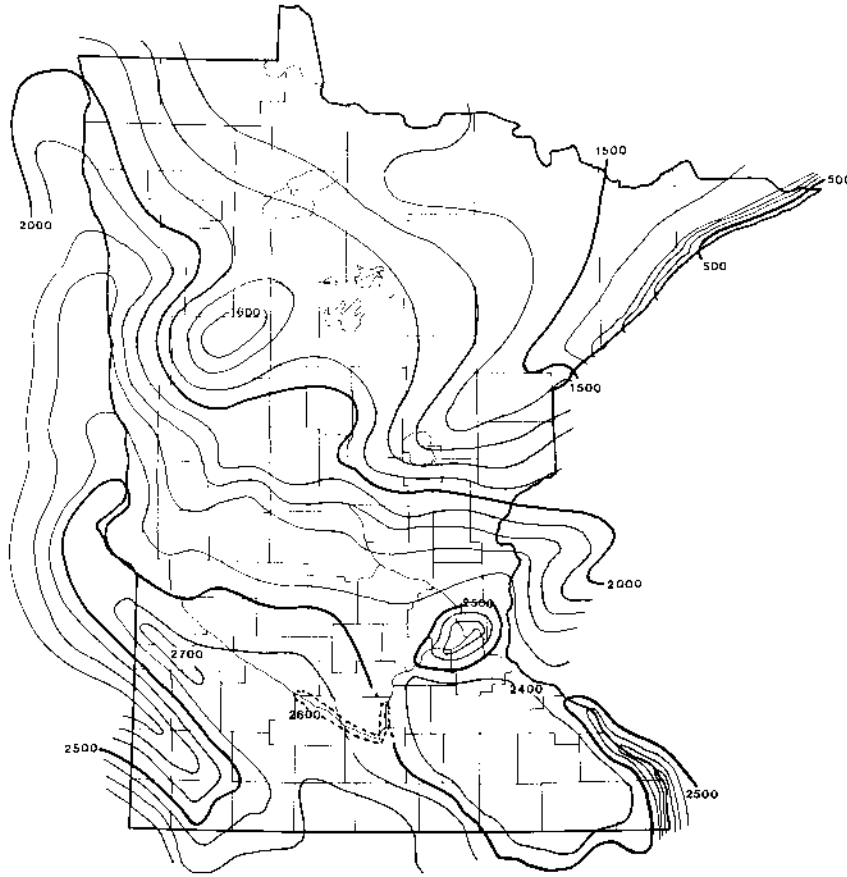


Figure 35.

Normal total annual growing degree days, $T_b$ = 50°F, corrected to an 8 a.m. observation.

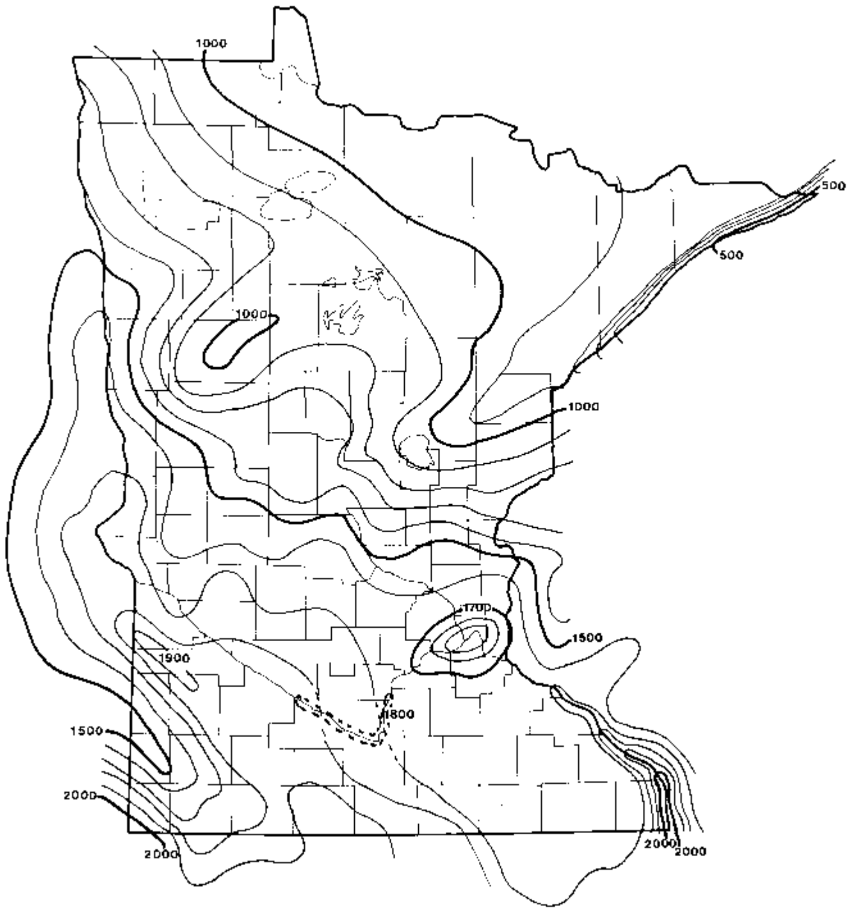


Figure 36.

Normal total annual growing degree days, $T_b = 55°F$, corrected to an 8 a.m. observation.

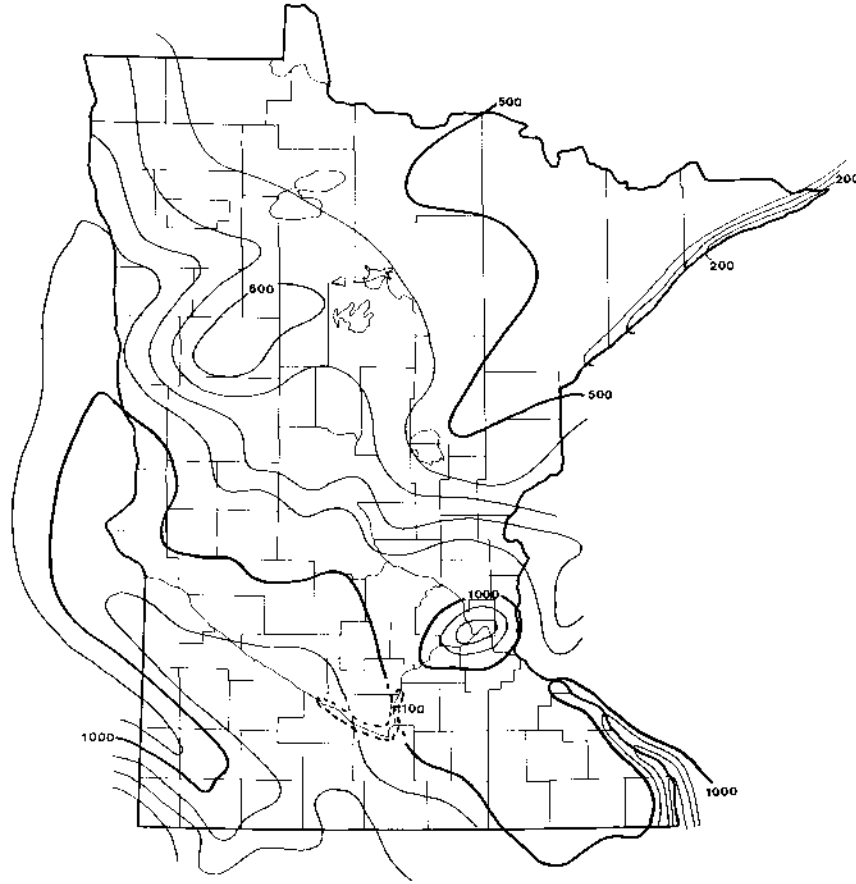


Figure 37.

Normal total annual growing degree days, $T_b = 60°F$, corrected to an 8 a.m. observation.

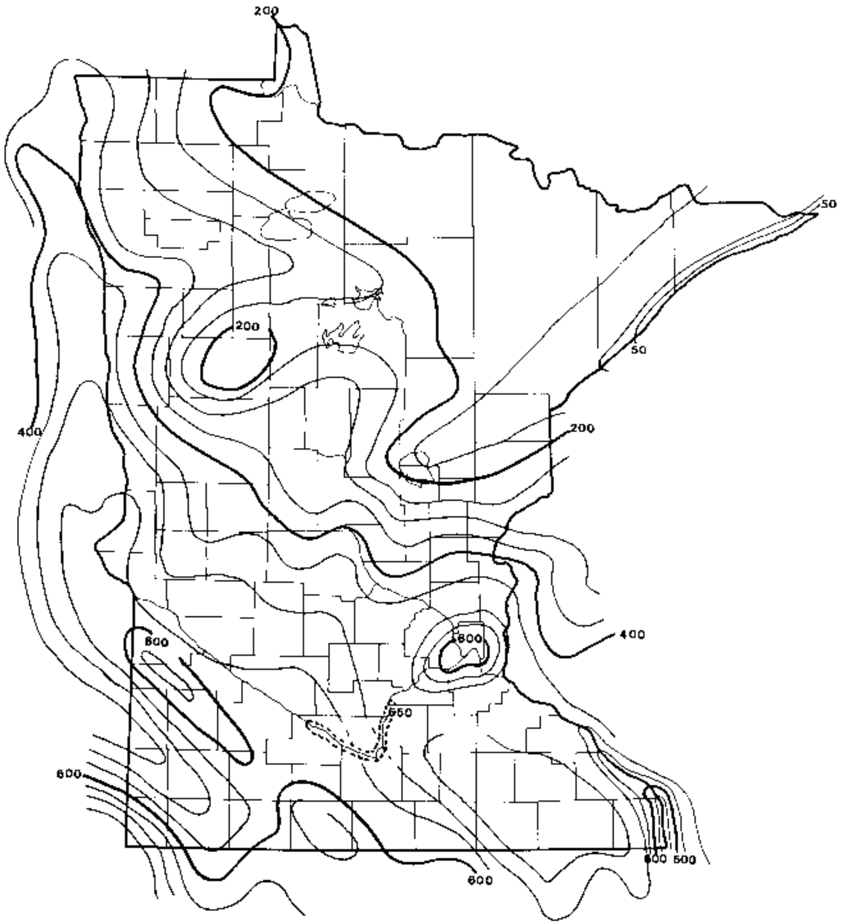


Figure 38.

Normal total annual cooling (growing) degree days, $T_b = 65°F$, corrected to an 8 a.m.

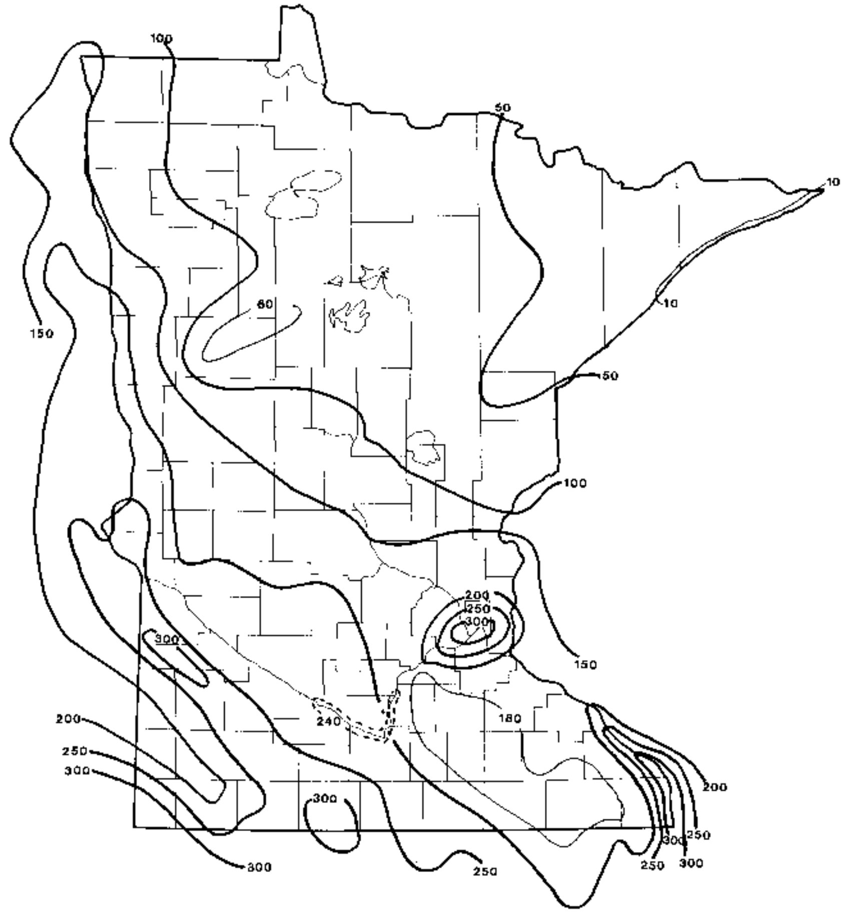


Figure 39.

Normal total annual growing degree days, $T_b = 70°F$, corrected to an 8 a.m. observation.

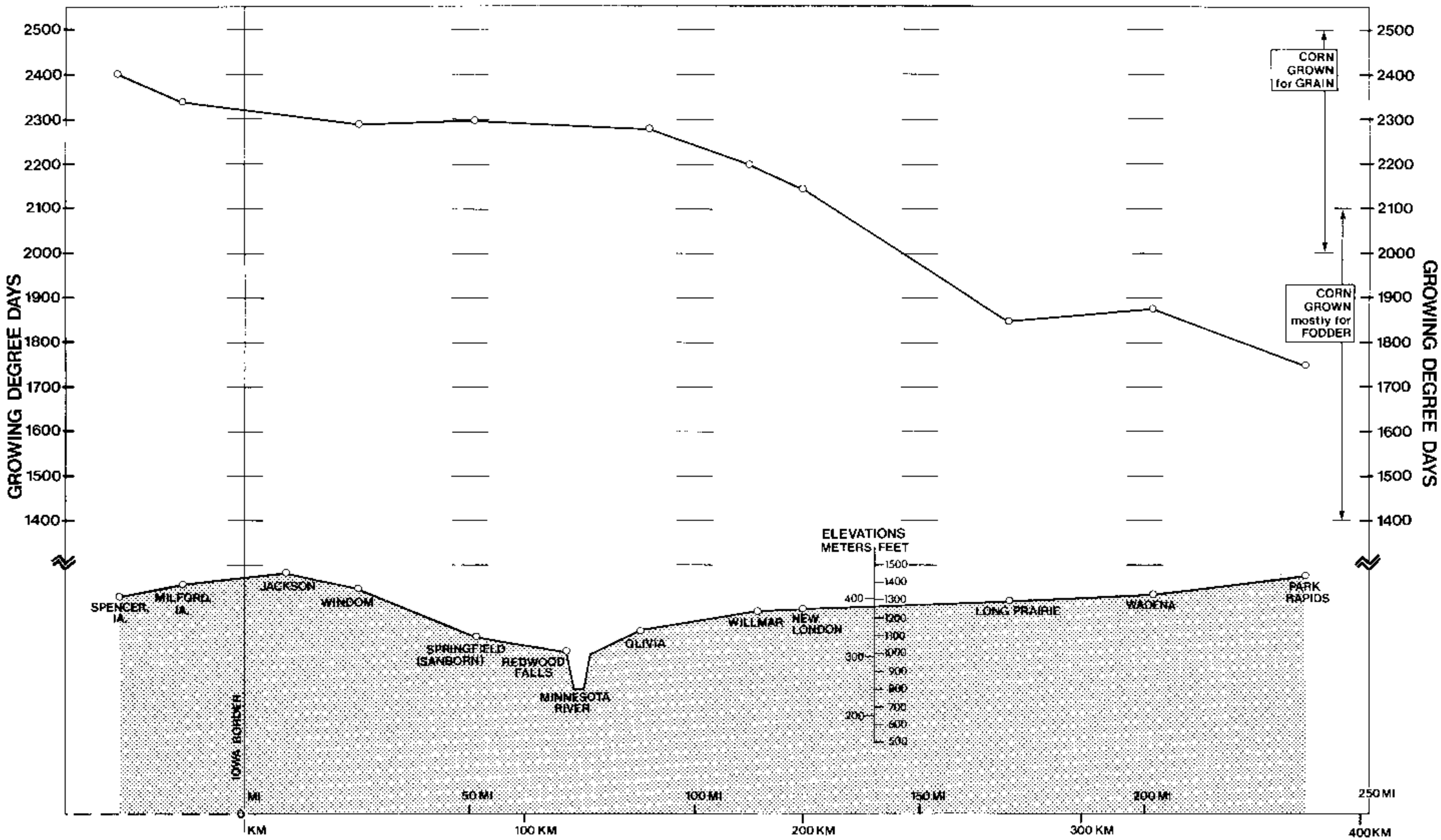


Figure 40.

A south to north profile of growing degree days, $T_b$ = 50°F, across western Minnesota.

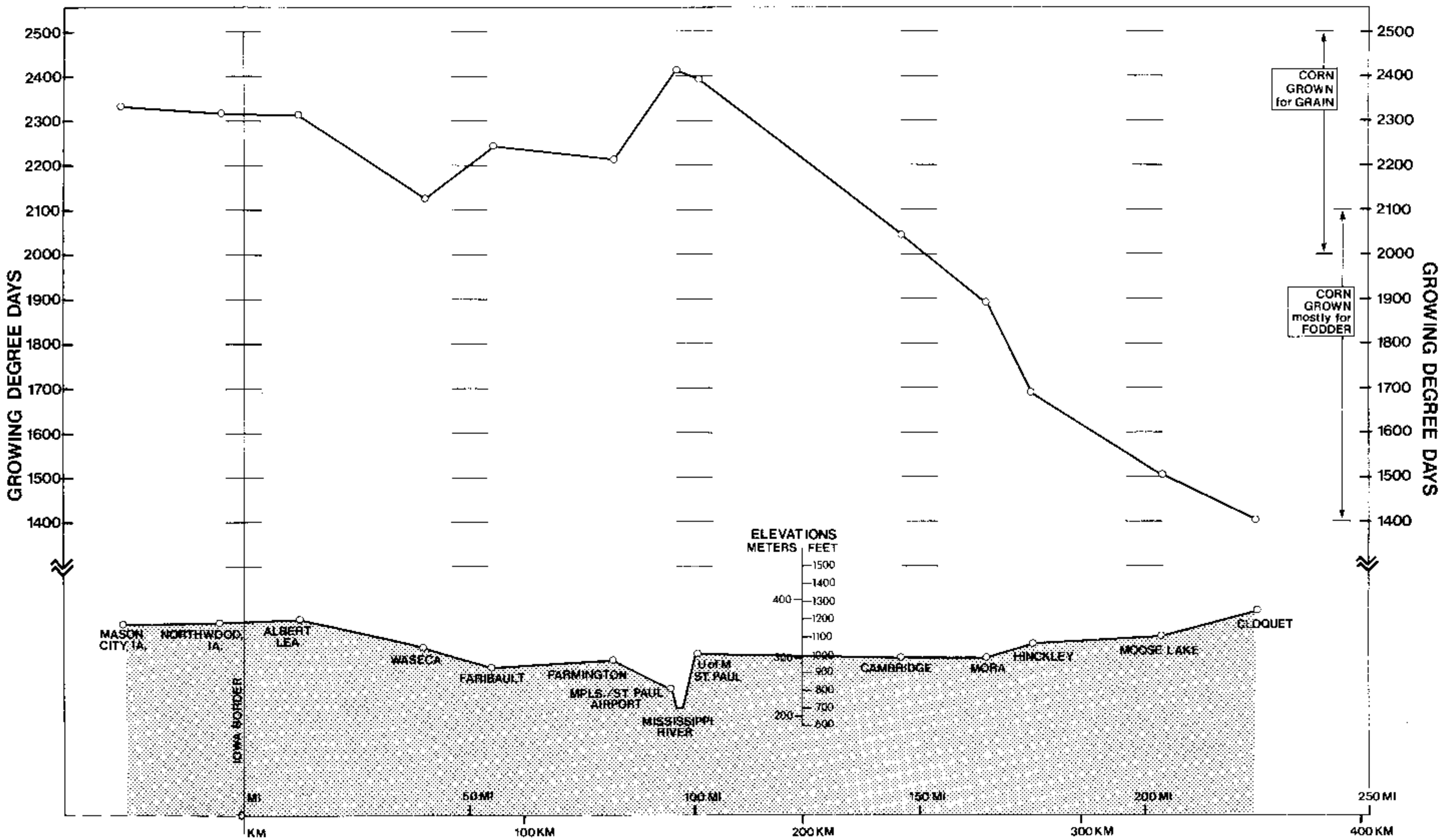


Figure 41.

A south to north profile of growing degree days, $T_b$ = 50°F, across eastern Minnesota.

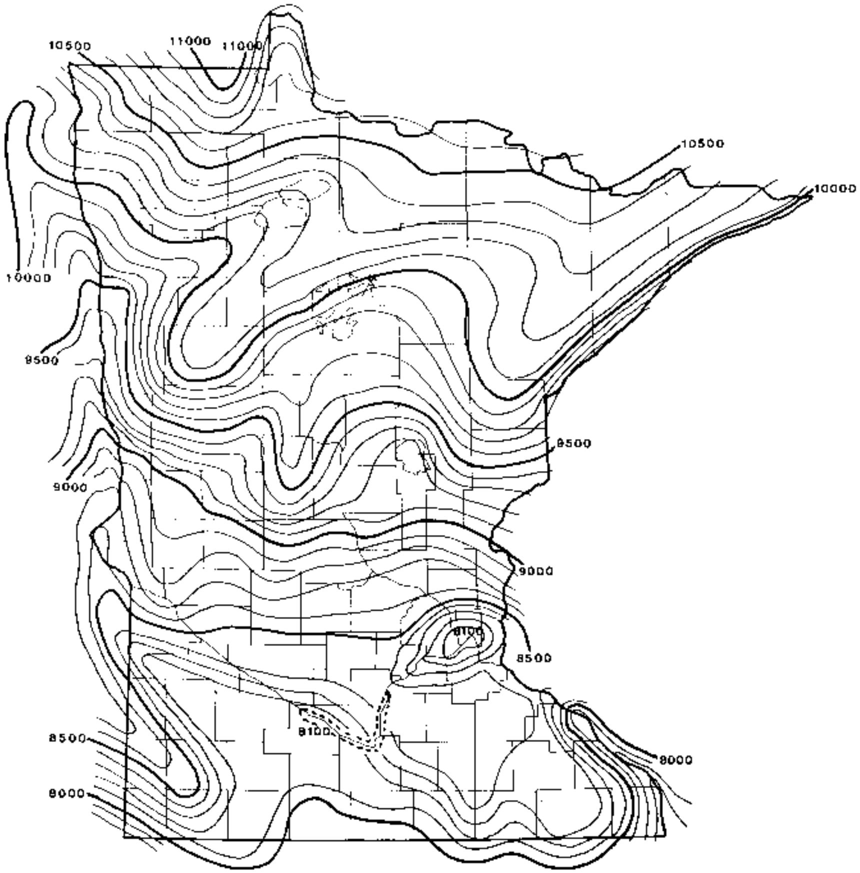


Figure 42.

Normal total annual heating degree days, $T_b$ = 65°F, corrected to a midnight observation.

The American Gas Association found that residential gas consumption varies directly with the number of HDD calculated using 65°F as the base temperature (American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc., 1962). Use of this temperature was further substantiated in a National District Heating Association study that examined steam heated buildings served by district heating companies. Where interior temperatures are not so critical, such as in industrial plants, a lower base temperature, usually 5°F lower than the desired inside temperature, is suggested.

In windy localities the correlation between fuel consumed and HDD is reduced because heat is removed more rapidly in the presence of air movement. For this reason HDD are more effective in predicting fuel consumption in the eastern part of Minnesota than in the western part, which generally has greater winds.

Freezing Degree Days. A final application to the physical realm is the use of freezing degree days (FDD), which are defined as:

$$FDD = \Sigma (T_b - \bar{T}).$$

With $T_b$ set at 32°F this measure obviously is the accumulation of temperatures below freezing (Appendix Table 12). Distribution of total annual values are shown in Figure 43. FDD have been used to predict the depth of soil freezing and lake ice (Lunardini, 1981). Because snow is such an effective insulator, FDD are effective predictors only when snow is shallow or where snow has been removed, as on highways, airport runways, and parking lots.

Freezing degree days also can be applied to the freezing rate of water bodies, a matter of some concern with respect to aquatic wildlife. The widgeon, shoveler, gadwall, and mallard ducks are particularly affected by an ice cover because they are dependent on shallow water bodies as an important food source. An early ice cover hastens their migration (Joselyn, 1985; Kitts, 1985).

The prediction of an ice cover of water bodies obviously is difficult due to the great variation that exists in terms of the exposure, areal extent, and depth of a lake. A meteorological factor adding further complexity is the wind speed associated with cold air outbreaks. An increase in water depth (greater heat reservoir) and an increase in wind speed (wave action) delay the occurrence of an ice cover. If, however, a limit is placed on the water depth, the effect of a major variable is reduced and a reasonable estimation of the first date of complete ice cover can be made.

A 15-year record from Lake Judy (also known as Mud Lake) (Kuehnast, 1985), a 16-acre lake no more than 4 feet deep located in Shoreview, Ramsey County, is the source of the basic data on which an estimation can be made. When compared to FDD over the same 15-year period, it was found that on the average a total of 15 FDD had accumulated by the time the complete ice cover was reached. Next the mean date when 15 FDD occurred at each of the stations used in this study was found and plotted on the map. Then isolines of the mean date of 15 FDD were drawn. The result is Figure 44. It is important to recognize that these dates do not necessarily represent the dates of continuous ice cover. Continuous cover often occurs sometime later. Figure 44 represents the estimated date at which small water bodies 4 feet or less in depth can be expected to have a complete ice cover. The map is based on a limited data set, but it is satisfactory as a first approximation for such an ill-defined event.

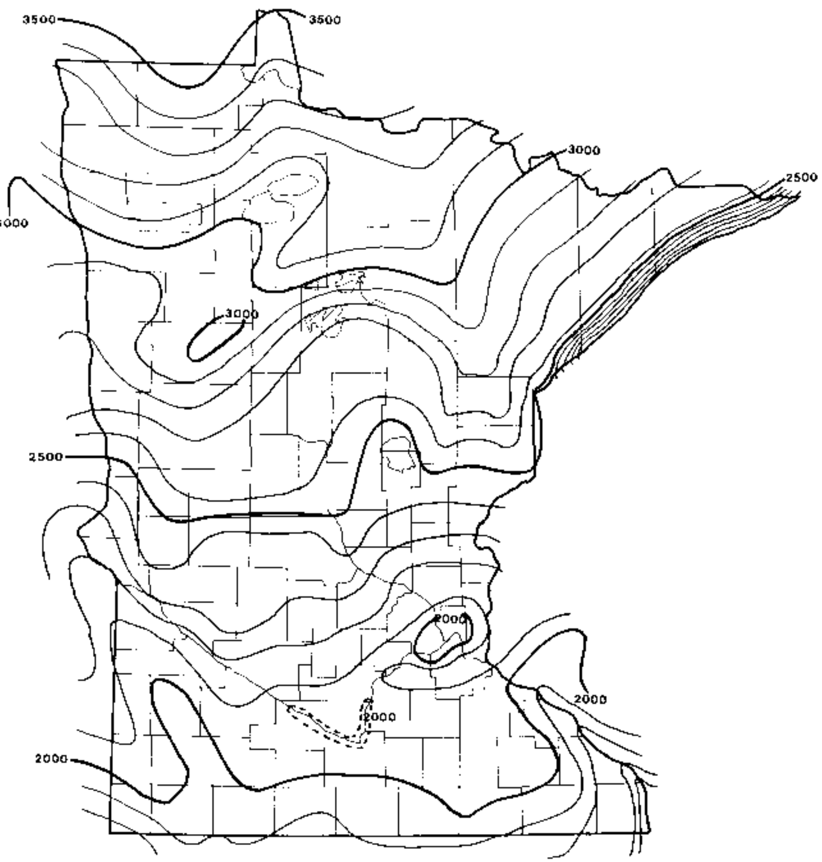


Figure 43.

Normal total annual freezing degree days, $T_b$ = 32°F, corrected to an 8 a.m. observation.

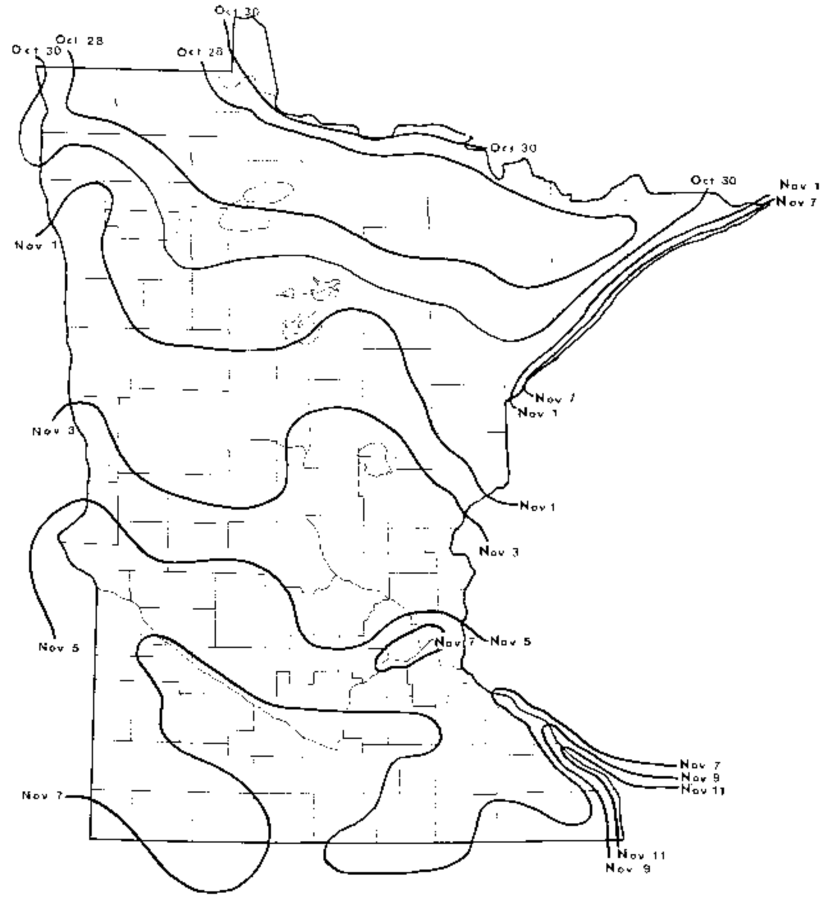


Figure 44.

Normal date for the occurrence of an ice cover on small bodies of water (no more than four feet deep).

Appendix Table 1. Normal monthly, annual, and seasonal temperatures, °F, adjusted to an 8 a.m. observation time, 1951-1980, Minnesota.

| STATION NAME | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN | SPR | SUM | FAL | WIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADA | MAX | 12.1 | 19.8 | 33.4 | 51.9 | 68.0 | 76.3 | 82.6 | 81.1 | 70.3 | 58.1 | 37.3 | 21.7 | 51.1 | 51.1 | 80.0 | 55.2 | 17.9 |
| | MIN | -8.6 | -1.4 | 12.3 | 30.6 | 41.9 | 52.6 | 57.6 | 55.5 | 45.5 | 34.7 | 18.4 | 2.7 | 28.5 | 28.2 | 55.2 | 32.9 | -2.4 |
| | AVE | 1.8 | 9.2 | 22.8 | 41.3 | 55.0 | 64.4 | 70.0 | 68.3 | 58.0 | 46.4 | 27.9 | 12.2 | 39.8 | 39.7 | 67.6 | 44.1 | 7.7 |
| ALBERT LEA | MAX | 19.7 | 26.0 | 36.1 | 53.9 | 68.5 | 78.2 | 82.6 | 80.3 | 71.5 | 60.2 | 42.1 | 27.1 | 53.9 | 52.8 | 80.4 | 57.9 | 24.3 |
| | MIN | 1.3 | 7.2 | 18.9 | 35.3 | 47.1 | 57.4 | 62.2 | 59.6 | 49.8 | 38.7 | 24.0 | 10.6 | 34.3 | 33.8 | 59.7 | 37.5 | 6.3 |
| | AVE | 10.5 | 16.6 | 27.5 | 44.7 | 57.8 | 67.8 | 72.5 | 70.0 | 60.8 | 49.5 | 33.0 | 19.0 | 44.1 | 43.3 | 70.1 | 47.8 | 15.4 |
| ALEXANDRIA FAA AP | MAX | 14.5 | 21.8 | 32.9 | 50.4 | 66.1 | 75.1 | 81.6 | 79.0 | 68.8 | 57.1 | 37.4 | 22.7 | 50.6 | 49.8 | 78.6 | 54.4 | 19.7 |
| | MIN | -5.8 | .8 | 13.3 | 32.2 | 44.8 | 54.9 | 60.3 | 58.2 | 48.0 | 36.8 | 20.7 | 5.4 | 30.8 | 30.1 | 57.8 | 35.1 | .1 |
| | AVE | 4.4 | 11.2 | 23.1 | 41.2 | 55.4 | 65.1 | 70.9 | 68.7 | 58.5 | 46.9 | 29.0 | 14.1 | 40.7 | 39.9 | 68.2 | 44.8 | 9.9 |
| ARGYLE 4 E | MAX | 9.8 | 17.1 | 30.0 | 49.7 | 67.0 | 75.8 | 81.2 | 80.0 | 68.3 | 56.1 | 34.6 | 18.8 | 49.0 | 48.9 | 79.0 | 53.0 | 15.3 |
| | MIN | -11.1 | -5.2 | 9.7 | 29.4 | 40.7 | 50.9 | 54.9 | 52.8 | 43.5 | 33.3 | 17.0 | .0 | 26.3 | 26.6 | 52.9 | 31.3 | -5.4 |
| | AVE | -.6 | 5.9 | 19.8 | 39.5 | 53.8 | 63.3 | 68.1 | 66.3 | 55.9 | 44.7 | 25.8 | 9.2 | 37.7 | 37.7 | 65.9 | 42.1 | 4.8 |
| ARTICHOKE LAKE | MAX | 16.5 | 23.0 | 34.5 | 52.5 | 67.7 | 77.1 | 83.5 | 81.2 | 71.6 | 59.7 | 40.1 | 25.0 | 52.7 | 51.6 | 80.6 | 57.1 | 21.5 |
| | MIN | -4.4 | 2.2 | 14.7 | 32.7 | 45.1 | 55.4 | 60.2 | 57.8 | 47.6 | 36.5 | 20.5 | 6.4 | 31.2 | 30.8 | 57.8 | 34.9 | 1.4 |
| | AVE | 6.1 | 12.6 | 24.7 | 42.6 | 56.4 | 66.1 | 71.8 | 69.5 | 59.6 | 48.1 | 30.3 | 15.7 | 42.0 | 41.2 | 69.2 | 46.0 | 11.4 |
| AUSTIN 3 S | MAX | 19.3 | 25.3 | 36.6 | 54.2 | 68.1 | 77.5 | 81.9 | 79.6 | 71.7 | 60.4 | 42.2 | 27.1 | 53.6 | 53.0 | 79.7 | 58.1 | 23.9 |
| | MIN | -1.0 | 5.3 | 17.5 | 33.7 | 44.9 | 54.8 | 59.1 | 56.5 | 47.1 | 34.6 | 22.4 | 9.7 | 32.0 | 32.0 | 56.8 | 34.7 | 4.7 |
| | AVE | 9.1 | 15.3 | 27.1 | 44.1 | 56.5 | 66.1 | 70.5 | 68.0 | 59.5 | 48.5 | 32.3 | 18.4 | 42.9 | 42.6 | 68.2 | 46.8 | 14.3 |
| BABBITT 2 SE | MAX | 12.4 | 18.4 | 31.6 | 46.6 | 62.1 | 70.8 | 75.7 | 72.7 | 61.9 | 51.5 | 33.2 | 19.5 | 46.4 | 46.7 | 73.1 | 48.9 | 17.1 |
| | MIN | -6.7 | -1.2 | 11.1 | 28.2 | 40.1 | 50.2 | 55.5 | 53.3 | 44.3 | 34.4 | 18.4 | 2.8 | 27.5 | 26.5 | 53.0 | 32.4 | -1.7 |
| | AVE | 2.9 | 8.1 | 21.4 | 37.4 | 51.0 | 60.5 | 65.6 | 63.0 | 53.1 | 43.0 | 25.8 | 11.2 | 37.0 | 36.6 | 63.0 | 40.6 | 7.7 |
| BAUDETTE | MAX | 10.4 | 18.0 | 31.3 | 47.8 | 62.9 | 72.3 | 77.6 | 74.9 | 64.3 | 52.9 | 34.0 | 19.0 | 47.1 | 47.3 | 74.9 | 50.4 | 15.8 |
| | MIN | -13.7 | -8.5 | 5.5 | 26.5 | 39.1 | 49.5 | 54.8 | 52.1 | 42.5 | 33.2 | 16.7 | -1.9 | 24.7 | 23.7 | 52.1 | 30.8 | -8.0 |
| | AVE | -1.6 | 4.8 | 18.4 | 37.2 | 51.1 | 60.9 | 66.2 | 63.5 | 53.5 | 43.1 | 25.3 | 8.6 | 35.9 | 35.6 | 63.5 | 40.6 | 3.9 |
| BEMIDJI AP | MAX | 12.3 | 20.7 | 32.1 | 48.7 | 64.5 | 73.6 | 79.6 | 76.7 | 65.9 | 54.7 | 34.8 | 20.1 | 48.6 | 48.4 | 76.7 | 51.8 | 17.7 |
| | MIN | -11.1 | -5.1 | 8.0 | 28.1 | 40.1 | 50.9 | 56.2 | 53.6 | 44.0 | 33.6 | 17.1 | -.1 | 26.3 | 25.4 | 53.5 | 31.6 | -5.4 |
| | AVE | .7 | 7.8 | 20.1 | 38.4 | 52.3 | 62.3 | 67.9 | 65.2 | 55.0 | 44.1 | 26.0 | 10.0 | 37.5 | 36.9 | 65.1 | 41.7 | 6.2 |
| BENSON | AVE | 6.4 | 13.3 | 25.7 | 43.3 | 56.9 | 66.7 | 72.0 | 69.7 | 59.5 | 48.0 | 30.6 | 16.2 | 42.4 | 42.0 | 69.5 | 46.0 | 11.9 |
| BIG FALLS | MAX | 12.7 | 21.2 | 34.4 | 50.0 | 64.7 | 73.8 | 78.9 | 76.0 | 65.2 | 54.2 | 34.8 | 20.4 | 48.9 | 49.7 | 76.3 | 51.4 | 18.1 |
| | MIN | -12.5 | -6.4 | 7.3 | 26.4 | 37.7 | 47.9 | 52.9 | 50.5 | 41.1 | 32.0 | 15.9 | -1.1 | 24.3 | 23.8 | 50.4 | 29.7 | -6.6 |
| | AVE | .1 | 7.4 | 20.9 | 38.1 | 51.2 | 60.8 | 65.9 | 63.3 | 53.2 | 43.1 | 25.4 | 9.7 | 36.6 | 36.7 | 63.4 | 40.6 | 5.8 |
| BROWNS VALLEY | AVE | 7.0 | 13.7 | 25.6 | 43.3 | 56.1 | 65.8 | 71.8 | 69.9 | 59.7 | 48.4 | 30.7 | 16.0 | 42.3 | 41.7 | 69.2 | 46.3 | 12.2 |
| CAMBRIDGE ST HOSP | MAX | 17.0 | 24.2 | 35.6 | 53.0 | 67.6 | 76.1 | 81.7 | 78.9 | 68.9 | 58.0 | 39.2 | 24.9 | 52.1 | 52.0 | 78.9 | 55.4 | 22.1 |
| | MIN | -3.6 | 2.6 | 15.4 | 33.1 | 44.8 | 54.6 | 59.4 | 56.8 | 47.5 | 36.9 | 21.5 | 7.1 | 31.3 | 31.1 | 56.9 | 35.3 | 2.0 |
| | AVE | 6.7 | 13.4 | 25.5 | 43.0 | 56.2 | 65.4 | 70.6 | 67.9 | 58.3 | 47.4 | 30.4 | 16.0 | 41.7 | 41.6 | 67.9 | 45.4 | 12.0 |
| CAMPBELL | MAX | 15.2 | 21.7 | 34.0 | 52.6 | 68.0 | 77.2 | 83.2 | 81.8 | 70.9 | 58.9 | 38.5 | 23.0 | 52.1 | 51.6 | 80.8 | 56.1 | 19.9 |
| | MIN | -5.9 | .7 | 15.0 | 32.1 | 42.8 | 53.2 | 57.1 | 55.4 | 45.4 | 34.5 | 19.3 | 3.8 | 29.5 | 30.0 | 55.2 | 33.1 | -.4 |
| | AVE | 4.6 | 11.2 | 24.5 | 42.3 | 55.4 | 65.3 | 70.2 | 68.6 | 58.2 | 46.6 | 28.9 | 13.5 | 40.8 | 40.8 | 68.1 | 44.5 | 9.8 |
| CANBY | MAX | 19.8 | 25.9 | 37.1 | 54.7 | 69.3 | 79.7 | 85.7 | 83.4 | 73.7 | 61.8 | 42.3 | 27.7 | 55.1 | 53.7 | 82.9 | 59.3 | 24.5 |
| | MIN | -.9 | 5.6 | 17.1 | 33.1 | 45.1 | 55.7 | 60.8 | 58.8 | 48.4 | 37.4 | 21.8 | 8.6 | 32.6 | 31.7 | 58.4 | 35.9 | 4.5 |
| | AVE | 9.4 | 15.8 | 27.1 | 43.9 | 57.3 | 67.7 | 73.3 | 71.2 | 61.0 | 49.6 | 32.1 | 18.2 | 43.9 | 42.8 | 70.7 | 47.6 | 14.5 |
| CASS LAKE | AVE | 1.3 | 7.8 | 21.0 | 39.0 | 52.1 | 62.4 | 67.3 | 65.0 | 54.8 | 44.0 | 26.5 | 9.7 | 37.6 | 37.4 | 64.9 | 41.8 | 6.3 |
| CHASKA | AVE | 8.5 | 15.1 | 27.5 | 44.7 | 57.8 | 67.4 | 72.3 | 69.7 | 60.1 | 49.1 | 32.5 | 18.1 | 43.6 | 43.3 | 69.8 | 47.2 | 13.9 |
| CLOQUET FOR RES CEN | MAX | 14.7 | 21.3 | 32.7 | 48.2 | 63.2 | 72.4 | 78.3 | 74.9 | 64.5 | 53.4 | 35.6 | 22.0 | 48.4 | 48.0 | 75.2 | 51.2 | 19.3 |
| | MIN | -6.2 | -1.1 | 11.1 | 27.3 | 37.1 | 46.8 | 53.4 | 51.8 | 43.5 | 33.7 | 19.1 | 4.2 | 26.7 | 25.2 | 50.6 | 32.1 | -1.0 |
| | AVE | 4.3 | 10.0 | 21.9 | 37.8 | 50.1 | 59.6 | 65.9 | 63.3 | 53.9 | 43.6 | 27.4 | 13.1 | 37.6 | 36.6 | 62.9 | 41.6 | 9.1 |
| COLLEGEVILLE ST JOHN | MAX | 15.8 | 22.6 | 34.3 | 51.7 | 67.2 | 75.8 | 81.4 | 78.9 | 69.0 | 57.8 | 39.0 | 24.3 | 51.5 | 51.1 | 78.7 | 55.3 | 20.9 |
| | MIN | -3.4 | 3.1 | 15.3 | 33.2 | 45.4 | 55.3 | 60.5 | 58.4 | 48.8 | 38.0 | 22.4 | 7.5 | 32.0 | 31.3 | 58.1 | 36.4 | 2.4 |
| | AVE | 6.2 | 12.9 | 24.8 | 42.5 | 56.2 | 65.6 | 70.9 | 68.7 | 58.9 | 47.9 | 30.7 | 16.0 | 41.8 | 41.2 | 68.4 | 45.8 | 11.7 |
| CROOKSTON NW EXP STA | MAX | 10.3 | 17.5 | 30.7 | 49.5 | 66.3 | 75.1 | 81.0 | 79.5 | 68.4 | 56.1 | 35.3 | 19.9 | 49.1 | 48.8 | 78.6 | 53.3 | 15.9 |
| | MIN | -9.9 | -3.4 | 10.7 | 30.2 | 41.3 | 52.2 | 57.1 | 55.2 | 45.2 | 34.5 | 17.4 | 1.4 | 27.7 | 27.4 | 54.8 | 32.4 | -4.0 |
| | AVE | .2 | 7.0 | 20.7 | 39.9 | 53.9 | 63.7 | 69.0 | 67.4 | 56.8 | 45.3 | 26.4 | 10.7 | 38.4 | 38.2 | 66.7 | 42.8 | 6.0 |
| DETROIT LAKES 1 NNE | MAX | 12.3 | 19.4 | 31.9 | 49.7 | 64.6 | 73.1 | 78.7 | 76.8 | 66.4 | 55.3 | 35.8 | 21.0 | 48.8 | 48.7 | 76.2 | 52.5 | 17.6 |
| | MIN | -10.3 | -4.6 | 9.3 | 28.6 | 40.0 | 50.5 | 55.1 | 53.2 | 42.9 | 32.8 | 16.9 | 1.2 | 26.3 | 26.0 | 52.9 | 30.8 | -4.6 |
| | AVE | 1.0 | 7.5 | 20.8 | 39.2 | 52.4 | 61.8 | 66.9 | 65.0 | 54.6 | 44.1 | 26.4 | 11.2 | 37.5 | 37.4 | 64.6 | 41.7 | 6.5 |
| DULUTH WSO | MAX | 14.7 | 21.0 | 31.0 | 46.2 | 61.0 | 69.9 | 76.6 | 73.6 | 64.0 | 53.3 | 35.4 | 21.8 | 47.4 | 46.0 | 73.4 | 50.9 | 19.2 |
| | MIN | -4.4 | 1.0 | 12.6 | 29.4 | 39.7 | 48.7 | 54.9 | 53.3 | 45.2 | 35.7 | 20.9 | 5.6 | 28.5 | 27.2 | 52.3 | 33.9 | .7 |
| | AVE | 5.2 | 11.0 | 21.8 | 37.8 | 50.3 | 59.4 | 65.7 | 63.5 | 54.7 | 44.5 | 28.1 | 13.7 | 38.0 | 36.6 | 62.8 | 42.4 | 10.0 |
| FAIRMONT | MAX | 20.4 | 27.1 | 37.2 | 54.7 | 70.0 | 79.3 | 83.8 | 81.4 | 72.7 | 61.2 | 42.4 | 27.7 | 54.8 | 53.9 | 81.5 | 58.8 | 25.1 |
| | MIN | 1.3 | 7.8 | 19.1 | 36.5 | 48.5 | 58.5 | 62.8 | 60.2 | 51.2 | 40.0 | 24.7 | 10.9 | 35.1 | 34.7 | 60.4 | 38.6 | 6.7 |
| | AVE | 10.9 | 17.4 | 28.2 | 45.6 | 59.2 | 69.0 | 73.3 | 70.9 | 62.0 | 50.6 | 33.5 | 19.3 | 45.0 | 44.3 | 71.0 | 48.7 | 15.9 |
| FARIBAULT | MAX | 19.6 | 25.9 | 36.9 | 54.6 | 68.8 | 78.2 | 83.2 | 80.2 | 71.6 | 60.6 | 42.0 | 27.3 | 54.1 | 53.4 | 80.5 | 58.1 | 24.3 |
| | MIN | -.9 | 5.1 | 17.4 | 34.3 | 45.9 | 56.0 | 60.6 | 58.3 | 49.0 | 38.2 | 23.4 | 9.9 | 33.1 | 32.5 | 58.3 | 36.8 | 4.7 |
| | AVE | 9.4 | 15.5 | 27.2 | 44.5 | 57.4 | 67.1 | 72.0 | 69.3 | 60.4 | 49.5 | 32.7 | 18.7 | 43.8 | 43.0 | 69.5 | 47.5 | 14.5 |
| FARMINGTON 3 NW | MAX | 18.0 | 24.4 | 36.1 | 54.3 | 68.8 | 77.5 | 82.4 | 80.0 | 70.8 | 59.7 | 41.1 | 26.2 | 53.3 | 53.1 | 79.9 | 57.2 | 22.8 |
| | MIN | -1.4 | 4.9 | 17.4 | 34.6 | 46.5 | 56.2 | 60.8 | 58.1 | 48.7 | 38.0 | 23.3 | 9.2 | 33.0 | 32.8 | 58.3 | 36.7 | 4.2 |
| | AVE | 8.3 | 14.7 | 26.8 | 44.5 | 57.6 | 66.9 | 71.5 | 69.1 | 59.8 | 48.9 | 32.2 | 17.7 | 43.2 | 43.0 | 69.2 | 47.0 | 13.5 |
| FERGUS FALLS | MAX | 13.8 | 21.0 | 33.6 | 51.8 | 67.1 | 76.2 | 82.3 | 80.2 | 69.7 | 57.6 | 37.5 | 22.5 | 51.1 | 50.8 | 79.5 | 54.9 | 19.0 |
| | MIN | -6.2 | .6 | 13.7 | 31.6 | 43.7 | 53.7 | 58.9 | 57.0 | 46.4 | 35.4 | 19.8 | 4.8 | 30.0 | 29.7 | 56.5 | 33.9 | -.2 |
| | AVE | 3.8 | 10.9 | 23.7 | 41.7 | 55.5 | 65.0 | 70.6 | 68.6 | 58.1 | 46.5 | 28.7 | 13.6 | 40.5 | 40.3 | 68.1 | 44.4 | 9.4 |
| FOSSTON | MAX | 11.9 | 19.2 | 32.1 | 49.8 | 65.2 | 74.1 | 79.9 | 78.1 | 67.2 | 55.9 | 35.6 | 21.0 | 49.2 | 49.1 | 77.4 | 52.9 | 17.4 |
| | MIN | -9.2 | -2.8 | 10.6 | 29.8 | 41.7 | 51.9 | 56.7 | 54.6 | 44.6 | 34.5 | 17.8 | 2.0 | 27.7 | 27.4 | 54.4 | 32.3 | -3.3 |
| | AVE | 1.3 | 8.2 | 21.4 | 39.8 | 53.4 | 63.0 | 68.3 | 66.3 | 55.9 | 45.2 | 26.7 | 11.5 | 38.4 | 38.2 | 65.9 | 42.6 | 7.0 |
| GLENWOOD | AVE | 6.0 | 12.6 | 24.8 | 42.3 | 55.8 | 65.3 | 70.8 | 68.6 | 58.5 | 47.4 | 30.3 | 15.2 | 41.5 | 40.9 | 68.2 | 45.4 | 11.3 |
| GRAND MARAIS | MAX | 18.9 | 22.6 | 31.8 | 43.8 | 54.5 | 62.3 | 69.7 | 68.7 | 60.4 | 50.9 | 37.3 | 25.9 | 45.6 | 43.4 | 66.9 | 49.6 | 22.5 |
| | MIN | -.2 | 3.8 | 15.3 | 29.7 | 37.7 | 44.7 | 52.0 | 53.4 | 46.1 | 36.7 | 23.3 | 9.7 | 29.4 | 27.6 | 50.0 | 35.4 | 4.4 |
| | AVE | 9.4 | 13.2 | 23.6 | 36.8 | 46.1 | 53.5 | 60.9 | 61.0 | 53.3 | 43.9 | 30.3 | 17.8 | 37.5 | 35.5 | 58.5 | 42.5 | 13.5 |

Appendix Table 1. Normal monthly, annual, and seasonal temperatures, °F, adjusted to an 8 a.m. observation time, 1951-1980, Minnesota.

| STATION NAME | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN | SPR | SUM | FAL | WIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GRAND MEADOW | MAX | 20.0 | 26.0 | 36.0 | 53.6 | 67.5 | 76.7 | 81.0 | 78.8 | 70.2 | 59.3 | 41.5 | 26.6 | 53.1 | 52.4 | 78.9 | 57.0 | 24.2 |
| | MIN | 1.1 | 6.8 | 19.2 | 35.0 | 46.2 | 56.0 | 59.9 | 57.4 | 48.9 | 38.6 | 24.2 | 10.3 | 33.6 | 33.5 | 57.8 | 37.2 | 6.1 |
| | AVE | 10.6 | 16.4 | 27.6 | 44.4 | 56.9 | 66.3 | 70.5 | 68.2 | 59.6 | 49.0 | 32.9 | 18.5 | 43.4 | 43.0 | 68.3 | 47.2 | 15.2 |
| GRAND RAPIDS NC SCHL | MAX | 14.1 | 21.8 | 33.9 | 49.5 | 64.1 | 73.3 | 78.2 | 75.3 | 64.9 | 54.1 | 35.5 | 21.5 | 48.8 | 49.2 | 75.6 | 51.5 | 19.1 |
| | MIN | -8.4 | -2.5 | 10.3 | 28.1 | 39.4 | 49.1 | 54.4 | 51.9 | 43.0 | 33.7 | 18.6 | 2.5 | 26.7 | 25.9 | 51.8 | 31.8 | -2.8 |
| | AVE | 2.9 | 9.7 | 22.1 | 38.8 | 51.8 | 61.2 | 66.3 | 63.7 | 54.0 | 43.9 | 27.1 | 12.0 | 37.8 | 37.6 | 63.7 | 41.6 | 8.2 |
| GULL LAKE DAM | MAX | 15.1 | 22.3 | 34.1 | 50.3 | 65.3 | 74.5 | 79.7 | 76.9 | 67.0 | 56.4 | 37.7 | 22.8 | 50.2 | 49.9 | 77.0 | 53.7 | 20.0 |
| | MIN | -6.1 | -.2 | 12.2 | 29.5 | 42.0 | 52.8 | 58.4 | 56.0 | 46.3 | 35.7 | 20.0 | 4.9 | 29.3 | 27.8 | 55.7 | 34.0 | -.5 |
| | AVE | 4.4 | 11.0 | 23.1 | 39.9 | 53.6 | 63.6 | 69.1 | 66.5 | 56.6 | 46.0 | 28.9 | 13.9 | 39.7 | 38.9 | 66.4 | 43.8 | 9.8 |
| HALLOCK | MAX | 9.0 | 16.4 | 29.5 | 49.4 | 66.2 | 75.4 | 81.1 | 79.4 | 67.6 | 55.3 | 34.2 | 17.8 | 48.4 | 48.3 | 78.6 | 52.4 | 14.4 |
| | MIN | -11.3 | -5.1 | 9.0 | 29.1 | 41.0 | 51.7 | 55.9 | 53.5 | 43.4 | 32.7 | 16.5 | -.6 | 26.3 | 26.3 | 53.7 | 30.9 | -5.7 |
| | AVE | -1.1 | 5.6 | 19.2 | 39.2 | 53.6 | 63.5 | 68.6 | 66.1 | 55.5 | 43.8 | 25.4 | 8.5 | 37.3 | 37.3 | 66.1 | 41.6 | 4.3 |
| HINCKLEY | MAX | 16.6 | 23.6 | 35.7 | 52.6 | 66.2 | 74.9 | 80.5 | 78.2 | 67.8 | 57.1 | 39.0 | 24.1 | 51.4 | 51.5 | 77.8 | 54.6 | 21.4 |
| | MIN | -5.5 | .2 | 13.6 | 30.3 | 40.8 | 50.2 | 55.1 | 52.9 | 43.5 | 33.7 | 20.2 | 5.1 | 28.3 | 28.2 | 52.7 | 32.5 | -.1 |
| | AVE | 5.6 | 11.9 | 24.7 | 41.4 | 53.6 | 62.5 | 67.8 | 65.5 | 55.6 | 45.5 | 29.5 | 14.8 | 39.9 | 39.9 | 65.3 | 43.6 | 10.8 |
| INTERNATIONAL FALLS | MAX | 10.3 | 18.8 | 31.1 | 47.7 | 63.6 | 72.7 | 78.7 | 75.4 | 64.5 | 53.1 | 33.1 | 17.8 | 47.2 | 47.4 | 75.6 | 50.2 | 15.7 |
| | MIN | -12.5 | -6.1 | 7.6 | 27.6 | 39.0 | 49.5 | 54.3 | 51.4 | 42.5 | 33.1 | 16.6 | -1.6 | 25.1 | 24.7 | 51.7 | 30.7 | -6.7 |
| | AVE | -1.0 | 6.4 | 19.4 | 37.7 | 51.3 | 61.2 | 66.5 | 63.5 | 53.5 | 43.1 | 24.8 | 8.1 | 36.2 | 36.1 | 63.7 | 40.5 | 4.5 |
| ITASCA ST PARK SCHL | MAX | 13.7 | 22.0 | 34.1 | 49.8 | 65.1 | 73.9 | 79.7 | 77.1 | 66.5 | 55.4 | 35.7 | 21.5 | 49.5 | 49.7 | 76.9 | 52.5 | 19.0 |
| | MIN | -11.0 | -5.0 | 8.0 | 26.3 | 38.1 | 48.9 | 54.0 | 51.9 | 42.4 | 32.5 | 16.6 | .3 | 25.3 | 24.1 | 51.6 | 30.5 | -5.2 |
| | AVE | 1.4 | 8.5 | 21.1 | 38.1 | 51.6 | 61.5 | 66.9 | 64.5 | 54.4 | 44.0 | 26.2 | 10.9 | 37.4 | 36.9 | 64.3 | 41.5 | 7.0 |
| JORDAN 1 S | MAX | 18.3 | 24.1 | 35.7 | 54.0 | 68.5 | 77.0 | 82.2 | 79.2 | 70.2 | 59.2 | 40.8 | 26.2 | 52.9 | 52.7 | 79.4 | 56.7 | 22.9 |
| | MIN | -1.6 | 4.5 | 17.0 | 34.2 | 45.5 | 55.0 | 59.4 | 57.1 | 47.8 | 37.5 | 22.6 | 9.1 | 32.3 | 32.2 | 57.2 | 35.9 | 4.0 |
| | AVE | 8.3 | 14.4 | 26.3 | 44.1 | 56.9 | 66.1 | 70.8 | 68.1 | 59.0 | 48.4 | 31.7 | 17.6 | 42.6 | 42.4 | 68.3 | 46.4 | 13.4 |
| LEECH LAKE DAM | MAX | 14.3 | 22.0 | 34.1 | 49.5 | 64.2 | 73.4 | 78.8 | 76.1 | 65.9 | 55.3 | 36.4 | 22.0 | 49.3 | 49.3 | 76.1 | 52.5 | 19.4 |
| | MIN | -8.3 | -2.5 | 10.3 | 28.2 | 40.2 | 50.9 | 56.5 | 53.7 | 44.5 | 34.3 | 19.0 | 2.6 | 27.4 | 26.2 | 53.7 | 32.6 | -2.7 |
| | AVE | 3.0 | 9.7 | 22.2 | 38.9 | 52.1 | 62.2 | 67.6 | 64.9 | 55.2 | 44.8 | 27.7 | 13.6 | 38.5 | 37.8 | 64.9 | 42.6 | 8.8 |
| LITCHFIELD | MAX | 17.3 | 23.7 | 35.3 | 53.1 | 68.1 | 77.5 | 82.6 | 79.9 | 70.7 | 59.3 | 40.1 | 25.6 | 52.8 | 52.1 | 80.0 | 56.7 | 23.2 |
| | MIN | -2.8 | 3.4 | 15.8 | 33.3 | 45.4 | 55.7 | 60.7 | 58.5 | 48.2 | 37.4 | 21.7 | 7.8 | 32.1 | 31.5 | 58.3 | 35.8 | 2.8 |
| | AVE | 7.3 | 13.5 | 25.6 | 43.2 | 56.7 | 66.6 | 71.7 | 69.2 | 59.4 | 48.4 | 31.0 | 16.8 | 42.4 | 41.8 | 69.2 | 46.3 | 12.5 |
| LITTLE FALLS 1 N | MAX | 15.9 | 23.0 | 35.0 | 52.3 | 67.0 | 75.9 | 81.6 | 78.7 | 68.9 | 57.8 | 38.8 | 24.0 | 51.6 | 51.4 | 78.7 | 55.1 | 21.0 |
| | MIN | -6.7 | -.9 | 12.3 | 30.5 | 42.5 | 53.0 | 58.1 | 55.5 | 45.7 | 35.0 | 19.7 | 4.3 | 29.1 | 28.4 | 55.5 | 33.5 | -1.1 |
| | AVE | 4.6 | 11.1 | 23.8 | 41.4 | 54.7 | 64.4 | 69.8 | 67.1 | 57.4 | 46.4 | 29.3 | 14.2 | 40.3 | 39.9 | 67.1 | 44.4 | 10.0 |
| LONG PRAIRIE | MAX | 14.4 | 21.3 | 33.2 | 50.7 | 65.3 | 74.7 | 80.7 | 77.8 | 67.9 | 56.7 | 37.7 | 22.9 | 50.3 | 49.7 | 77.7 | 54.1 | 19.6 |
| | MIN | -7.1 | -1.3 | 12.1 | 30.8 | 42.5 | 52.8 | 57.7 | 55.2 | 45.2 | 34.7 | 19.2 | 4.3 | 28.8 | 28.4 | 55.2 | 33.1 | -1.4 |
| | AVE | 3.7 | 10.0 | 22.6 | 40.7 | 53.9 | 63.7 | 69.2 | 66.5 | 56.6 | 45.7 | 28.5 | 13.6 | 39.6 | 39.1 | 66.5 | 43.6 | 9.1 |
| MADISON SEWAGE PLANT | MAX | 18.8 | 25.1 | 36.7 | 54.4 | 68.9 | 78.5 | 84.4 | 82.0 | 72.6 | 61.3 | 42.5 | 27.4 | 54.4 | 53.3 | 81.6 | 58.8 | 23.8 |
| | MIN | -2.5 | 4.1 | 16.2 | 32.9 | 44.9 | 55.2 | 60.2 | 57.7 | 46.7 | 36.0 | 20.6 | 7.5 | 31.6 | 31.3 | 57.7 | 34.5 | 3.1 |
| | AVE | 8.2 | 14.6 | 26.5 | 43.6 | 56.9 | 66.9 | 72.3 | 69.8 | 59.7 | 48.7 | 31.6 | 18.6 | 43.1 | 42.3 | 69.7 | 46.7 | 13.8 |
| MAPLE PLAIN | MAX | 18.6 | 25.0 | 36.7 | 54.4 | 68.4 | 77.1 | 82.4 | 79.7 | 70.3 | 59.5 | 41.1 | 26.4 | 53.3 | 53.2 | 79.8 | 57.0 | 23.3 |
| | MIN | -2.2 | 3.8 | 16.3 | 33.2 | 45.2 | 55.1 | 58.7 | 57.4 | 47.9 | 37.2 | 22.4 | 8.1 | 32.0 | 31.6 | 57.4 | 35.8 | 3.2 |
| | AVE | 8.2 | 14.4 | 26.4 | 43.9 | 56.8 | 66.1 | 71.1 | 68.6 | 59.1 | 48.4 | 31.8 | 17.3 | 42.7 | 42.4 | 68.6 | 46.4 | 13.3 |
| MARSHALL | MAX | 20.1 | 26.2 | 37.0 | 54.9 | 69.4 | 78.8 | 84.1 | 82.0 | 72.3 | 61.0 | 42.1 | 27.4 | 54.6 | 53.7 | 81.7 | 58.5 | 24.5 |
| | MIN | .4 | 6.5 | 18.3 | 34.3 | 46.2 | 57.0 | 61.5 | 59.1 | 49.0 | 37.8 | 22.8 | 9.4 | 33.5 | 32.9 | 59.2 | 36.5 | 5.4 |
| | AVE | 10.3 | 16.4 | 27.6 | 44.7 | 57.9 | 67.9 | 72.8 | 70.6 | 60.7 | 49.4 | 32.5 | 18.7 | 44.1 | 43.4 | 70.4 | 47.5 | 15.1 |
| MEADOWLANDS | MAX | 15.0 | 22.0 | 34.0 | 49.3 | 64.1 | 73.0 | 78.6 | 75.5 | 65.3 | 54.5 | 36.1 | 22.3 | 49.1 | 49.1 | 75.7 | 51.9 | 19.8 |
| | MIN | -9.4 | -3.7 | 8.0 | 27.0 | 37.5 | 47.3 | 52.9 | 50.8 | 41.8 | 32.3 | 17.6 | 1.4 | 25.4 | 24.5 | 50.3 | 30.6 | -3.9 |
| | AVE | 2.8 | 9.3 | 20.8 | 38.1 | 50.9 | 60.2 | 65.7 | 63.1 | 53.6 | 43.4 | 26.9 | 11.9 | 37.2 | 36.6 | 63.0 | 41.3 | 8.0 |
| MILACA | MAX | 16.4 | 23.4 | 35.1 | 52.5 | 67.0 | 75.7 | 81.5 | 79.0 | 69.0 | 57.7 | 39.1 | 24.4 | 51.7 | 51.5 | 78.7 | 55.3 | 21.4 |
| | MIN | -4.5 | 1.6 | 14.1 | 30.9 | 42.4 | 52.2 | 57.5 | 54.9 | 45.4 | 34.7 | 20.4 | 6.3 | 29.6 | 29.1 | 54.9 | 33.5 | 1.1 |
| | AVE | 5.9 | 12.4 | 24.5 | 41.8 | 54.7 | 63.9 | 69.5 | 67.0 | 57.2 | 46.2 | 29.8 | 15.3 | 40.7 | 40.3 | 66.8 | 44.4 | 11.2 |
| MILAN | MAX | 17.2 | 23.9 | 35.9 | 53.5 | 68.6 | 77.8 | 83.5 | 81.1 | 71.4 | 59.6 | 40.4 | 25.8 | 53.2 | 52.7 | 80.8 | 57.2 | 22.2 |
| | MIN | -4.3 | 2.3 | 15.1 | 32.5 | 44.3 | 54.9 | 59.5 | 57.4 | 46.8 | 35.5 | 20.1 | 6.4 | 30.9 | 30.6 | 57.3 | 34.1 | 1.5 |
| | AVE | 6.5 | 13.1 | 25.6 | 43.0 | 56.4 | 66.4 | 71.5 | 69.3 | 59.2 | 47.6 | 30.3 | 16.0 | 42.1 | 41.7 | 69.1 | 45.7 | 11.8 |
| MINNEAPOLIS-ST PAUL | MAX | 19.1 | 25.7 | 36.6 | 54.6 | 69.1 | 77.9 | 83.6 | 80.8 | 71.4 | 60.0 | 41.3 | 26.7 | 53.9 | 53.4 | 80.8 | 57.6 | 23.9 |
| | MIN | .9 | 7.3 | 19.5 | 36.5 | 48.0 | 58.2 | 63.3 | 60.8 | 51.1 | 39.7 | 25.0 | 11.5 | 35.1 | 34.6 | 60.7 | 38.6 | 6.6 |
| | AVE | 10.1 | 16.5 | 28.1 | 45.5 | 58.5 | 68.1 | 73.5 | 70.8 | 61.3 | 49.9 | 33.1 | 19.1 | 44.5 | 44.0 | 70.8 | 48.1 | 15.2 |
| MONTEVIDEO 1 SW | MAX | 18.0 | 24.7 | 36.2 | 54.3 | 69.0 | 78.2 | 83.5 | 81.3 | 72.1 | 61.1 | 41.4 | 26.3 | 53.9 | 53.2 | 81.0 | 58.2 | 23.0 |
| | MIN | -2.5 | 4.0 | 17.1 | 33.9 | 45.7 | 55.7 | 60.1 | 57.7 | 47.3 | 37.0 | 21.6 | 8.0 | 32.1 | 32.2 | 57.8 | 35.3 | 3.1 |
| | AVE | 7.7 | 14.4 | 26.7 | 44.2 | 57.4 | 66.9 | 71.8 | 69.6 | 59.8 | 49.1 | 31.5 | 17.2 | 43.0 | 42.8 | 69.4 | 46.8 | 13.1 |
| MOOSE LAKE 1 SSE | MAX | 16.1 | 22.8 | 34.5 | 50.2 | 64.6 | 73.6 | 79.7 | 76.6 | 66.8 | 56.1 | 37.8 | 23.4 | 50.2 | 49.7 | 76.6 | 53.6 | 20.7 |
| | MIN | -8.0 | -2.8 | 10.4 | 27.1 | 37.2 | 46.9 | 53.6 | 51.7 | 43.3 | 32.9 | 18.6 | 3.1 | 26.2 | 24.9 | 50.7 | 31.6 | -2.6 |
| | AVE | 4.1 | 10.0 | 22.5 | 38.7 | 50.9 | 60.3 | 66.6 | 64.2 | 55.0 | 44.5 | 28.2 | 13.2 | 38.2 | 37.4 | 63.7 | 42.6 | 9.1 |
| MORA | MAX | 16.8 | 23.8 | 35.5 | 52.7 | 67.0 | 75.8 | 81.5 | 78.9 | 68.8 | 57.7 | 39.0 | 24.6 | 51.8 | 51.7 | 78.7 | 55.2 | 21.7 |
| | MIN | -5.6 | .3 | 13.4 | 30.9 | 42.3 | 52.0 | 57.5 | 55.0 | 45.6 | 34.9 | 20.2 | 5.6 | 29.3 | 28.9 | 54.8 | 33.6 | .1 |
| | AVE | 5.7 | 12.1 | 24.5 | 41.8 | 54.6 | 63.8 | 69.6 | 66.9 | 57.2 | 46.3 | 29.6 | 15.1 | 40.6 | 40.3 | 66.8 | 44.4 | 11.0 |
| MORRIS W C SCHOOL | MAX | 15.5 | 21.9 | 33.6 | 52.5 | 67.6 | 76.7 | 82.1 | 80.4 | 70.2 | 58.4 | 38.9 | 23.4 | 51.8 | 51.2 | 79.7 | 55.9 | 20.3 |
| | MIN | -4.0 | 2.2 | 15.5 | 32.8 | 44.7 | 55.0 | 59.3 | 57.1 | 46.6 | 35.4 | 20.6 | 6.4 | 31.0 | 31.0 | 57.1 | 34.2 | 1.5 |
| | AVE | 5.7 | 12.1 | 24.6 | 42.7 | 56.1 | 65.9 | 70.7 | 68.8 | 58.5 | 47.0 | 29.8 | 14.8 | 41.4 | 41.1 | 68.5 | 45.1 | 10.6 |
| NEW LONDON | AVE | 6.5 | 12.8 | 24.9 | 42.5 | 56.3 | 66.1 | 71.5 | 68.9 | 59.0 | 48.0 | 30.6 | 15.9 | 41.9 | 41.2 | 68.8 | 45.9 | 11.8 |
| NEW ULM | MAX | 20.2 | 26.3 | 37.5 | 55.7 | 69.9 | 79.5 | 84.1 | 81.5 | 72.9 | 61.9 | 42.8 | 27.9 | 55.0 | 54.4 | 81.7 | 59.2 | 24.8 |
| | MIN | -.5 | 5.8 | 18.3 | 35.0 | 46.4 | 56.5 | 61.3 | 58.6 | 48.9 | 38.1 | 23.3 | 10.1 | 33.5 | 33.3 | 58.9 | 36.8 | 5.2 |
| | AVE | 9.9 | 16.0 | 28.0 | 45.4 | 58.1 | 68.0 | 72.7 | 70.1 | 61.0 | 50.0 | 33.1 | 19.1 | 44.3 | 43.8 | 70.3 | 48.0 | 15.0 |
| OLIVIA | AVE | 8.0 | 14.4 | 26.4 | 44.0 | 57.6 | 67.5 | 72.2 | 69.6 | 60.3 | 49.2 | 31.7 | 17.3 | 43.2 | 42.6 | 69.8 | 47.0 | 13.2 |
| PARK RAPIDS | MAX | 13.9 | 21.9 | 33.8 | 50.4 | 65.3 | 74.5 | 80.2 | 78.0 | 67.3 | 56.2 | 36.3 | 21.8 | 50.0 | 49.9 | 77.6 | 53.3 | 19.2 |
| | MIN | -9.8 | -3.3 | 10.1 | 28.6 | 40.7 | 51.1 | 56.1 | 54.0 | 43.8 | 33.3 | 17.4 | 1.4 | 27.0 | 26.5 | 53.7 | 31.5 | -3.9 |
| | AVE | 2.0 | 9.4 | 22.0 | 39.5 | 53.1 | 62.8 | 68.1 | 66.1 | 55.6 | 44.8 | 26.9 | 11.6 | 38.5 | 38.2 | 65.7 | 42.4 | 7.6 |
| PINE RIVER DAM | MAX | 15.4 | 23.0 | 35.1 | 50.9 | 65.7 | 74.5 | 80.0 | 77.0 | 67.1 | 56.4 | 37.7 | 23.2 | 50.5 | 50.6 | 77.2 | 53.8 | 20.5 |
| | MIN | -8.3 | -2.1 | 10.7 | 28.0 | 40.2 | 50.6 | 56.3 | 53.6 | 44.5 | 34.2 | 19.6 | 3.3 | 27.5 | 26.3 | 53.5 | 32.8 | -2.4 |
| | AVE | 3.6 | 10.5 | 22.9 | 39.4 | 53.0 | 62.6 | 68.1 | 65.3 | 55.8 | 45.4 | 28.7 | 13.3 | 39.0 | 38.4 | 65.3 | 43.3 | 9.1 |

Appendix Table 1. Normal monthly, annual, and seasonal temperatures, °F, adjusted to an 8 a.m. observation time, 1951-1980, Minnesota.

| STATION NAME | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN | SPR | SUM | FAL | WIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PIPESTONE | MAX | 18.9 | 25.2 | 36.7 | 54.6 | 68.4 | 78.3 | 83.9 | 81.8 | 71.8 | 60.4 | 41.5 | 26.9 | 54.0 | 53.3 | 81.4 | 57.9 | 23.7 |
| | MIN | -2.3 | 4.5 | 16.6 | 32.0 | 43.4 | 53.7 | 58.6 | 56.3 | 46.0 | 34.7 | 19.9 | 7.0 | 30.8 | 30.7 | 56.2 | 33.5 | 3.1 |
| | AVE | 8.4 | 14.9 | 26.7 | 43.4 | 55.9 | 66.0 | 71.2 | 69.1 | 59.0 | 47.5 | 30.7 | 16.9 | 42.5 | 42.0 | 68.8 | 45.7 | 13.4 |
| POKEGAMA DAM | MAX | 14.4 | 21.9 | 34.1 | 50.1 | 64.4 | 73.3 | 78.6 | 75.7 | 65.4 | 54.9 | 36.3 | 21.9 | 49.3 | 49.5 | 75.9 | 52.2 | 19.4 |
| | MIN | -8.9 | -3.1 | 9.9 | 28.0 | 39.7 | 49.9 | 55.4 | 53.2 | 44.0 | 34.1 | 18.8 | 2.2 | 26.8 | 25.9 | 52.8 | 32.3 | -3.3 |
| | AVE | 2.8 | 9.4 | 22.1 | 39.1 | 52.0 | 61.6 | 67.0 | 64.5 | 54.7 | 44.6 | 27.6 | 12.1 | 38.1 | 37.7 | 64.4 | 43.3 | 8.1 |
| PRESTON | AVE | 10.6 | 16.2 | 27.7 | 43.8 | 55.8 | 65.4 | 70.0 | 67.6 | 58.7 | 47.8 | 32.4 | 19.4 | 43.0 | 42.4 | 67.7 | 46.3 | 15.4 |
| RED LAKE FALLS | MAX | 10.5 | 17.9 | 31.0 | 49.7 | 65.7 | 74.6 | 80.5 | 78.3 | 67.9 | 56.0 | 35.2 | 19.9 | 48.9 | 48.8 | 77.8 | 53.0 | 16.1 |
| | MIN | -11.3 | -4.5 | 9.5 | 29.9 | 41.4 | 51.7 | 56.5 | 54.4 | 44.5 | 33.9 | 17.0 | .7 | 27.0 | 26.9 | 54.2 | 31.8 | -5.1 |
| | AVE | -.4 | 6.7 | 20.4 | 39.8 | 53.6 | 63.1 | 68.5 | 66.4 | 56.2 | 45.0 | 26.1 | 10.3 | 38.0 | 37.9 | 66.0 | 42.4 | 5.6 |
| RED LAKE INDIAN | MAX | 12.2 | 19.6 | 31.6 | 48.3 | 63.4 | 72.9 | 78.2 | 76.1 | 65.2 | 54.2 | 35.1 | 19.9 | 48.1 | 47.8 | 75.7 | 51.5 | 17.2 |
| | MIN | -9.7 | -4.5 | 9.5 | 28.1 | 41.2 | 51.8 | 57.0 | 54.5 | 44.8 | 34.9 | 18.9 | .6 | 27.3 | 26.3 | 54.4 | 32.9 | -4.5 |
| | AVE | 1.2 | 7.7 | 20.6 | 38.2 | 52.3 | 62.4 | 67.6 | 65.3 | 55.0 | 44.5 | 27.0 | 10.3 | 37.7 | 37.0 | 65.1 | 42.2 | 6.4 |
| ROCHESTER WSO | MAX | 18.9 | 25.5 | 35.8 | 53.5 | 67.9 | 77.0 | 81.6 | 79.1 | 70.7 | 59.5 | 41.3 | 26.3 | 53.1 | 52.4 | 79.3 | 57.2 | 23.6 |
| | MIN | .4 | 6.5 | 17.9 | 34.8 | 46.0 | 56.0 | 60.5 | 58.1 | 49.0 | 38.4 | 23.8 | 10.5 | 33.5 | 32.9 | 58.2 | 37.1 | 5.8 |
| | AVE | 9.7 | 16.0 | 26.9 | 44.1 | 56.9 | 66.6 | 71.1 | 68.7 | 59.9 | 49.0 | 32.5 | 18.4 | 43.3 | 42.6 | 68.8 | 47.1 | 14.7 |
| ROSEAU 1 E | MAX | 8.2 | 16.0 | 29.0 | 47.4 | 63.6 | 72.6 | 78.0 | 75.6 | 65.0 | 53.4 | 32.9 | 17.3 | 46.6 | 46.6 | 75.4 | 50.5 | 13.8 |
| | MIN | -13.9 | -7.9 | 5.2 | 27.1 | 38.6 | 49.0 | 53.9 | 51.1 | 41.5 | 31.6 | 14.8 | -2.4 | 24.0 | 23.6 | 51.3 | 29.3 | -8.1 |
| | AVE | -2.9 | 4.2 | 17.1 | 37.3 | 51.1 | 60.9 | 66.0 | 63.3 | 53.2 | 42.5 | 23.9 | 7.5 | 35.3 | 35.2 | 63.4 | 39.9 | 2.9 |
| ROSEMOUNT AGRI EXP | MAX | 17.7 | 23.8 | 35.4 | 53.3 | 67.3 | 76.8 | 81.8 | 79.1 | 70.2 | 59.2 | 40.7 | 25.8 | 52.6 | 52.0 | 79.2 | 56.7 | 22.4 |
| | MIN | -2.7 | 3.4 | 16.3 | 33.0 | 44.5 | 54.8 | 59.5 | 57.1 | 47.5 | 36.8 | 21.9 | 8.3 | 31.7 | 31.3 | 57.1 | 35.4 | 3.0 |
| | AVE | 7.5 | 13.6 | 25.8 | 43.1 | 55.9 | 65.8 | 70.7 | 68.1 | 58.8 | 48.0 | 31.4 | 17.1 | 42.1 | 41.6 | 68.2 | 46.1 | 12.7 |
| ST CLOUD WSO | MAX | 16.6 | 23.8 | 34.9 | 52.7 | 68.0 | 76.3 | 82.0 | 79.2 | 69.4 | 58.3 | 39.0 | 24.2 | 52.0 | 51.8 | 79.2 | 55.6 | 21.6 |
| | MIN | -4.8 | 1.6 | 14.2 | 32.3 | 43.7 | 53.6 | 58.3 | 55.9 | 46.6 | 35.8 | 20.5 | 6.0 | 30.3 | 30.0 | 55.9 | 34.3 | .9 |
| | AVE | 5.9 | 12.7 | 24.6 | 42.5 | 55.8 | 65.0 | 70.2 | 67.6 | 58.1 | 47.1 | 29.7 | 15.1 | 41.2 | 41.0 | 67.6 | 45.0 | 11.2 |
| ST PETER 2 SW | MAX | 20.5 | 27.1 | 38.0 | 55.8 | 70.1 | 79.4 | 84.2 | 81.5 | 72.9 | 61.9 | 42.9 | 27.9 | 55.2 | 54.8 | 81.7 | 59.2 | 25.2 |
| | MIN | -.9 | 5.8 | 18.6 | 35.1 | 46.7 | 56.8 | 61.3 | 58.6 | 48.7 | 37.6 | 23.8 | 9.9 | 33.5 | 33.5 | 58.9 | 36.7 | 4.9 |
| | AVE | 9.8 | 16.5 | 28.3 | 45.5 | 58.4 | 68.1 | 72.7 | 70.2 | 60.8 | 49.8 | 33.4 | 18.9 | 44.4 | 44.0 | 70.3 | 48.0 | 15.1 |
| SANDY LAKE DAM | MAX | 15.6 | 22.6 | 34.3 | 49.9 | 64.2 | 73.0 | 78.3 | 75.3 | 65.6 | 55.3 | 37.2 | 22.7 | 49.5 | 49.4 | 75.5 | 52.7 | 20.3 |
| | MIN | -7.7 | -2.0 | 10.5 | 28.7 | 40.8 | 50.7 | 56.1 | 53.9 | 44.6 | 34.7 | 19.4 | 3.5 | 27.8 | 26.7 | 53.5 | 32.9 | -2.1 |
| | AVE | 4.0 | 10.3 | 22.5 | 39.3 | 52.4 | 61.9 | 67.2 | 64.6 | 55.1 | 45.0 | 28.3 | 13.2 | 38.7 | 38.1 | 64.6 | 42.8 | 9.1 |
| SPRINGFIELD 1 NW | MAX | 19.6 | 25.9 | 36.6 | 54.9 | 70.0 | 79.5 | 83.8 | 80.9 | 72.8 | 61.4 | 42.4 | 27.2 | 54.6 | 53.9 | 81.4 | 58.9 | 24.2 |
| | MIN | -.3 | 6.1 | 18.5 | 34.8 | 46.1 | 56.7 | 60.4 | 57.8 | 48.1 | 37.7 | 23.0 | 9.4 | 33.2 | 33.2 | 58.3 | 36.2 | 5.1 |
| | AVE | 9.7 | 16.0 | 27.7 | 44.9 | 58.1 | 68.1 | 72.1 | 69.4 | 60.5 | 49.6 | 32.7 | 18.4 | 43.9 | 43.6 | 69.9 | 47.6 | 14.7 |
| THEIF RIVER FALLS | AVE | -.8 | 6.0 | 19.3 | 38.7 | 52.8 | 62.5 | 67.8 | 65.9 | 55.3 | 44.0 | 25.3 | 9.5 | 37.2 | 37.0 | 65.4 | 41.5 | 4.9 |
| TRACY | MAX | 20.5 | 26.1 | 37.0 | 54.9 | 69.3 | 79.3 | 84.4 | 82.4 | 72.7 | 61.3 | 42.4 | 27.6 | 54.8 | 53.7 | 82.0 | 58.8 | 24.7 |
| | MIN | -.3 | 6.1 | 17.6 | 33.5 | 45.7 | 56.2 | 60.9 | 58.4 | 48.2 | 37.3 | 22.3 | 9.1 | 32.9 | 32.2 | 58.5 | 35.9 | 5.0 |
| | AVE | 10.1 | 16.1 | 27.3 | 44.2 | 57.5 | 67.7 | 72.7 | 70.4 | 60.5 | 49.3 | 32.4 | 18.3 | 43.9 | 43.0 | 70.3 | 47.4 | 14.8 |
| TWO HARBORS | MAX | 19.1 | 23.2 | 32.7 | 45.0 | 56.4 | 65.6 | 73.7 | 71.8 | 63.0 | 52.9 | 38.3 | 26.2 | 47.4 | 44.7 | 70.4 | 51.4 | 22.8 |
| | MIN | -.5 | 3.7 | 15.2 | 29.3 | 37.6 | 44.3 | 52.7 | 53.9 | 46.4 | 36.9 | 23.2 | 9.4 | 29.4 | 27.4 | 50.3 | 35.5 | 4.2 |
| | AVE | 9.4 | 13.5 | 24.0 | 37.2 | 46.9 | 54.9 | 63.2 | 62.9 | 54.8 | 44.9 | 30.9 | 17.8 | 38.4 | 36.0 | 60.4 | 43.5 | 13.6 |
| VIRGINIA | MAX | 13.9 | 21.4 | 33.6 | 49.3 | 64.3 | 73.3 | 78.6 | 75.7 | 64.9 | 53.9 | 35.2 | 21.0 | 48.7 | 49.0 | 75.8 | 51.3 | 18.8 |
| | MIN | -8.6 | -2.7 | 9.9 | 27.4 | 38.9 | 48.6 | 53.9 | 51.5 | 43.0 | 33.0 | 17.5 | 1.5 | 26.2 | 25.4 | 51.3 | 31.2 | -3.3 |
| | AVE | 2.6 | 9.4 | 21.8 | 38.4 | 51.6 | 60.9 | 66.3 | 63.6 | 53.9 | 43.5 | 26.4 | 11.3 | 37.5 | 37.2 | 63.6 | 41.3 | 7.8 |
| WADENA 3 S | MAX | 14.3 | 21.9 | 33.6 | 51.1 | 66.2 | 74.9 | 80.8 | 78.7 | 67.8 | 56.7 | 37.4 | 22.4 | 50.5 | 50.3 | 78.1 | 54.0 | 19.5 |
| | MIN | -7.4 | -1.1 | 12.2 | 30.3 | 42.4 | 52.6 | 57.6 | 55.3 | 45.1 | 34.4 | 19.2 | 3.5 | 28.7 | 28.3 | 55.1 | 32.9 | -1.6 |
| | AVE | 3.5 | 10.4 | 23.0 | 40.7 | 54.3 | 63.8 | 69.2 | 67.1 | 56.6 | 45.6 | 28.3 | 13.5 | 39.7 | 39.3 | 66.7 | 43.5 | 9.2 |
| WALKER | AVE | 3.0 | 10.2 | 22.4 | 39.3 | 52.8 | 62.1 | 67.6 | 65.3 | 55.3 | 45.2 | 27.7 | 12.4 | 38.8 | 38.2 | 65.0 | 42.7 | 8.6 |
| WARROAD | MAX | 9.4 | 16.8 | 29.7 | 46.0 | 61.2 | 71.2 | 77.1 | 74.6 | 64.1 | 52.9 | 33.4 | 16.3 | 46.2 | 45.6 | 74.3 | 50.1 | 14.8 |
| | MIN | -13.2 | -7.5 | 6.1 | 26.2 | 39.5 | 50.9 | 56.0 | 53.3 | 43.5 | 33.1 | 15.8 | -1.7 | 25.2 | 23.9 | 53.4 | 30.8 | -7.5 |
| | AVE | -1.9 | 4.7 | 17.9 | 36.1 | 50.4 | 61.0 | 66.6 | 64.0 | 53.8 | 43.0 | 24.6 | 8.3 | 35.7 | 34.8 | 63.9 | 40.5 | 3.7 |
| WASECA EXP STA | MAX | 18.8 | 25.0 | 35.5 | 53.8 | 68.2 | 77.5 | 81.7 | 79.1 | 70.9 | 59.7 | 41.5 | 26.3 | 53.2 | 52.5 | 79.4 | 57.4 | 23.4 |
| | MIN | -1.3 | 5.2 | 17.1 | 33.9 | 45.6 | 55.5 | 59.9 | 57.4 | 47.7 | 36.8 | 22.6 | 8.6 | 32.4 | 32.2 | 57.6 | 35.7 | 4.2 |
| | AVE | 8.8 | 15.1 | 26.4 | 43.9 | 57.0 | 66.5 | 70.8 | 68.3 | 59.3 | 48.2 | 32.1 | 17.5 | 42.8 | 42.4 | 68.6 | 46.5 | 13.8 |
| WHEATON | MAX | 16.9 | 23.1 | 35.4 | 53.1 | 68.4 | 77.6 | 83.9 | 82.2 | 72.3 | 60.3 | 40.4 | 25.3 | 53.2 | 52.3 | 81.2 | 57.7 | 21.8 |
| | MIN | -3.0 | 3.4 | 16.0 | 32.9 | 44.9 | 55.4 | 60.1 | 58.2 | 47.8 | 36.6 | 20.8 | 6.8 | 31.7 | 31.3 | 57.9 | 35.1 | 2.4 |
| | AVE | 6.9 | 13.3 | 25.7 | 43.1 | 56.3 | 66.6 | 72.0 | 70.2 | 60.0 | 48.5 | 30.6 | 16.0 | 42.4 | 41.7 | 69.6 | 46.4 | 12.1 |
| WILLMAR ST HOSP | MAX | 16.3 | 23.1 | 34.5 | 52.6 | 67.5 | 76.8 | 82.1 | 79.7 | 71.0 | 59.6 | 40.0 | 24.9 | 52.3 | 51.5 | 79.5 | 56.8 | 21.4 |
| | MIN | -3.0 | 3.3 | 15.9 | 33.7 | 45.8 | 56.2 | 61.0 | 58.8 | 48.5 | 37.8 | 22.0 | 7.7 | 32.3 | 31.8 | 58.7 | 36.1 | 2.7 |
| | AVE | 6.6 | 13.2 | 25.2 | 43.2 | 56.7 | 66.5 | 71.6 | 69.2 | 59.8 | 48.7 | 31.0 | 16.3 | 42.3 | 41.7 | 69.1 | 46.5 | 12.1 |
| WINDOM | MAX | 20.0 | 26.2 | 37.2 | 54.6 | 68.8 | 79.1 | 83.9 | 81.0 | 72.4 | 61.4 | 43.1 | 27.8 | 54.6 | 53.5 | 81.3 | 58.9 | 24.6 |
| | MIN | -.3 | 6.1 | 17.7 | 33.9 | 45.8 | 56.4 | 61.0 | 58.5 | 48.2 | 37.0 | 22.3 | 9.5 | 33.0 | 32.5 | 58.6 | 35.8 | 5.1 |
| | AVE | 9.9 | 16.2 | 27.5 | 44.2 | 57.3 | 67.7 | 72.4 | 69.8 | 60.4 | 49.4 | 33.1 | 18.7 | 44.0 | 43.0 | 70.0 | 47.6 | 15.3 |
| WINNEBAGO | MAX | 19.9 | 26.4 | 36.8 | 55.1 | 69.3 | 78.9 | 82.9 | 80.6 | 71.7 | 60.4 | 41.9 | 26.7 | 54.2 | 53.8 | 80.8 | 58.0 | 24.3 |
| | MIN | 1.1 | 7.3 | 19.3 | 34.7 | 46.2 | 56.6 | 60.9 | 58.8 | 49.5 | 38.7 | 24.2 | 10.0 | 33.9 | 33.4 | 58.7 | 37.5 | 6.1 |
| | AVE | 10.5 | 16.9 | 28.0 | 45.0 | 57.8 | 67.7 | 72.0 | 69.7 | 60.6 | 49.6 | 33.1 | 18.4 | 44.1 | 43.6 | 69.8 | 47.8 | 15.3 |
| WINNIBIGOSHISH DAM | MAX | 13.2 | 20.9 | 33.3 | 49.5 | 64.4 | 73.9 | 79.2 | 76.1 | 65.3 | 54.1 | 35.5 | 21.2 | 48.9 | 49.1 | 76.4 | 51.6 | 18.4 |
| | MIN | -9.6 | -3.9 | 9.0 | 27.4 | 40.2 | 51.0 | 56.7 | 54.1 | 44.6 | 34.5 | 18.7 | 1.8 | 27.0 | 25.5 | 53.9 | 32.5 | -3.9 |
| | AVE | 1.8 | 8.5 | 21.1 | 38.5 | 52.3 | 62.5 | 67.9 | 65.2 | 55.0 | 44.3 | 27.1 | 12.7 | 38.1 | 37.3 | 65.2 | 42.1 | 7.7 |
| WINONA | MAX | 23.4 | 29.9 | 40.5 | 57.3 | 70.6 | 79.8 | 84.5 | 82.1 | 73.3 | 62.1 | 44.8 | 29.7 | 56.5 | 56.2 | 82.2 | 60.1 | 27.7 |
| | MIN | 2.0 | 7.0 | 19.7 | 35.4 | 46.9 | 56.5 | 61.1 | 58.7 | 49.7 | 39.6 | 25.7 | 11.4 | 34.5 | 34.0 | 58.8 | 38.3 | 6.8 |
| | AVE | 12.7 | 18.5 | 30.1 | 46.4 | 58.8 | 68.1 | 72.9 | 70.4 | 61.5 | 50.9 | 35.2 | 20.6 | 45.5 | 45.1 | 70.5 | 49.2 | 17.3 |
| WORTHINGTON | AVE | 10.6 | 16.9 | 27.6 | 44.5 | 57.3 | 67.1 | 71.8 | 69.3 | 59.7 | 48.7 | 32.4 | 18.3 | 43.7 | 43.1 | 69.4 | 46.9 | 15.3 |
| ZUMBROTA | MAX | 19.8 | 25.9 | 37.1 | 54.7 | 68.2 | 77.6 | 82.9 | 80.3 | 71.4 | 60.7 | 42.3 | 27.7 | 54.0 | 53.3 | 80.3 | 58.2 | 24.4 |
| | MIN | -1.6 | 3.7 | 16.1 | 32.9 | 44.1 | 54.4 | 59.1 | 56.6 | 47.2 | 36.4 | 22.1 | 9.1 | 31.7 | 31.0 | 56.7 | 35.2 | 3.7 |
| | AVE | 9.1 | 14.8 | 26.6 | 43.8 | 56.1 | 66.0 | 71.0 | 68.5 | 59.3 | 48.6 | 32.3 | 18.4 | 42.9 | 42.2 | 68.5 | 46.7 | 14.1 |

Appendix Table 1. Normal monthly, annual, and seasonal temperatures, °F, adjusted to an 8 a.m. observation time, 1951-1980, Minnesota.

| STATION NAME | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN | SPR | SUM | FAL | WIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALGONA 3 W, IA | MAX | 21.1 | 27.2 | 38.2 | 56.1 | 69.6 | 79.5 | 83.5 | 81.0 | 72.7 | 61.7 | 43.8 | 28.8 | 55.3 | 54.6 | 81.3 | 59.4 | 25.7 |
| | MIN | 1.9 | 8.3 | 19.3 | 35.0 | 46.7 | 56.8 | 61.1 | 58.6 | 49.2 | 38.3 | 23.7 | 11.3 | 34.2 | 33.7 | 58.8 | 37.1 | 7.2 |
| | AVE | 11.5 | 17.7 | 28.8 | 45.6 | 58.2 | 68.2 | 72.4 | 69.8 | 60.9 | 50.1 | 33.8 | 20.1 | 44.8 | 44.2 | 70.1 | 48.3 | 16.4 |
| BRITT, IA | MAX | 21.0 | 27.4 | 38.2 | 56.0 | 70.0 | 79.8 | 83.4 | 80.9 | 73.3 | 62.5 | 43.9 | 28.9 | 55.4 | 54.7 | 81.4 | 59.9 | 25.8 |
| | MIN | 1.4 | 7.8 | 19.3 | 35.5 | 47.2 | 57.6 | 61.6 | 59.2 | 49.5 | 38.7 | 24.0 | 11.2 | 34.4 | 34.0 | 59.5 | 37.4 | 6.8 |
| | AVE | 11.2 | 17.6 | 28.7 | 45.8 | 58.7 | 68.6 | 72.5 | 70.1 | 61.4 | 50.7 | 34.0 | 20.1 | 45.0 | 44.4 | 70.4 | 48.7 | 16.3 |
| CHARLES CITY, IA | MAX | 21.2 | 27.3 | 38.3 | 55.3 | 68.9 | 78.6 | 82.8 | 80.7 | 72.6 | 61.3 | 43.6 | 28.8 | 55.0 | 54.2 | 80.7 | 59.2 | 25.8 |
| | MIN | 2.6 | 8.0 | 20.3 | 36.2 | 47.6 | 57.2 | 61.6 | 59.4 | 50.0 | 39.3 | 25.0 | 12.7 | 35.1 | 34.7 | 59.4 | 38.1 | 8.1 |
| | AVE | 11.9 | 18.2 | 28.3 | 45.8 | 58.3 | 67.9 | 72.3 | 70.1 | 61.3 | 50.3 | 34.4 | 20.8 | 45.1 | 44.5 | 70.1 | 48.7 | 17.0 |
| CRESCO, IA | MAX | 19.8 | 25.9 | 36.9 | 54.1 | 67.4 | 76.6 | 81.2 | 78.8 | 70.4 | 59.3 | 42.0 | 27.2 | 53.3 | 52.8 | 78.8 | 57.2 | 24.3 |
| | MIN | 1.7 | 7.8 | 19.0 | 35.0 | 46.4 | 56.2 | 60.3 | 58.2 | 48.9 | 38.3 | 24.2 | 11.3 | 33.9 | 33.5 | 58.2 | 37.1 | 7.0 |
| | AVE | 10.8 | 16.8 | 28.0 | 44.6 | 56.9 | 66.4 | 70.8 | 68.5 | 59.7 | 48.8 | 33.1 | 19.3 | 43.6 | 43.2 | 68.6 | 47.2 | 15.6 |
| DECORAH 2 N, IA | MAX | 21.7 | 27.7 | 38.9 | 55.7 | 69.3 | 78.1 | 82.9 | 81.1 | 72.6 | 61.2 | 43.8 | 29.3 | 55.2 | 54.7 | 80.7 | 59.2 | 26.2 |
| | MIN | 2.0 | 7.8 | 19.4 | 35.3 | 46.8 | 56.3 | 60.6 | 58.5 | 49.4 | 38.6 | 24.7 | 12.3 | 34.3 | 33.8 | 58.5 | 37.6 | 7.4 |
| | AVE | 11.8 | 17.8 | 29.2 | 45.5 | 58.0 | 67.2 | 71.7 | 69.8 | 61.1 | 49.9 | 34.3 | 20.8 | 44.8 | 44.2 | 69.6 | 48.4 | 16.8 |
| EMMETSBURG, IA | MAX | 21.3 | 27.5 | 38.3 | 55.9 | 69.7 | 79.3 | 83.7 | 81.1 | 73.1 | 62.2 | 43.8 | 29.2 | 55.4 | 54.6 | 81.4 | 59.7 | 26.0 |
| | MIN | 2.2 | 8.5 | 19.6 | 35.6 | 47.2 | 57.4 | 61.8 | 59.1 | 49.3 | 38.3 | 23.9 | 11.7 | 34.5 | 34.1 | 59.4 | 37.2 | 7.5 |
| | AVE | 11.7 | 18.0 | 28.9 | 45.8 | 58.5 | 68.3 | 72.8 | 70.2 | 61.2 | 50.3 | 33.9 | 20.5 | 45.0 | 44.4 | 70.4 | 48.5 | 16.8 |
| ESTHERVILLE 2 N, IA | MAX | 21.2 | 27.5 | 37.8 | 55.9 | 70.2 | 79.3 | 83.6 | 81.4 | 72.9 | 61.7 | 43.2 | 28.2 | 55.2 | 54.6 | 81.4 | 59.2 | 25.6 |
| | MIN | 1.8 | 8.0 | 18.9 | 34.7 | 46.5 | 56.8 | 61.0 | 58.7 | 48.5 | 37.2 | 23.8 | 10.8 | 33.9 | 33.4 | 58.8 | 36.5 | 6.8 |
| | AVE | 11.5 | 17.8 | 28.4 | 45.3 | 58.4 | 68.0 | 72.4 | 70.0 | 60.7 | 49.5 | 33.5 | 19.5 | 44.6 | 44.0 | 70.1 | 47.9 | 16.3 |
| FOREST CITY, IA | MAX | 20.4 | 26.8 | 37.6 | 54.9 | 69.1 | 78.8 | 82.7 | 80.6 | 72.2 | 61.4 | 42.8 | 28.1 | 54.6 | 53.9 | 80.7 | 58.8 | 25.0 |
| | MIN | .8 | 7.6 | 18.9 | 35.1 | 46.8 | 56.6 | 61.3 | 58.8 | 49.2 | 38.3 | 23.7 | 10.9 | 34.0 | 33.6 | 58.9 | 37.1 | 6.4 |
| | AVE | 10.7 | 17.2 | 28.3 | 45.0 | 57.9 | 67.7 | 72.0 | 69.7 | 60.8 | 49.9 | 33.2 | 19.5 | 44.3 | 43.7 | 69.8 | 48.0 | 15.8 |
| HAWARDEN, IA | MAX | 24.1 | 30.5 | 41.7 | 59.1 | 71.9 | 80.9 | 86.1 | 83.9 | 75.1 | 64.1 | 45.9 | 31.7 | 57.9 | 57.6 | 83.6 | 61.7 | 28.7 |
| | MIN | 2.5 | 9.3 | 20.4 | 36.1 | 47.5 | 58.3 | 63.2 | 60.9 | 50.2 | 38.0 | 23.2 | 11.6 | 35.1 | 34.6 | 60.8 | 37.1 | 7.8 |
| | AVE | 13.3 | 19.9 | 31.1 | 47.7 | 59.7 | 69.6 | 74.6 | 72.4 | 62.7 | 51.1 | 34.6 | 21.7 | 46.5 | 46.2 | 72.2 | 49.5 | 18.3 |
| HUMBOLDT NO 2, IA | MAX | 23.2 | 29.6 | 40.1 | 57.4 | 71.2 | 80.4 | 84.9 | 82.2 | 74.5 | 63.4 | 45.2 | 30.6 | 56.9 | 56.2 | 82.5 | 61.1 | 27.8 |
| | MIN | 3.6 | 10.0 | 21.0 | 36.7 | 48.4 | 57.8 | 62.3 | 59.4 | 50.0 | 38.9 | 24.9 | 12.8 | 35.5 | 35.4 | 59.8 | 37.9 | 8.8 |
| | AVE | 13.4 | 19.8 | 30.6 | 47.1 | 59.9 | 69.2 | 73.6 | 70.8 | 62.3 | 51.2 | 35.0 | 21.7 | 46.2 | 45.9 | 71.2 | 49.5 | 18.3 |
| LAKE PARK, IA | MAX | 20.8 | 27.0 | 37.4 | 55.2 | 69.2 | 78.7 | 83.6 | 81.2 | 72.5 | 61.2 | 42.8 | 27.9 | 54.8 | 53.9 | 81.2 | 58.8 | 25.2 |
| | MIN | .7 | 7.1 | 18.2 | 34.5 | 46.1 | 56.4 | 61.1 | 58.6 | 48.5 | 37.5 | 23.2 | 10.0 | 33.5 | 32.9 | 58.7 | 36.4 | 5.9 |
| | AVE | 10.7 | 17.1 | 27.8 | 44.9 | 57.7 | 67.5 | 72.4 | 70.0 | 60.6 | 49.4 | 33.0 | 18.9 | 44.2 | 43.5 | 70.0 | 47.7 | 15.6 |
| MASON CITY FAA, IA | MAX | 20.6 | 26.9 | 37.1 | 55.3 | 69.8 | 79.0 | 83.4 | 81.2 | 73.0 | 61.8 | 43.4 | 28.0 | 55.0 | 54.0 | 81.2 | 59.4 | 25.2 |
| | MIN | 2.0 | 8.4 | 19.4 | 35.8 | 47.1 | 57.2 | 61.7 | 59.2 | 49.7 | 38.6 | 24.2 | 11.4 | 34.5 | 34.1 | 59.3 | 37.5 | 7.3 |
| | AVE | 11.4 | 17.6 | 28.3 | 45.5 | 58.4 | 68.2 | 72.6 | 70.3 | 61.4 | 50.2 | 33.8 | 19.7 | 44.8 | 44.1 | 70.3 | 48.5 | 16.2 |
| MASON CITY 3 N, IA | MAX | 20.6 | 27.1 | 38.0 | 55.3 | 69.6 | 78.8 | 83.2 | 81.0 | 72.8 | 61.7 | 43.8 | 28.6 | 55.0 | 54.3 | 81.0 | 59.4 | 25.5 |
| | MIN | 1.4 | 8.0 | 19.1 | 35.4 | 46.8 | 56.8 | 61.2 | 58.8 | 49.3 | 38.5 | 24.0 | 11.3 | 34.2 | 33.8 | 58.9 | 37.3 | 6.9 |
| | AVE | 11.1 | 17.6 | 28.6 | 45.3 | 58.2 | 67.9 | 72.2 | 69.9 | 61.1 | 50.1 | 33.9 | 20.0 | 44.6 | 44.1 | 70.0 | 48.4 | 16.2 |
| MILFORD 4 NW, IA | MAX | 20.1 | 26.8 | 37.6 | 55.5 | 69.8 | 79.3 | 84.1 | 81.7 | 72.9 | 61.6 | 42.9 | 28.1 | 55.0 | 54.3 | 81.7 | 59.2 | 25.0 |
| | MIN | -.3 | 6.7 | 17.9 | 34.2 | 45.8 | 56.0 | 60.7 | 58.6 | 48.8 | 37.4 | 22.5 | 9.7 | 33.2 | 32.6 | 58.4 | 36.2 | 5.4 |
| | AVE | 9.9 | 16.8 | 27.9 | 44.8 | 57.8 | 67.7 | 72.4 | 70.2 | 61.0 | 49.5 | 32.7 | 18.9 | 44.1 | 43.5 | 70.1 | 47.7 | 15.2 |
| NEW HAMPTON, IA | MAX | 21.0 | 27.2 | 37.8 | 54.8 | 68.3 | 77.1 | 81.2 | 79.5 | 71.7 | 61.2 | 43.4 | 28.9 | 54.3 | 53.6 | 79.3 | 58.8 | 25.7 |
| | MIN | 1.9 | 8.3 | 19.1 | 35.0 | 46.7 | 56.2 | 60.9 | 58.6 | 49.3 | 38.7 | 24.0 | 11.6 | 34.2 | 33.6 | 58.6 | 37.4 | 7.3 |
| | AVE | 11.6 | 17.7 | 28.5 | 44.9 | 57.6 | 66.7 | 71.1 | 69.1 | 60.5 | 50.0 | 33.8 | 20.3 | 44.3 | 43.7 | 69.0 | 48.1 | 16.5 |
| NORTHWOOD, IA | MAX | 19.9 | 26.3 | 37.2 | 54.7 | 68.9 | 78.6 | 82.9 | 80.6 | 72.8 | 61.3 | 42.6 | 27.7 | 54.4 | 53.6 | 80.7 | 58.8 | 24.6 |
| | MIN | .7 | 7.2 | 18.5 | 34.9 | 46.6 | 57.0 | 61.5 | 58.9 | 48.9 | 38.4 | 23.6 | 10.8 | 33.9 | 33.3 | 59.1 | 37.0 | 6.2 |
| | AVE | 10.3 | 16.7 | 27.8 | 44.8 | 57.8 | 67.8 | 72.2 | 69.8 | 60.8 | 49.9 | 33.1 | 19.3 | 44.2 | 43.5 | 69.9 | 47.9 | 15.5 |
| OSAGE, IA | MAX | 20.4 | 26.4 | 37.3 | 54.3 | 67.8 | 77.2 | 81.4 | 79.3 | 71.3 | 60.5 | 43.0 | 28.3 | 53.9 | 53.1 | 79.3 | 58.2 | 25.0 |
| | MIN | 1.6 | 8.2 | 19.6 | 35.6 | 47.2 | 57.1 | 61.6 | 59.3 | 49.6 | 39.1 | 24.3 | 11.7 | 34.6 | 34.1 | 59.3 | 37.7 | 7.2 |
| | AVE | 11.0 | 17.3 | 28.4 | 45.0 | 57.6 | 67.1 | 71.5 | 69.3 | 60.5 | 49.8 | 33.7 | 20.0 | 44.3 | 43.7 | 69.3 | 48.0 | 16.1 |
| ROCK RAPIDS, IA | MAX | 22.5 | 28.8 | 39.6 | 57.8 | 71.2 | 80.2 | 85.7 | 83.3 | 73.9 | 62.8 | 44.5 | 30.0 | 56.7 | 56.2 | 83.0 | 60.4 | 27.1 |
| | MIN | .8 | 7.7 | 19.4 | 34.8 | 46.4 | 57.1 | 61.8 | 59.4 | 48.7 | 36.6 | 22.5 | 10.2 | 33.8 | 33.5 | 59.4 | 35.9 | 6.2 |
| | AVE | 11.7 | 18.3 | 29.5 | 46.4 | 58.8 | 68.7 | 73.7 | 71.3 | 61.3 | 49.8 | 33.5 | 20.1 | 45.3 | 44.9 | 71.2 | 48.2 | 16.7 |
| SANBORN, IA | MAX | 20.6 | 27.2 | 38.2 | 56.3 | 70.3 | 79.5 | 84.1 | 81.8 | 72.8 | 61.4 | 43.2 | 28.6 | 55.3 | 55.0 | 81.8 | 59.2 | 25.4 |
| | MIN | .4 | 7.4 | 18.4 | 34.3 | 46.1 | 56.2 | 61.0 | 58.7 | 48.9 | 37.7 | 22.7 | 10.2 | 33.5 | 32.9 | 58.6 | 36.4 | 6.0 |
| | AVE | 10.5 | 17.4 | 28.4 | 45.4 | 58.2 | 67.9 | 72.5 | 70.3 | 60.9 | 49.6 | 33.0 | 19.4 | 44.5 | 44.0 | 70.2 | 47.8 | 15.7 |
| SHELDON, IA | MAX | 21.3 | 27.8 | 38.7 | 56.6 | 70.3 | 79.4 | 84.2 | 81.6 | 73.0 | 61.8 | 43.6 | 29.1 | 55.6 | 55.2 | 81.7 | 59.5 | 26.0 |
| | MIN | 1.0 | 7.9 | 19.0 | 34.6 | 46.1 | 56.4 | 61.1 | 58.7 | 48.8 | 37.3 | 22.7 | 10.5 | 33.7 | 33.2 | 58.7 | 36.3 | 6.5 |
| | AVE | 11.2 | 17.9 | 28.9 | 45.6 | 58.2 | 67.9 | 72.6 | 70.2 | 61.0 | 49.6 | 33.2 | 19.9 | 44.7 | 44.2 | 70.2 | 47.9 | 16.3 |
| SIBLEY, IA | MAX | 20.7 | 26.9 | 38.1 | 55.8 | 68.8 | 78.5 | 83.2 | 80.5 | 72.2 | 61.2 | 43.5 | 28.8 | 54.9 | 54.2 | 80.7 | 59.0 | 25.5 |
| | MIN | .4 | 7.1 | 18.3 | 33.9 | 45.3 | 55.3 | 60.2 | 57.6 | 47.7 | 36.8 | 21.8 | 9.8 | 32.9 | 32.5 | 57.7 | 35.5 | 5.8 |
| | AVE | 10.6 | 17.0 | 28.2 | 44.8 | 57.0 | 66.9 | 71.7 | 69.1 | 60.0 | 49.0 | 32.8 | 19.4 | 43.9 | 43.4 | 69.2 | 47.3 | 15.7 |
| SPENCER 1 N, IA | MAX | 22.1 | 28.7 | 38.7 | 56.3 | 70.7 | 79.7 | 84.5 | 82.2 | 73.6 | 62.6 | 43.8 | 29.4 | 56.0 | 55.2 | 82.2 | 60.0 | 26.8 |
| | MIN | 1.0 | 7.7 | 19.0 | 34.8 | 46.6 | 57.1 | 61.4 | 58.8 | 48.7 | 37.2 | 22.8 | 10.3 | 33.8 | 33.4 | 59.1 | 36.2 | 6.3 |
| | AVE | 11.6 | 18.2 | 28.9 | 45.5 | 58.6 | 68.4 | 72.9 | 70.6 | 61.2 | 49.9 | 33.2 | 19.9 | 44.9 | 44.3 | 70.6 | 48.1 | 16.6 |
| WAUKON, IA | MAX | 20.4 | 26.5 | 37.8 | 54.6 | 67.6 | 75.8 | 80.7 | 78.9 | 70.9 | 60.2 | 42.8 | 28.1 | 53.7 | 53.4 | 78.4 | 58.0 | 25.0 |
| | MIN | 2.9 | 8.7 | 19.7 | 35.7 | 47.1 | 56.5 | 61.1 | 59.1 | 50.1 | 39.3 | 24.7 | 12.4 | 34.8 | 34.1 | 58.9 | 38.0 | 8.0 |
| | AVE | 11.7 | 17.7 | 28.8 | 45.2 | 57.3 | 66.2 | 70.9 | 69.0 | 60.6 | 49.8 | 33.8 | 20.3 | 44.3 | 43.8 | 68.7 | 48.1 | 16.5 |
| AMENIA, ND | MAX | 12.7 | 20.1 | 33.4 | 52.3 | 69.0 | 77.3 | 83.7 | 82.3 | 72.0 | 59.0 | 37.8 | 21.8 | 51.8 | 51.6 | 81.1 | 56.3 | 18.1 |
| | MIN | -8.2 | -.7 | 13.3 | 31.2 | 42.5 | 52.3 | 57.2 | 55.2 | 44.9 | 34.1 | 17.7 | 2.0 | 28.5 | 29.0 | 54.9 | 32.2 | -2.3 |
| | AVE | 2.3 | 9.6 | 23.4 | 41.7 | 55.7 | 64.8 | 70.5 | 68.8 | 58.5 | 46.6 | 27.8 | 11.9 | 40.1 | 40.3 | 68.0 | 44.3 | 7.9 |
| CAVALIER, ND | MAX | 9.9 | 17.5 | 29.7 | 49.2 | 66.4 | 75.5 | 80.8 | 79.2 | 68.3 | 56.1 | 35.0 | 18.9 | 48.9 | 48.5 | 78.5 | 53.1 | 15.4 |
| | MIN | -10.0 | -3.2 | 10.0 | 29.0 | 40.8 | 51.3 | 56.2 | 53.5 | 43.8 | 33.4 | 16.9 | .5 | 26.9 | 26.6 | 53.7 | 31.4 | -4.2 |
| | AVE | -.0 | 7.2 | 19.9 | 39.1 | 53.6 | 63.4 | 68.5 | 66.3 | 56.0 | 44.8 | 26.0 | 9.8 | 37.9 | 37.5 | 66.1 | 42.3 | 5.6 |
| FARGO WSO, ND | MAX | 12.9 | 19.8 | 32.3 | 51.1 | 67.8 | 76.3 | 82.9 | 81.1 | 70.2 | 58.0 | 37.2 | 21.3 | 50.9 | 50.4 | 80.1 | 55.1 | 18.0 |
| | MIN | -6.6 | .3 | 13.5 | 32.1 | 43.4 | 54.0 | 59.0 | 56.9 | 46.6 | 35.2 | 19.1 | 3.8 | 29.8 | 29.6 | 56.6 | 33.6 | -.8 |
| | AVE | 3.2 | 10.0 | 22.9 | 41.6 | 55.6 | 65.2 | 71.0 | 69.1 | 58.5 | 46.6 | 28.1 | 12.6 | 40.4 | 40.0 | 68.4 | 44.4 | 8.6 |

Appendix Table 1. Normal monthly, annual, and seasonal temperatures, °F, adjusted to an 8 a.m. observation time, 1951-1980, Minnesota.

| STATION NAME | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN | SPR | SUM | FAL | WIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FORMAN 5 SSE, ND | MAX | 14.9 | 22.1 | 34.7 | 52.5 | 67.4 | 76.8 | 83.8 | 82.3 | 71.3 | 59.1 | 38.3 | 23.8 | 52.3 | 51.6 | 81.0 | 56.6 | 20.3 |
| | MIN | -2.5 | 1.2 | 14.1 | 31.3 | 42.8 | 53.2 | 58.3 | 56.2 | 44.6 | 33.7 | 18.4 | 4.2 | 29.6 | 29.4 | 55.9 | 32.2 | 1.0 |
| | AVE | 4.4 | 11.7 | 24.4 | 42.0 | 55.1 | 65.0 | 71.1 | 69.3 | 58.0 | 46.4 | 28.8 | 14.1 | 40.9 | 40.5 | 68.4 | 44.4 | 10.1 |
| GRAFTON, ND | MAX | 9.9 | 17.4 | 30.3 | 49.6 | 66.5 | 75.4 | 81.6 | 80.0 | 69.0 | 56.4 | 35.0 | 19.0 | 49.2 | 48.8 | 79.0 | 53.5 | 15.4 |
| | MIN | -10.6 | -3.9 | 9.5 | 28.9 | 40.6 | 51.0 | 55.4 | 53.3 | 43.5 | 33.0 | 16.3 | .2 | 26.4 | 26.3 | 53.2 | 30.9 | -4.8 |
| | AVE | -.3 | 6.7 | 20.0 | 39.3 | 53.6 | 63.2 | 68.5 | 66.7 | 56.2 | 44.7 | 25.7 | 9.6 | 37.8 | 37.6 | 66.1 | 42.2 | 5.3 |
| GRAND FORKS FAA, ND | MAX | 10.8 | 18.4 | 30.5 | 49.2 | 66.9 | 75.6 | 81.8 | 80.1 | 68.8 | 56.5 | 35.0 | 19.7 | 49.4 | 48.8 | 79.2 | 53.4 | 16.3 |
| | MIN | -8.9 | -1.8 | 11.4 | 31.3 | 41.9 | 52.1 | 56.6 | 54.2 | 44.9 | 34.0 | 17.9 | 2.1 | 28.0 | 28.2 | 54.3 | 32.3 | -2.9 |
| | AVE | 1.1 | 8.3 | 21.0 | 40.2 | 54.4 | 63.9 | 69.2 | 67.2 | 56.9 | 45.2 | 26.4 | 11.0 | 38.7 | 38.5 | 66.7 | 42.8 | 6.8 |
| GRAND FORKS UNIV, ND | MAX | 10.5 | 18.0 | 30.8 | 50.1 | 67.4 | 76.1 | 81.7 | 80.2 | 69.3 | 56.7 | 35.4 | 19.7 | 49.6 | 49.4 | 79.3 | 53.8 | 16.0 |
| | MIN | -8.0 | -1.2 | 12.1 | 31.5 | 42.7 | 53.1 | 57.7 | 55.4 | 45.6 | 35.0 | 18.7 | 2.8 | 28.8 | 28.6 | 55.4 | 33.1 | -2.2 |
| | AVE | 1.2 | 8.4 | 21.5 | 40.8 | 55.0 | 64.5 | 69.7 | 67.8 | 57.5 | 45.9 | 27.1 | 11.3 | 39.2 | 39.1 | 67.4 | 43.5 | 7.0 |
| HANKINSON R R, ND | MAX | 17.0 | 23.1 | 34.6 | 52.9 | 67.9 | 77.2 | 83.3 | 81.6 | 70.3 | 59.3 | 40.0 | 24.8 | 52.7 | 51.8 | 80.7 | 56.5 | 21.7 |
| | MIN | -4.2 | 2.2 | 15.3 | 32.0 | 43.7 | 54.1 | 59.1 | 56.7 | 46.1 | 35.3 | 19.9 | 5.0 | 30.4 | 30.3 | 56.7 | 33.8 | 1.0 |
| | AVE | 6.4 | 12.7 | 25.0 | 42.5 | 55.9 | 65.7 | 71.2 | 69.2 | 58.3 | 47.4 | 30.0 | 14.9 | 41.6 | 41.1 | 68.7 | 45.2 | 11.3 |
| HILLSBORO, ND | MAX | 11.9 | 19.0 | 32.1 | 50.7 | 67.3 | 76.3 | 82.7 | 81.2 | 70.5 | 58.0 | 36.9 | 21.0 | 50.6 | 50.0 | 80.1 | 55.2 | 17.3 |
| | MIN | -7.3 | -.6 | 12.5 | 31.1 | 42.3 | 53.0 | 58.1 | 55.5 | 45.3 | 34.5 | 18.3 | 3.2 | 28.8 | 28.6 | 55.5 | 32.7 | -1.6 |
| | AVE | 2.3 | 9.2 | 22.2 | 40.9 | 54.9 | 64.6 | 70.4 | 68.3 | 58.0 | 46.3 | 27.7 | 12.2 | 39.8 | 39.3 | 67.8 | 44.0 | 7.9 |
| LANGDON EXP FARM, ND | MAX | 7.3 | 15.0 | 27.6 | 46.5 | 63.3 | 72.4 | 78.1 | 76.6 | 65.8 | 53.5 | 32.4 | 16.7 | 46.3 | 45.8 | 75.7 | 50.6 | 13.0 |
| | MIN | -13.2 | -6.5 | 6.2 | 26.3 | 37.8 | 48.5 | 53.0 | 50.7 | 40.4 | 30.0 | 13.0 | -2.4 | 23.6 | 23.4 | 50.7 | 27.8 | -7.4 |
| | AVE | -3.0 | 4.2 | 16.9 | 36.4 | 50.6 | 60.4 | 65.6 | 63.7 | 53.1 | 41.8 | 22.8 | 7.2 | 35.0 | 34.6 | 63.2 | 39.2 | 2.8 |
| LARIMORE, ND | MAX | 11.7 | 18.7 | 31.3 | 49.7 | 66.0 | 75.0 | 81.1 | 79.4 | 68.6 | 56.3 | 36.3 | 21.0 | 49.8 | 49.0 | 78.5 | 53.7 | 17.1 |
| | MIN | -7.6 | -1.5 | 11.2 | 29.1 | 40.9 | 51.6 | 56.2 | 53.7 | 43.7 | 33.4 | 17.4 | 1.4 | 27.5 | 27.1 | 53.8 | 31.5 | -2.6 |
| | AVE | 2.1 | 8.6 | 21.2 | 39.4 | 53.5 | 63.4 | 68.7 | 66.7 | 56.1 | 44.8 | 26.9 | 11.2 | 38.6 | 38.0 | 66.3 | 42.6 | 7.3 |
| LISBON, ND | MAX | 15.5 | 22.6 | 35.5 | 53.4 | 68.0 | 76.7 | 83.0 | 81.5 | 71.1 | 59.8 | 39.6 | 24.2 | 52.6 | 52.3 | 80.4 | 56.8 | 20.8 |
| | MIN | -5.8 | .3 | 13.2 | 30.2 | 41.3 | 51.8 | 56.7 | 54.5 | 43.8 | 33.0 | 17.8 | 3.4 | 28.3 | 28.2 | 54.3 | 31.5 | -.7 |
| | AVE | 4.9 | 11.5 | 24.4 | 41.8 | 54.7 | 64.3 | 69.9 | 68.0 | 57.4 | 46.4 | 28.7 | 13.8 | 40.5 | 40.3 | 67.4 | 44.2 | 10.1 |
| MAYVILLE, ND | MAX | 11.5 | 18.5 | 31.6 | 50.2 | 66.5 | 75.4 | 81.7 | 80.2 | 69.3 | 57.2 | 36.2 | 20.8 | 49.9 | 49.4 | 79.1 | 54.2 | 16.8 |
| | MIN | -7.6 | -.8 | 12.4 | 30.9 | 42.1 | 52.8 | 57.7 | 55.5 | 45.4 | 34.7 | 18.3 | 3.3 | 28.7 | 28.4 | 55.3 | 32.8 | -1.7 |
| | AVE | 1.9 | 8.8 | 22.0 | 40.6 | 54.4 | 64.1 | 69.7 | 67.9 | 57.3 | 46.0 | 27.3 | 12.1 | 39.3 | 39.0 | 67.2 | 43.5 | 7.6 |
| MCLEOD 3 E, ND | MAX | 14.5 | 21.4 | 34.6 | 52.9 | 68.2 | 76.8 | 83.2 | 81.7 | 71.4 | 58.7 | 39.1 | 23.5 | 52.3 | 51.9 | 80.6 | 56.7 | 19.8 |
| | MIN | -7.4 | -.4 | 12.9 | 30.7 | 42.3 | 52.9 | 58.1 | 56.1 | 45.1 | 33.9 | 17.7 | 3.3 | 28.8 | 28.6 | 55.7 | 32.2 | -1.5 |
| | AVE | 3.6 | 10.6 | 23.8 | 41.9 | 55.3 | 64.9 | 70.7 | 68.8 | 58.3 | 46.8 | 28.4 | 13.5 | 40.5 | 40.3 | 68.1 | 44.5 | 9.2 |
| PARK RIVER, ND | MAX | 10.8 | 18.0 | 30.6 | 49.6 | 66.2 | 75.2 | 81.5 | 80.0 | 69.1 | 56.8 | 35.6 | 19.9 | 49.4 | 48.8 | 78.9 | 53.9 | 16.2 |
| | MIN | -8.1 | -1.5 | 11.0 | 29.4 | 41.3 | 52.2 | 57.2 | 54.6 | 44.7 | 34.2 | 17.5 | 2.2 | 27.9 | 27.2 | 54.6 | 32.1 | -2.5 |
| | AVE | 1.3 | 8.2 | 20.9 | 39.5 | 53.7 | 63.7 | 69.4 | 67.3 | 56.9 | 45.5 | 26.6 | 11.1 | 38.7 | 38.0 | 66.8 | 43.0 | 6.9 |
| PEMBINA 1 S, ND | MAX | 8.3 | 16.0 | 28.7 | 49.3 | 66.0 | 75.3 | 80.6 | 78.9 | 68.2 | 55.8 | 34.3 | 18.0 | 48.3 | 48.0 | 78.2 | 52.8 | 14.1 |
| | MIN | -12.6 | -6.3 | 8.0 | 28.2 | 40.0 | 50.4 | 55.3 | 52.4 | 42.6 | 32.3 | 15.6 | -1.3 | 25.4 | 25.4 | 52.7 | 30.2 | -6.7 |
| | AVE | -2.1 | 4.9 | 18.4 | 38.8 | 53.0 | 62.8 | 68.0 | 65.6 | 55.5 | 44.1 | 25.0 | 8.4 | 36.9 | 36.8 | 65.5 | 41.5 | 3.7 |
| PETERSBURG 2 N, ND | MAX | 10.4 | 17.1 | 29.2 | 47.8 | 64.3 | 73.5 | 79.6 | 78.3 | 66.7 | 54.7 | 34.0 | 18.9 | 47.9 | 47.1 | 77.1 | 51.8 | 15.5 |
| | MIN | -10.0 | -3.4 | 9.3 | 28.0 | 39.8 | 50.1 | 54.5 | 51.8 | 41.5 | 31.1 | 15.2 | -.4 | 25.6 | 25.8 | 52.2 | 28.3 | -4.6 |
| | AVE | .2 | 6.9 | 19.3 | 38.0 | 52.2 | 61.8 | 67.1 | 65.1 | 54.1 | 43.0 | 24.6 | 9.3 | 36.8 | 36.5 | 64.7 | 40.5 | 5.4 |
| SHARON, ND | MAX | 10.1 | 17.4 | 30.2 | 48.6 | 64.7 | 73.4 | 79.8 | 78.9 | 68.0 | 56.1 | 34.9 | 19.4 | 48.5 | 47.8 | 77.4 | 53.0 | 15.6 |
| | MIN | -9.3 | -2.0 | 10.7 | 29.1 | 40.6 | 51.1 | 55.8 | 53.8 | 43.3 | 32.9 | 15.9 | 1.1 | 26.9 | 26.8 | 53.6 | 30.7 | -3.4 |
| | AVE | .4 | 7.7 | 20.4 | 38.9 | 52.7 | 62.2 | 67.8 | 66.4 | 55.7 | 44.5 | 25.4 | 10.3 | 37.7 | 37.3 | 65.5 | 41.9 | 6.2 |
| WAHPETON, ND | MAX | 14.4 | 21.2 | 33.9 | 52.4 | 68.3 | 77.3 | 83.4 | 81.1 | 71.0 | 59.2 | 38.0 | 23.8 | 52.1 | 51.6 | 80.6 | 56.4 | 19.7 |
| | MIN | -5.4 | 1.3 | 14.5 | 32.4 | 44.0 | 54.4 | 59.4 | 57.4 | 46.9 | 36.3 | 20.1 | 5.3 | 30.5 | 30.3 | 57.1 | 34.4 | .4 |
| | AVE | 4.6 | 11.2 | 24.2 | 42.5 | 56.2 | 65.9 | 71.5 | 69.3 | 58.9 | 47.8 | 29.6 | 14.5 | 41.3 | 41.0 | 68.9 | 45.4 | 10.1 |
| BROOKINGS 2 NE, SD | MAX | 19.1 | 25.1 | 36.5 | 54.2 | 67.9 | 77.1 | 83.3 | 81.3 | 71.4 | 60.1 | 41.3 | 26.7 | 53.7 | 52.8 | 80.6 | 57.6 | 23.6 |
| | MIN | -2.9 | 3.8 | 16.5 | 32.1 | 43.0 | 53.2 | 57.9 | 55.5 | 45.1 | 34.0 | 19.7 | 6.7 | 30.4 | 30.5 | 55.5 | 32.9 | 2.5 |
| | AVE | 8.1 | 14.5 | 26.5 | 43.2 | 55.5 | 65.2 | 70.5 | 68.4 | 58.3 | 47.1 | 30.6 | 16.7 | 42.0 | 41.7 | 68.0 | 45.3 | 13.1 |
| CANTON, SD | MAX | 23.2 | 29.8 | 41.2 | 58.8 | 71.9 | 81.6 | 87.4 | 84.8 | 75.7 | 64.4 | 45.5 | 30.9 | 57.9 | 57.3 | 84.6 | 61.8 | 28.0 |
| | MIN | .4 | 7.6 | 19.0 | 34.6 | 46.0 | 56.4 | 61.4 | 59.2 | 48.3 | 36.5 | 21.7 | 9.8 | 33.4 | 33.2 | 59.0 | 35.5 | 6.0 |
| | AVE | 11.8 | 18.7 | 30.1 | 46.7 | 59.0 | 69.0 | 74.4 | 72.0 | 62.0 | 50.4 | 33.6 | 20.4 | 45.7 | 45.3 | 71.8 | 48.7 | 17.0 |
| CASTLEWOOD, SD | MAX | 18.6 | 25.7 | 37.5 | 54.8 | 68.6 | 78.0 | 84.7 | 83.1 | 73.1 | 61.3 | 41.4 | 27.1 | 54.5 | 53.6 | 81.9 | 58.6 | 23.8 |
| | MIN | -4.7 | 2.7 | 14.9 | 30.8 | 41.9 | 52.8 | 57.5 | 55.8 | 44.7 | 33.2 | 18.0 | 5.5 | 29.4 | 29.2 | 55.4 | 32.0 | 1.2 |
| | AVE | 7.0 | 14.2 | 26.1 | 42.9 | 55.3 | 65.4 | 71.1 | 69.4 | 58.9 | 47.3 | 29.7 | 16.3 | 42.0 | 41.4 | 68.6 | 45.3 | 12.5 |
| FLANDREAU, SD | MAX | 20.4 | 26.6 | 37.3 | 55.5 | 68.8 | 78.2 | 84.3 | 82.3 | 72.4 | 61.1 | 42.5 | 28.0 | 54.8 | 53.9 | 81.6 | 58.7 | 25.0 |
| | MIN | -1.9 | 4.7 | 17.1 | 32.9 | 44.3 | 54.8 | 59.8 | 57.2 | 46.6 | 34.8 | 20.5 | 7.7 | 31.6 | 31.4 | 57.3 | 34.0 | 3.5 |
| | AVE | 9.3 | 15.7 | 27.2 | 44.3 | 56.6 | 66.6 | 72.1 | 69.8 | 59.5 | 47.9 | 31.5 | 17.9 | 43.2 | 42.7 | 69.5 | 46.3 | 14.3 |
| MILBANK, SD | MAX | 18.9 | 24.9 | 36.6 | 54.1 | 68.8 | 78.2 | 84.6 | 82.7 | 73.2 | 61.4 | 41.8 | 27.3 | 54.4 | 53.2 | 81.8 | 58.8 | 23.7 |
| | MIN | -2.3 | 4.3 | 16.8 | 32.7 | 44.4 | 54.9 | 59.6 | 58.0 | 47.3 | 36.5 | 21.1 | 7.9 | 31.8 | 31.3 | 57.5 | 35.0 | 3.3 |
| | AVE | 8.4 | 14.7 | 26.7 | 43.4 | 56.6 | 66.5 | 72.1 | 70.3 | 60.3 | 49.0 | 31.5 | 17.7 | 43.1 | 42.3 | 69.7 | 46.9 | 13.6 |
| SIOUX FALLS WSO, SD | MAX | 22.1 | 28.6 | 39.2 | 56.7 | 70.2 | 79.7 | 86.4 | 83.9 | 73.9 | 62.4 | 43.9 | 29.3 | 56.4 | 55.3 | 83.4 | 60.1 | 26.7 |
| | MIN | .4 | 7.7 | 19.3 | 35.1 | 46.1 | 56.8 | 62.4 | 60.2 | 49.4 | 37.0 | 22.0 | 9.9 | 33.8 | 33.5 | 59.8 | 36.1 | 6.0 |
| | AVE | 11.3 | 18.1 | 29.3 | 45.8 | 58.2 | 68.4 | 74.4 | 72.1 | 61.7 | 49.7 | 32.9 | 19.6 | 45.1 | 44.4 | 71.6 | 48.1 | 16.3 |
| SISSETON, SD | MAX | 17.8 | 24.4 | 36.6 | 53.9 | 68.3 | 77.4 | 84.2 | 82.7 | 73.1 | 61.4 | 41.1 | 26.8 | 54.0 | 52.9 | 81.4 | 58.5 | 23.0 |
| | MIN | -3.0 | 4.0 | 16.2 | 32.4 | 44.0 | 54.5 | 59.9 | 57.9 | 46.9 | 36.1 | 20.7 | 7.2 | 31.4 | 30.8 | 57.4 | 34.6 | 2.8 |
| | AVE | 7.4 | 14.2 | 26.4 | 43.1 | 56.2 | 65.9 | 72.1 | 70.3 | 60.0 | 48.8 | 30.9 | 17.0 | 42.7 | 41.9 | 69.4 | 46.6 | 12.9 |
| WATERTOWN FAA AP, SD | MAX | 17.6 | 24.5 | 35.4 | 52.5 | 67.3 | 76.6 | 83.6 | 81.8 | 71.2 | 59.1 | 38.7 | 25.4 | 52.9 | 51.7 | 80.7 | 56.7 | 22.5 |
| | MIN | -3.7 | 3.4 | 15.3 | 32.2 | 43.6 | 54.5 | 59.5 | 57.3 | 46.9 | 35.3 | 19.7 | 6.8 | 30.9 | 30.3 | 57.1 | 34.0 | 2.1 |
| | AVE | 7.0 | 13.9 | 25.4 | 42.3 | 55.4 | 65.6 | 71.6 | 69.6 | 59.1 | 47.2 | 29.7 | 16.1 | 41.9 | 41.0 | 68.9 | 45.3 | 12.3 |
| WEBSTER, SD | MAX | 16.4 | 22.7 | 34.9 | 52.2 | 66.4 | 75.8 | 82.8 | 81.5 | 71.0 | 58.6 | 39.2 | 25.2 | 52.2 | 51.2 | 80.0 | 56.3 | 21.4 |
| | MIN | -4.9 | 2.3 | 14.0 | 30.9 | 42.7 | 53.0 | 58.5 | 56.6 | 44.8 | 33.9 | 18.0 | 5.4 | 29.6 | 29.2 | 56.0 | 32.2 | .9 |
| | AVE | 5.7 | 12.6 | 24.5 | 41.5 | 54.5 | 64.4 | 70.6 | 69.0 | 58.0 | 46.2 | 28.6 | 15.3 | 40.9 | 40.2 | 68.0 | 44.3 | 11.2 |
| WENTWORTH 2 WNW, SD | MAX | 20.6 | 26.8 | 38.0 | 55.6 | 69.0 | 78.3 | 84.7 | 82.4 | 73.0 | 61.6 | 42.8 | 28.3 | 55.1 | 54.2 | 81.8 | 59.1 | 25.2 |
| | MIN | -1.0 | 5.9 | 17.1 | 33.0 | 44.4 | 55.0 | 60.0 | 57.6 | 47.2 | 36.2 | 21.0 | 8.7 | 32.1 | 31.5 | 57.5 | 34.8 | 4.6 |
| | AVE | 9.8 | 16.4 | 27.5 | 44.3 | 56.8 | 66.6 | 72.4 | 70.0 | 60.1 | 48.9 | 31.9 | 18.5 | 43.6 | 42.9 | 69.7 | 47.0 | 14.9 |

Appendix Table 1. Normal monthly, annual, and seasonal temperatures, °F, adjusted to an 8 a.m. observation time, 1951-1980, Minnesota.

| STATION NAME | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | ANN | SPR | SUM | FAL | WIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AMERY, WI | MAX | 17.7 | 24.0 | 35.6 | 52.9 | 66.7 | 75.5 | 80.9 | 78.5 | 68.9 | 58.0 | 39.9 | 25.2 | 52.0 | 51.8 | 78.3 | 55.6 | 22.3 |
| | MIN | -4.4 | .4 | 14.3 | 32.1 | 43.5 | 53.0 | 57.9 | 55.6 | 46.2 | 35.9 | 21.5 | 6.6 | 30.2 | 30.0 | 55.5 | 34.5 | .8 |
| | AVE | 6.7 | 12.3 | 25.0 | 42.6 | 55.2 | 64.2 | 69.5 | 67.0 | 57.6 | 47.0 | 30.7 | 15.9 | 41.1 | 40.9 | 66.9 | 45.1 | 11.6 |
| BLAIR, WI | MAX | 21.1 | 27.3 | 38.5 | 55.3 | 68.8 | 77.6 | 82.6 | 80.1 | 71.2 | 60.1 | 42.7 | 28.2 | 54.5 | 54.2 | 80.1 | 58.0 | 25.5 |
| | MIN | -.8 | 4.1 | 16.7 | 33.0 | 43.6 | 53.4 | 58.0 | 55.8 | 46.4 | 36.1 | 23.1 | 9.7 | 31.6 | 31.1 | 55.8 | 35.2 | 4.3 |
| | AVE | 10.1 | 15.7 | 27.6 | 44.2 | 56.2 | 65.5 | 70.4 | 68.0 | 58.8 | 48.1 | 33.0 | 19.0 | 43.0 | 42.7 | 67.9 | 46.6 | 14.9 |
| CUMBERLAND, WI | MAX | 17.1 | 23.7 | 35.4 | 52.5 | 66.5 | 75.4 | 80.6 | 77.8 | 67.9 | 56.9 | 38.8 | 24.5 | 51.4 | 51.4 | 77.9 | 54.6 | 21.7 |
| | MIN | -3.6 | .9 | 13.7 | 31.7 | 43.9 | 54.0 | 59.3 | 56.8 | 47.5 | 36.8 | 21.8 | 7.2 | 30.8 | 29.8 | 56.7 | 35.4 | 1.5 |
| | AVE | 6.8 | 12.3 | 24.6 | 42.1 | 55.2 | 64.7 | 70.0 | 67.3 | 57.6 | 46.9 | 30.4 | 15.9 | 41.1 | 40.6 | 67.3 | 45.0 | 11.7 |
| DANBURY, WI | MAX | 17.7 | 24.6 | 36.3 | 52.8 | 67.0 | 74.9 | 80.4 | 77.6 | 67.9 | 57.4 | 39.2 | 24.9 | 51.7 | 52.0 | 77.6 | 54.8 | 22.4 |
| | MIN | -6.6 | -1.5 | 12.1 | 29.0 | 39.6 | 49.6 | 55.2 | 52.8 | 44.0 | 33.5 | 19.4 | 4.6 | 27.6 | 26.8 | 52.5 | 32.3 | -1.2 |
| | AVE | 5.5 | 11.6 | 24.2 | 40.9 | 53.3 | 62.3 | 67.8 | 65.2 | 56.0 | 45.5 | 29.3 | 14.8 | 39.7 | 39.5 | 65.1 | 43.6 | 10.6 |
| EAU CLAIRE FAA, WI | MAX | 19.0 | 25.7 | 36.7 | 54.3 | 68.6 | 77.1 | 82.5 | 79.7 | 70.3 | 59.2 | 40.9 | 26.4 | 53.4 | 53.2 | 79.8 | 56.8 | 23.7 |
| | MIN | -1.6 | 3.5 | 16.2 | 33.4 | 45.0 | 54.9 | 59.7 | 57.3 | 48.1 | 37.2 | 22.9 | 8.7 | 32.1 | 31.5 | 57.3 | 36.1 | 3.5 |
| | AVE | 8.7 | 14.5 | 26.5 | 43.9 | 56.8 | 66.1 | 71.2 | 68.6 | 59.3 | 48.2 | 31.9 | 17.6 | 42.8 | 42.4 | 68.6 | 46.5 | 13.6 |
| GENOA DAM, WI | MAX | 24.7 | 30.7 | 41.2 | 57.6 | 70.8 | 79.5 | 83.6 | 81.4 | 72.8 | 61.8 | 44.5 | 30.6 | 56.6 | 56.6 | 81.5 | 59.7 | 28.7 |
| | MIN | 6.5 | 11.5 | 23.8 | 38.4 | 49.2 | 58.3 | 62.6 | 60.7 | 52.8 | 43.0 | 28.9 | 15.4 | 37.6 | 37.1 | 60.5 | 41.6 | 11.1 |
| | AVE | 15.6 | 21.2 | 32.5 | 48.1 | 60.1 | 68.9 | 73.2 | 71.1 | 62.8 | 52.4 | 36.7 | 23.0 | 47.1 | 46.9 | 71.1 | 50.6 | 19.9 |
| GRANTSBURG, WI | MAX | 17.4 | 24.4 | 35.8 | 53.6 | 67.2 | 75.6 | 81.0 | 78.3 | 68.1 | 57.6 | 39.8 | 25.0 | 52.0 | 52.2 | 78.3 | 55.1 | 22.3 |
| | MIN | -6.1 | -.9 | 12.9 | 30.5 | 41.8 | 51.6 | 56.4 | 54.3 | 45.0 | 34.6 | 20.8 | 4.7 | 28.8 | 28.4 | 54.1 | 33.4 | -.8 |
| | AVE | 5.7 | 11.8 | 24.4 | 42.1 | 54.5 | 63.7 | 68.7 | 66.3 | 56.6 | 46.1 | 30.2 | 14.9 | 40.4 | 40.3 | 66.2 | 44.3 | 10.8 |
| LA CROSSE FAA AP, WI | MAX | 22.2 | 28.7 | 39.1 | 56.1 | 69.8 | 78.5 | 83.7 | 81.4 | 72.4 | 61.1 | 43.3 | 29.2 | 55.5 | 55.0 | 81.2 | 58.9 | 26.7 |
| | MIN | 3.5 | 8.7 | 20.5 | 37.4 | 48.9 | 58.3 | 63.0 | 60.8 | 52.1 | 41.3 | 27.1 | 13.6 | 36.2 | 35.6 | 60.7 | 40.2 | 8.6 |
| | AVE | 12.9 | 18.7 | 29.8 | 46.7 | 59.4 | 68.5 | 73.4 | 71.2 | 62.3 | 51.2 | 35.2 | 21.4 | 45.9 | 45.3 | 71.0 | 49.6 | 17.7 |
| MENOMONIE, WI | MAX | 20.5 | 26.5 | 38.2 | 55.4 | 69.2 | 77.9 | 83.4 | 80.5 | 71.3 | 60.4 | 42.3 | 27.8 | 54.4 | 54.3 | 80.6 | 58.0 | 24.9 |
| | MIN | -.6 | 4.6 | 16.8 | 33.4 | 44.5 | 54.4 | 59.0 | 56.8 | 47.6 | 37.4 | 23.3 | 10.0 | 32.3 | 31.6 | 56.7 | 36.2 | 4.7 |
| | AVE | 9.9 | 15.6 | 27.5 | 44.4 | 56.9 | 66.2 | 71.2 | 68.7 | 59.7 | 48.9 | 32.8 | 18.9 | 43.4 | 42.9 | 68.7 | 47.1 | 14.8 |
| MONDOVI, WI | MAX | 20.5 | 26.6 | 37.9 | 54.8 | 68.0 | 76.9 | 81.8 | 79.1 | 70.2 | 59.6 | 42.2 | 27.8 | 53.8 | 53.6 | 79.2 | 57.3 | 25.0 |
| | MIN | -1.4 | 4.0 | 16.5 | 33.2 | 44.1 | 54.5 | 58.9 | 56.7 | 47.5 | 36.8 | 22.1 | 9.0 | 31.8 | 31.3 | 56.7 | 35.5 | 3.9 |
| | AVE | 9.6 | 15.3 | 27.3 | 44.1 | 56.1 | 65.7 | 70.3 | 67.9 | 58.9 | 48.2 | 32.2 | 18.4 | 42.8 | 42.5 | 68.0 | 46.4 | 14.4 |
| RICE LAKE, WI | MAX | 17.8 | 24.2 | 35.4 | 52.5 | 66.0 | 74.6 | 80.0 | 77.3 | 67.6 | 57.3 | 39.4 | 25.0 | 51.4 | 51.3 | 77.3 | 54.8 | 22.3 |
| | MIN | -4.6 | .4 | 13.5 | 30.8 | 42.1 | 51.9 | 57.2 | 54.9 | 45.6 | 35.1 | 20.9 | 6.3 | 29.5 | 28.8 | 54.7 | 33.9 | .7 |
| | AVE | 6.6 | 12.4 | 24.5 | 41.7 | 54.0 | 63.3 | 68.7 | 66.1 | 56.7 | 46.3 | 30.2 | 15.7 | 40.5 | 40.1 | 66.0 | 44.4 | 11.6 |
| RIVER FALLS, WI | MAX | 18.6 | 24.6 | 36.4 | 53.9 | 67.5 | 76.5 | 81.7 | 78.9 | 69.5 | 58.8 | 41.0 | 26.5 | 52.8 | 52.6 | 79.1 | 56.4 | 23.3 |
| | MIN | -1.6 | 4.2 | 16.9 | 33.5 | 45.3 | 55.1 | 60.0 | 58.0 | 48.4 | 38.0 | 23.0 | 9.5 | 32.5 | 31.8 | 57.7 | 36.5 | 4.0 |
| | AVE | 8.5 | 14.4 | 26.6 | 43.8 | 56.5 | 65.8 | 70.9 | 68.4 | 59.0 | 48.4 | 32.1 | 18.1 | 42.7 | 42.3 | 68.4 | 46.5 | 13.7 |
| ST CROIX FALLS, WI | MAX | 19.3 | 26.3 | 37.4 | 54.5 | 68.8 | 77.3 | 82.8 | 80.2 | 70.7 | 59.6 | 41.0 | 26.6 | 53.7 | 53.6 | 80.1 | 57.1 | 24.1 |
| | MIN | -4.0 | 1.4 | 14.9 | 32.8 | 44.6 | 54.4 | 59.5 | 57.5 | 48.3 | 37.3 | 22.5 | 7.8 | 31.4 | 30.8 | 57.2 | 36.0 | 1.7 |
| | AVE | 7.7 | 13.9 | 26.2 | 43.7 | 56.7 | 65.9 | 71.2 | 68.9 | 59.5 | 48.5 | 31.8 | 17.2 | 42.6 | 42.2 | 68.7 | 46.6 | 12.9 |
| SOLON SPRINGS, WI | MAX | 17.9 | 24.3 | 35.9 | 51.8 | 66.4 | 75.5 | 80.9 | 77.8 | 67.6 | 56.6 | 38.2 | 24.5 | 51.4 | 51.3 | 78.1 | 54.2 | 22.2 |
| | MIN | -5.8 | -.8 | 11.8 | 28.2 | 39.0 | 48.7 | 54.7 | 52.5 | 43.8 | 33.8 | 19.4 | 4.7 | 27.5 | 26.3 | 51.9 | 32.3 | -.6 |
| | AVE | 6.0 | 11.7 | 23.9 | 40.0 | 52.7 | 62.1 | 67.8 | 65.2 | 55.7 | 45.2 | 28.9 | 14.7 | 39.5 | 38.9 | 65.0 | 43.3 | 10.8 |
| SPARTA, WI | MAX | 21.3 | 27.4 | 38.8 | 55.5 | 68.9 | 77.7 | 82.6 | 80.1 | 71.2 | 59.9 | 42.5 | 28.4 | 54.5 | 54.4 | 80.1 | 57.8 | 25.7 |
| | MIN | .8 | 5.9 | 18.1 | 34.0 | 44.7 | 54.1 | 58.6 | 56.4 | 47.5 | 37.5 | 24.2 | 11.2 | 32.8 | 32.3 | 56.4 | 36.4 | 6.0 |
| | AVE | 11.0 | 16.6 | 28.5 | 44.8 | 56.8 | 65.9 | 70.6 | 68.3 | 59.3 | 48.6 | 33.4 | 19.8 | 43.6 | 43.3 | 68.3 | 47.1 | 15.8 |
| SPOONER EXP FARM, WI | MAX | 17.7 | 24.1 | 35.6 | 52.5 | 66.0 | 74.7 | 80.0 | 77.0 | 67.3 | 56.9 | 38.9 | 24.7 | 51.3 | 51.3 | 77.2 | 54.4 | 22.1 |
| | MIN | -5.1 | -.5 | 12.8 | 30.3 | 41.3 | 51.2 | 56.4 | 53.9 | 45.0 | 35.0 | 20.4 | 5.7 | 28.9 | 28.1 | 53.8 | 33.5 | .0 |
| | AVE | 6.3 | 11.8 | 24.3 | 41.4 | 53.6 | 63.0 | 68.2 | 65.5 | 56.1 | 46.0 | 29.7 | 15.2 | 40.1 | 39.8 | 65.6 | 43.9 | 11.1 |
| SUPERIOR, WI | MAX | 18.5 | 23.9 | 33.8 | 47.0 | 59.0 | 68.8 | 76.9 | 74.5 | 65.6 | 55.5 | 38.9 | 25.3 | 49.0 | 46.6 | 73.4 | 53.3 | 22.6 |
| | MIN | -3.4 | 1.8 | 13.3 | 28.5 | 37.1 | 45.9 | 53.5 | 53.1 | 45.0 | 35.2 | 21.9 | 7.3 | 28.3 | 26.3 | 50.8 | 34.0 | 1.9 |
| | AVE | 7.5 | 12.9 | 23.6 | 37.8 | 48.1 | 57.3 | 65.3 | 63.8 | 55.4 | 45.4 | 30.4 | 16.4 | 38.7 | 36.5 | 62.1 | 43.7 | 12.3 |
| TREMPEALEAU DAM, WI | MAX | 21.8 | 27.9 | 39.0 | 55.3 | 69.2 | 78.0 | 83.0 | 80.7 | 71.9 | 60.5 | 43.3 | 29.2 | 55.0 | 54.5 | 80.6 | 58.5 | 26.3 |
| | MIN | 1.8 | 7.0 | 19.2 | 36.2 | 47.8 | 57.1 | 61.8 | 59.5 | 50.6 | 40.3 | 26.0 | 12.4 | 35.0 | 34.4 | 59.5 | 39.0 | 7.1 |
| | AVE | 11.8 | 17.5 | 29.1 | 45.8 | 58.5 | 67.6 | 72.5 | 70.2 | 61.2 | 50.5 | 34.6 | 20.9 | 45.0 | 44.5 | 70.1 | 48.8 | 16.7 |
| VIROQUA, WI | MAX | 22.7 | 29.0 | 39.4 | 56.5 | 69.2 | 77.7 | 82.2 | 80.3 | 71.7 | 60.5 | 42.9 | 28.5 | 55.1 | 55.0 | 80.1 | 58.4 | 26.7 |
| | MIN | 3.8 | 8.5 | 19.9 | 34.7 | 45.6 | 55.1 | 59.3 | 57.0 | 48.6 | 38.5 | 25.1 | 12.2 | 34.0 | 33.4 | 57.1 | 37.4 | 8.2 |
| | AVE | 13.3 | 18.8 | 29.7 | 45.6 | 57.4 | 66.4 | 70.7 | 68.7 | 60.2 | 49.6 | 34.1 | 20.4 | 44.6 | 44.2 | 68.6 | 48.0 | 17.5 |

Appendix Table 2. Normal annual degree days for selected base temperatures for the indicated time of observation, 1951-1980.

| STATION | BELOW 32 (8AM) | ABOVE 32 (8AM) | ABOVE 40 (8AM) | ABOVE 45 (8AM) | ABOVE 50 (8AM) | ABOVE 55 (8AM) | ABOVE 60 (8AM) | ABOVE 70 (8AM) | ABOVE 65 (MID) | BELOW 65 (MID) |
|---|---|---|---|---|---|---|---|---|---|---|
| ADA | 2849 | 5742 | 4030 | 3061 | 2233 | 1500 | 898 | 174 | 431 | 9522 |
| ALBERT LEA | 1916 | 6399 | 4568 | 3550 | 2627 | 1811 | 1125 | 226 | 559 | 8063 |
| ALEXANDRIA | 2607 | 5836 | 4115 | 3160 | 2305 | 1562 | 946 | 165 | 459 | 9216 |
| ARGYLE | 3235 | 5357 | 3699 | 2783 | 1970 | 1275 | 717 | 105 | 307 | 10171 |
| ARTICHOKE LAKE | 2407 | 6097 | 4325 | 3340 | 2453 | 1679 | 1033 | 206 | 511 | 8806 |
| AUSTIN | 2056 | 6101 | 4282 | 3277 | 2375 | 1591 | 942 | 162 | 435 | 8375 |
| BABBITT | 2894 | 4768 | 3172 | 2307 | 1557 | 938 | 471 | 47 | 169 | 10281 |
| BAUDETTE | 3366 | 4845 | 3245 | 2376 | 1618 | 987 | 506 | 54 | 188 | 10695 |
| BEMIDJI | 3099 | 5149 | 3513 | 2617 | 1830 | 1165 | 641 | 90 | 268 | 10203 |
| BENSON | 2329 | 6159 | 4379 | 3390 | 2501 | 1724 | 1072 | 231 | 544 | 8698 |
| BIG FALLS | 3125 | 4855 | 3236 | 2357 | 1596 | 966 | 492 | 54 | 183 | 10439 |
| BROWNS VALLEY | 2263 | 6083 | 4305 | 3320 | 2437 | 1669 | 1030 | 217 | 516 | 8681 |
| CAMBRIDGE | 2302 | 5902 | 4140 | 3163 | 2266 | 1527 | 904 | 163 | 424 | 8808 |
| CAMPBELL | 2582 | 5843 | 4101 | 3137 | 2278 | 1533 | 917 | 163 | 432 | 9155 |
| CANBY | 2061 | 6450 | 4631 | 3623 | 2715 | 1916 | 1237 | 318 | 673 | 8269 |
| CASS LAKE | 3056 | 5142 | 3494 | 2592 | 1802 | 1137 | 613 | 74 | 244 | 10143 |
| CHASKA | 2014 | 6289 | 4476 | 3470 | 2561 | 1763 | 1094 | 228 | 549 | 8258 |
| CLOQUET | 2697 | 4780 | 3150 | 2270 | 1511 | 891 | 432 | 37 | 145 | 10047 |
| COLLEGEVILLE | 2361 | 5979 | 4220 | 3244 | 2368 | 1604 | 965 | 176 | 458 | 8826 |
| CROOKSTON | 3088 | 5485 | 3812 | 2866 | 2063 | 1356 | 781 | 119 | 344 | 9931 |
| DETROIT LAKES | 2993 | 5069 | 3416 | 2507 | 1712 | 1051 | 542 | 56 | 200 | 10110 |
| DULUTH | 2618 | 4844 | 3204 | 2315 | 1544 | 909 | 440 | 36 | 145 | 9904 |
| FAIRMONT | 1889 | 6677 | 4818 | 3782 | 2644 | 2010 | 1295 | 316 | 694 | 7891 |
| FARIBAULT | 1990 | 6287 | 4462 | 3451 | 2539 | 1737 | 1065 | 210 | 523 | 8212 |
| FARMINGTON | 2124 | 6249 | 4436 | 3430 | 2523 | 1726 | 1054 | 199 | 511 | 8372 |
| FERGUS FALLS | 2615 | 5765 | 4065 | 3110 | 2256 | 1519 | 913 | 180 | 442 | 9257 |
| FOSSTON | 2974 | 5370 | 3704 | 2786 | 1973 | 1278 | 720 | 107 | 310 | 9899 |
| GLENWOOD | 2364 | 5687 | 4140 | 3170 | 2301 | 1548 | 928 | 180 | 445 | 8927 |
| GRAND MARAIS | 2139 | 4182 | 2526 | 1672 | 980 | 475 | 163 | 3 | 30 | 9972 |
| GRAND MEADOW | 1934 | 6146 | 4322 | 3314 | 2411 | 1623 | 966 | 163 | 447 | 8220 |
| GRAND RAPIDS | 2604 | 4966 | 3318 | 2423 | 1643 | 995 | 501 | 47 | 179 | 10002 |
| GULL LAKE | 2599 | 5465 | 3771 | 2841 | 2018 | 1313 | 742 | 105 | 317 | 9436 |
| HALLOCK | 3300 | 5301 | 3673 | 2773 | 1976 | 1298 | 755 | 140 | 351 | 10335 |
| HINCKLEY | 2366 | 5310 | 3601 | 2660 | 1833 | 1142 | 597 | 58 | 219 | 9280 |
| INTL FALLS | 3289 | 4873 | 3270 | 2396 | 1635 | 1004 | 523 | 60 | 200 | 10601 |
| ITASCA | 2989 | 5017 | 3382 | 2491 | 1712 | 1061 | 555 | 59 | 209 | 10166 |
| JORDAN | 2150 | 6065 | 4285 | 3287 | 2389 | 1604 | 952 | 158 | 438 | 8488 |
| LEECH LAKE | 2764 | 5169 | 3516 | 2604 | 1806 | 1133 | 605 | 70 | 235 | 9795 |
| LITCHFIELD | 2266 | 6131 | 4351 | 3363 | 2474 | 1697 | 1047 | 217 | 523 | 8643 |
| LITTLE FALLS | 2562 | 5657 | 3939 | 2991 | 2147 | 1418 | 819 | 126 | 363 | 9252 |
| LONG PRAIRIE | 2698 | 5512 | 3811 | 2872 | 2038 | 1325 | 751 | 112 | 325 | 9496 |
| MADISON | 2167 | 6277 | 4453 | 3443 | 2538 | 1749 | 1090 | 241 | 558 | 8433 |
| MAPLE PLAIN | 2150 | 6094 | 4306 | 3313 | 2420 | 1642 | 996 | 196 | 485 | 8526 |
| MARSHALL | 1951 | 6427 | 4600 | 3584 | 2666 | 1862 | 1181 | 272 | 617 | 8127 |
| MEADOWLAND | 2889 | 4842 | 3203 | 2314 | 1545 | 915 | 447 | 39 | 152 | 10184 |
| MILACA | 2363 | 5607 | 3880 | 2928 | 2081 | 1357 | 771 | 115 | 335 | 9095 |
| MILAN | 2351 | 6078 | 4305 | 3323 | 2443 | 1676 | 1035 | 220 | 521 | 8779 |
| MPLS-ST PAUL | 1922 | 6551 | 4708 | 3686 | 2764 | 1949 | 1256 | 319 | 679 | 8036 |
| MONTEVIDEO | 2139 | 6210 | 4410 | 3406 | 2502 | 1711 | 1054 | 223 | 528 | 8441 |
| MOOSE LAKE | 2680 | 4987 | 3324 | 2422 | 1639 | 992 | 504 | 54 | 165 | 9862 |
| MORA | 2419 | 5609 | 3879 | 2927 | 2081 | 1358 | 776 | 124 | 344 | 9139 |
| MORRIS | 2456 | 5925 | 4182 | 3215 | 2349 | 1596 | 970 | 188 | 472 | 8981 |
| NEW LONDON | 2322 | 5999 | 4242 | 3267 | 2394 | 1631 | 995 | 198 | 467 | 8795 |
| NEW ULM | 1939 | 6476 | 4630 | 3602 | 2672 | 1851 | 1158 | 241 | 586 | 8034 |
| OLIVIA | 2190 | 6320 | 4515 | 3508 | 2600 | 1800 | 1124 | 241 | 572 | 8427 |
| PARK RAPIDS | 2644 | 5254 | 3605 | 2692 | 1887 | 1203 | 657 | 61 | 264 | 9829 |
| PINE RIVER | 2607 | 5269 | 3602 | 2679 | 1867 | 1180 | 636 | 75 | 253 | 9616 |
| PIPESTONE | 2035 | 5970 | 4197 | 3217 | 2337 | 1580 | 954 | 176 | 454 | 8565 |
| POKEGAMA DAM | 2808 | 5693 | 3432 | 2527 | 1735 | 1074 | 561 | 57 | 209 | 9909 |
| PRESTON | 1917 | 5964 | 4145 | 3151 | 2267 | 1505 | 873 | 145 | 399 | 8337 |
| RED LAKE FALLS | 3158 | 5391 | 3725 | 2805 | 1969 | 1292 | 732 | 104 | 314 | 10066 |
| RED LAKE AGENCY | 3047 | 5171 | 3531 | 2632 | 1841 | 1173 | 644 | 86 | 266 | 10128 |
| ROCHESTER | 2013 | 6169 | 4369 | 3363 | 2459 | 1668 | 1009 | 195 | 468 | 8297 |
| ROSEAU | 3553 | 4825 | 3234 | 2366 | 1611 | 966 | 511 | 58 | 193 | 10907 |
| ROSEMOUNT | 2222 | 5976 | 4197 | 3215 | 2335 | 1568 | 931 | 162 | 432 | 8663 |
| ST CLOUD | 2415 | 5817 | 4070 | 3102 | 2236 | 1486 | 871 | 145 | 397 | 8980 |
| ST PETER | 1690 | 6452 | 4614 | 3592 | 2667 | 1848 | 1158 | 248 | 590 | 8014 |
| SANDY LAKE | 2676 | 5355 | 3482 | 2567 | 1764 | 1092 | 572 | 65 | 219 | 9727 |
| SPRINGFIELD | 1956 | 6359 | 4532 | 3516 | 2597 | 1787 | 1105 | 215 | 545 | 8127 |
| THIEF RIVER | 3235 | 5191 | 3507 | 2672 | 1882 | 1211 | 677 | 99 | 289 | 10318 |
| TRACY | 1952 | 6537 | 4526 | 3522 | 2616 | 1821 | 1151 | 267 | 600 | 8201 |
| TWO HARBORS | 2137 | 4509 | 2830 | 1954 | 1226 | 673 | 302 | 25 | 95 | 9706 |
| VIRGINIA | 2870 | 4917 | 3285 | 2396 | 1628 | 993 | 513 | 58 | 195 | 10132 |
| WADENA | 2652 | 5503 | 3810 | 2876 | 2049 | 1341 | 769 | 123 | 341 | 9476 |
| WALKER | 2759 | 5221 | 3554 | 2641 | 1839 | 1163 | 632 | 63 | 257 | 9760 |
| WARROAD | 3425 | 4835 | 3253 | 2392 | 1641 | 1014 | 551 | 60 | 263 | 10778 |
| WASECA | 2049 | 6055 | 4266 | 3276 | 2383 | 1605 | 956 | 159 | 443 | 8424 |
| WHEATON | 2331 | 6135 | 4409 | 3421 | 2536 | 1762 | 1109 | 254 | 575 | 8696 |
| WILLMAR | 2320 | 6143 | 4363 | 3373 | 2460 | 1696 | 1058 | 200 | 507 | 8688 |
| WINDOM | 2056 | 6425 | 4573 | 3545 | 2621 | 1814 | 1137 | 253 | 585 | 8153 |
| WINNEBAGO | 1947 | 6415 | 4570 | 3549 | 2632 | 1826 | 1144 | 249 | 565 | 8102 |
| WINNIBIGOSISH | 2905 | 5175 | 3520 | 2616 | 1623 | 1154 | 624 | 76 | 249 | 9964 |
| WINONA | 1665 | 6864 | 4770 | 3723 | 2761 | 1950 | 1242 | 291 | 655 | 7660 |
| WORTHINGTON | 1962 | 6275 | 4447 | 3436 | 2529 | 1737 | 1076 | 226 | 541 | 8214 |
| ZUMBROTA | 2074 | 6092 | 4263 | 3264 | 2369 | 1611 | 966 | 178 | 456 | 8425 |

Appendix Table 3. First and last dates of degree days seasons, length of season in calendar days, and total degree days during the normal season, 1951-1980, at indicated observation times.

| | DD ABOVE 32 (8AM) | | | | DD ABOVE 40 (8AM) | | | | DD ABOVE 50 (8AM) | | | | DD BELOW 65 (MID) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STATION | START | END | LEN | DD | START | END | LEN | DD | START | END | LEN | DD | START | END | LEN | DD |
| ADA | MAR 31 | NOV 7 | 222 | 5598 | APR 11 | OCT 25 | 198 | 3911 | MAY 3 | OCT 7 | 156 | 2118 | AUG 27 | JUN 13 | 291 | 9531 |
| ALBERT LEA | MAR 26 | NOV 17 | 237 | 6262 | APR 6 | NOV 1 | 210 | 4467 | APR 24 | OCT 13 | 173 | 2529 | SEP 5 | JUN 5 | 274 | 8105 |
| ALEXANDRIA | APR 1 | NOV 9 | 223 | 5697 | APR 12 | OCT 26 | 198 | 4000 | MAY 2 | OCT 6 | 160 | 2198 | AUG 28 | JUN 11 | 286 | 9237 |
| ARGYLE | APR 3 | NOV 5 | 217 | 5227 | APR 14 | OCT 23 | 193 | 3589 | MAY 8 | OCT 2 | 148 | 1850 | AUG 19 | JUN 16 | 302 | 10176 |
| ARTICHOKE LAKE | MAR 30 | NOV 12 | 228 | 5946 | APR 9 | OCT 28 | 203 | 4209 | APR 29 | OCT 10 | 165 | 2348 | SEP 1 | JUN 9 | 282 | 8836 |
| AUSTIN | MAR 27 | NOV 16 | 235 | 5948 | APR 7 | OCT 30 | 207 | 4164 | APR 26 | OCT 11 | 169 | 2273 | AUG 30 | JUN 9 | 284 | 8395 |
| BABBITT | APR 5 | NOV 4 | 214 | 4675 | APR 19 | OCT 20 | 185 | 3082 | MAY 16 | SEP 26 | 134 | 1435 | JUL 1 | JUN 30 | 365 | 10360 |
| BAUDETTE | APR 6 | NOV 3 | 212 | 4728 | APR 18 | OCT 20 | 186 | 3144 | MAY 16 | SEP 27 | 135 | 1496 | JUL 15 | JUN 27 | 348 | 10736 |
| BEMIDJI | APR 4 | NOV 4 | 215 | 5022 | APR 16 | OCT 22 | 190 | 3408 | MAY 13 | SEP 30 | 141 | 1704 | AUG 9 | JUN 20 | 316 | 10218 |
| BENSON | MAR 28 | NOV 12 | 230 | 6013 | APR 8 | OCT 26 | 204 | 4261 | APR 27 | OCT 10 | 167 | 2399 | SEP 1 | JUN 6 | 281 | 8729 |
| BIG FALLS | APR 4 | NOV 3 | 214 | 4732 | APR 17 | OCT 20 | 187 | 3127 | MAY 16 | SEP 26 | 134 | 1467 | JUL 10 | JUN 29 | 355 | 10493 |
| BROWNS VALLEY | MAR 28 | NOV 12 | 230 | 5963 | APR 8 | OCT 29 | 205 | 4212 | APR 28 | OCT 11 | 167 | 2350 | SEP 2 | JUN 10 | 282 | 8710 |
| CAMBRIDGE | MAR 29 | NOV 12 | 229 | 5775 | APR 9 | OCT 28 | 203 | 4036 | APR 28 | OCT 8 | 164 | 2165 | AUG 26 | JUN 11 | 290 | 8829 |
| CAMPBELL | MAR 29 | NOV 9 | 226 | 5702 | APR 9 | OCT 26 | 201 | 3986 | MAY 2 | OCT 6 | 158 | 2165 | AUG 29 | JUN 10 | 286 | 9176 |
| CANBY | MAR 27 | NOV 15 | 234 | 6284 | APR 7 | OCT 31 | 208 | 4508 | APR 26 | OCT 13 | 171 | 2600 | SEP 6 | JUN 6 | 274 | 8294 |
| CASS LAKE | APR 3 | NOV 6 | 218 | 5017 | APR 15 | OCT 22 | 191 | 3379 | MAY 14 | SEP 29 | 139 | 1670 | AUG 3 | JUN 19 | 321 | 10160 |
| CHASKA | MAR 26 | NOV 16 | 236 | 6182 | APR 6 | OCT 31 | 209 | 4393 | APR 24 | OCT 12 | 172 | 2479 | SEP 3 | JUN 6 | 277 | 8294 |
| CLOQUET | APR 4 | NOV 6 | 217 | 4684 | APR 18 | OCT 21 | 187 | 3064 | MAY 20 | SEP 28 | 132 | 1401 | JUL 1 | JUN 30 | 365 | 10126 |
| COLLEGEVILLE | MAR 30 | NOV 12 | 228 | 5845 | APR 10 | OCT 28 | 202 | 4109 | APR 29 | OCT 9 | 164 | 2259 | AUG 29 | JUN 10 | 286 | 8857 |
| CROOKSTON | APR 2 | NOV 5 | 218 | 5354 | APR 14 | OCT 23 | 193 | 3697 | MAY 8 | OCT 4 | 150 | 1946 | AUG 24 | JUN 15 | 296 | 9951 |
| DETROIT LAKES | APR 3 | NOV 5 | 217 | 4966 | APR 15 | OCT 22 | 191 | 3325 | MAY 13 | SEP 30 | 141 | 1619 | AUG 5 | JUN 22 | 322 | 10126 |
| DULUTH | APR 4 | NOV 7 | 218 | 4745 | APR 18 | OCT 23 | 189 | 3115 | MAY 19 | OCT 1 | 136 | 1427 | JUL 1 | JUN 30 | 365 | 9963 |
| FAIRMONT | MAR 25 | NOV 19 | 240 | 6515 | APR 5 | NOV 2 | 212 | 4694 | APR 21 | OCT 15 | 178 | 2740 | SEP 9 | JUN 3 | 268 | 7920 |
| FARIBAULT | MAR 26 | NOV 17 | 237 | 6164 | APR 6 | OCT 31 | 209 | 4368 | APR 24 | OCT 13 | 173 | 2451 | SEP 3 | JUN 7 | 278 | 8244 |
| FARMINGTON | MAR 27 | NOV 16 | 235 | 6108 | APR 7 | OCT 31 | 208 | 4326 | APR 24 | OCT 11 | 171 | 2415 | SEP 1 | JUN 7 | 280 | 8407 |
| FERGUS FALLS | MAR 31 | NOV 9 | 224 | 5665 | APR 11 | OCT 26 | 199 | 3968 | MAY 2 | OCT 7 | 159 | 2156 | AUG 28 | JUN 11 | 288 | 9266 |
| FOSSTON | APR 2 | NOV 6 | 219 | 5246 | APR 14 | OCT 23 | 193 | 3566 | MAY 9 | OCT 3 | 148 | 1840 | AUG 18 | JUN 17 | 304 | 9912 |
| GLENWOOD | MAR 30 | NOV 12 | 228 | 5768 | APR 10 | OCT 26 | 202 | 4041 | MAY 1 | OCT 8 | 161 | 2195 | AUG 28 | JUN 11 | 288 | 8946 |
| GRAND MARAIS | APR 4 | NOV 11 | 222 | 4101 | APR 22 | OCT 23 | 185 | 2467 | JUN 3 | SEP 27 | 117 | 922 | JUL 1 | JUN 30 | 365 | 10044 |
| GRAND MEADOW | MAR 26 | NOV 17 | 237 | 6011 | APR 6 | NOV 1 | 210 | 4220 | APR 25 | OCT 11 | 170 | 2311 | AUG 31 | JUN 8 | 282 | 8244 |
| GRAND RAPIDS | APR 3 | NOV 6 | 218 | 4855 | APR 16 | OCT 22 | 190 | 3221 | MAY 14 | SEP 29 | 139 | 1527 | JUL 18 | JUN 26 | 344 | 10039 |
| GULL LAKE | APR 2 | NOV 9 | 222 | 5347 | APR 14 | OCT 25 | 195 | 3672 | MAY 9 | OCT 5 | 150 | 1900 | AUG 19 | JUN 15 | 301 | 9459 |
| HALLOCK | APR 4 | NOV 4 | 215 | 5189 | APR 15 | OCT 21 | 190 | 3566 | MAY 9 | SEP 30 | 145 | 1650 | AUG 17 | JUN 15 | 303 | 10331 |
| HINCKLEY | MAR 30 | NOV 10 | 226 | 5229 | APR 11 | OCT 25 | 198 | 3527 | MAY 7 | OCT 2 | 149 | 1747 | AUG 12 | JUN 19 | 312 | 9306 |
| INTL FALLS | APR 5 | NOV 3 | 213 | 4764 | APR 17 | OCT 20 | 187 | 3172 | MAY 16 | SEP 27 | 135 | 1509 | JUL 20 | JUN 25 | 341 | 10633 |
| ITASCA | APR 4 | NOV 4 | 215 | 4893 | APR 17 | OCT 22 | 189 | 3279 | MAY 15 | SEP 30 | 139 | 1595 | JUL 29 | JUN 23 | 330 | 10193 |
| JORDAN | MAR 27 | NOV 15 | 234 | 5947 | APR 7 | OCT 30 | 207 | 4177 | APR 25 | OCT 10 | 169 | 2283 | AUG 28 | JUN 9 | 286 | 8523 |
| LEECH LAKE | APR 3 | NOV 6 | 218 | 5044 | APR 15 | OCT 23 | 192 | 3407 | MAY 13 | OCT 2 | 143 | 1666 | AUG 6 | JUN 20 | 319 | 9818 |
| LITCHFIELD | MAR 28 | NOV 13 | 231 | 5992 | APR 9 | OCT 29 | 204 | 4236 | APR 28 | OCT 11 | 167 | 2357 | AUG 31 | JUN 6 | 282 | 8669 |
| LITTLE FALLS | MAR 31 | NOV 10 | 225 | 5537 | APR 11 | OCT 26 | 199 | 3838 | MAY 4 | OCT 6 | 156 | 2038 | AUG 22 | JUN 13 | 296 | 9261 |
| LONG PRAIRIE | APR 1 | NOV 8 | 222 | 5380 | APR 12 | OCT 25 | 197 | 3701 | MAY 7 | OCT 4 | 151 | 1915 | AUG 19 | JUN 15 | 301 | 9517 |
| MADISON | MAR 26 | NOV 14 | 232 | 6075 | APR 8 | OCT 29 | 205 | 4308 | APR 27 | OCT 11 | 168 | 2424 | SEP 1 | JUN 7 | 280 | 8462 |
| MAPLE PLAIN | MAR 27 | NOV 15 | 234 | 5970 | APR 7 | OCT 30 | 207 | 4202 | APR 26 | OCT 10 | 168 | 2310 | AUG 30 | JUN 9 | 284 | 8543 |
| MARSHALL | MAR 26 | NOV 16 | 236 | 6283 | APR 6 | OCT 31 | 209 | 4490 | APR 24 | OCT 12 | 172 | 2565 | SEP 5 | JUN 5 | 274 | 8160 |
| MEADOWLAND | APR 4 | NOV 5 | 216 | 4708 | APR 17 | OCT 21 | 188 | 3093 | MAY 17 | SEP 28 | 135 | 1427 | JUL 6 | JUL 5 | 365 | 10263 |
| MILACA | MAR 30 | NOV 11 | 227 | 5504 | APR 10 | OCT 26 | 200 | 3794 | MAY 3 | OCT 5 | 156 | 1963 | AUG 22 | JUN 15 | 296 | 9119 |
| MILAN | MAR 28 | NOV 12 | 230 | 5931 | APR 9 | OCT 28 | 203 | 4185 | APR 29 | OCT 9 | 164 | 2332 | AUG 31 | JUN 6 | 282 | 8800 |
| MPLS-ST PAUL | MAR 25 | NOV 18 | 239 | 6412 | APR 5 | NOV 1 | 211 | 4602 | APR 22 | OCT 13 | 175 | 2663 | SEP 7 | JUN 5 | 272 | 8060 |
| MONTEVIDEO | MAR 27 | NOV 14 | 233 | 6094 | APR 7 | OCT 30 | 207 | 4316 | APR 25 | OCT 12 | 171 | 2416 | SEP 1 | JUN 7 | 280 | 8467 |
| MOOSE LAKE | APR 2 | NOV 8 | 221 | 4878 | APR 16 | OCT 23 | 191 | 3231 | MAY 17 | OCT 1 | 138 | 1527 | JUL 25 | JUN 29 | 340 | 9900 |
| MORA | MAR 30 | NOV 10 | 226 | 5495 | APR 11 | OCT 26 | 199 | 3786 | MAY 3 | OCT 6 | 157 | 1988 | AUG 21 | JUN 15 | 299 | 9157 |
| MORRIS | MAR 29 | NOV 11 | 228 | 5807 | APR 9 | OCT 27 | 202 | 4076 | APR 30 | OCT 7 | 161 | 2241 | AUG 30 | JUN 9 | 284 | 9000 |
| NEW LONDON | MAR 29 | NOV 12 | 229 | 5887 | APR 10 | OCT 29 | 203 | 4150 | APR 29 | OCT 10 | 165 | 2302 | AUG 30 | JUN 9 | 284 | 8624 |
| NEW ULM | MAR 25 | NOV 16 | 239 | 6343 | APR 5 | NOV 1 | 211 | 4520 | APR 22 | OCT 14 | 176 | 2579 | SEP 5 | JUN 5 | 274 | 8076 |
| OLIVIA | MAR 27 | NOV 14 | 233 | 6167 | APR 7 | OCT 30 | 207 | 4391 | APR 25 | OCT 12 | 171 | 2489 | SEP 3 | JUN 6 | 277 | 8456 |
| PARK RAPIDS | APR 2 | NOV 6 | 219 | 5166 | APR 14 | OCT 23 | 193 | 3517 | MAY 10 | OCT 2 | 146 | 1786 | AUG 17 | JUN 18 | 306 | 9849 |
| PINE RIVER | APR 2 | NOV 9 | 222 | 5171 | APR 15 | OCT 25 | 194 | 3505 | MAY 10 | OCT 3 | 147 | 1759 | AUG 10 | JUN 19 | 314 | 9643 |
| PIPESTONE | MAR 27 | NOV 12 | 231 | 5871 | APR 8 | OCT 28 | 204 | 4114 | APR 29 | OCT 8 | 163 | 2256 | AUG 31 | JUN 9 | 283 | 8599 |
| POKEGAMA DAM | APR 2 | NOV 7 | 220 | 4981 | APR 15 | OCT 23 | 192 | 3332 | MAY 14 | SEP 30 | 140 | 1612 | JUL 29 | JUN 23 | 330 | 9939 |
| PRESTON | MAR 26 | NOV 16 | 236 | 5817 | APR 7 | OCT 30 | 207 | 4039 | APR 28 | OCT 9 | 165 | 2170 | AUG 27 | JUN 11 | 289 | 8356 |
| RED LAKE FALLS | APR 3 | NOV 5 | 217 | 5252 | APR 14 | OCT 23 | 193 | 3606 | MAY 8 | OCT 4 | 150 | 1666 | AUG 18 | JUN 17 | 304 | 10089 |
| RED LAKE AGENCY | APR 4 | NOV 6 | 217 | 5047 | APR 17 | OCT 23 | 190 | 3422 | MAY 13 | SEP 30 | 141 | 1706 | AUG 10 | JUN 19 | 314 | 10141 |
| ROCHESTER | MAR 27 | NOV 16 | 235 | 6039 | APR 7 | OCT 31 | 208 | 4261 | APR 25 | OCT 11 | 170 | 2356 | SEP 1 | JUN 8 | 281 | 8315 |
| ROSEAU | APR 6 | NOV 1 | 210 | 4695 | APR 18 | OCT 19 | 185 | 3119 | MAY 17 | SEP 26 | 133 | 1475 | JUL 12 | JUN 27 | 351 | 10956 |
| ROSEMOUNT | MAR 28 | NOV 14 | 232 | 5845 | APR 8 | OCT 29 | 205 | 4094 | APR 29 | OCT 9 | 164 | 2226 | AUG 28 | JUN 10 | 287 | 8692 |
| ST CLOUD | MAR 30 | NOV 10 | 226 | 5684 | APR 10 | OCT 27 | 201 | 3965 | APR 29 | OCT 8 | 163 | 2137 | AUG 25 | JUN 12 | 292 | 9004 |
| ST PETER | MAR 25 | NOV 18 | 239 | 6339 | APR 5 | NOV 2 | 212 | 4527 | APR 22 | OCT 13 | 175 | 2579 | SEP 5 | JUN 5 | 274 | 8054 |
| SANDY LAKE | APR 2 | NOV 8 | 221 | 5044 | APR 15 | OCT 24 | 193 | 3366 | MAY 12 | OCT 2 | 144 | 1651 | JUL 31 | JUN 22 | 327 | 9748 |
| SPRINGFIELD | MAR 26 | NOV 17 | 237 | 6241 | APR 6 | NOV 1 | 210 | 4439 | APR 23 | OCT 13 | 174 | 2512 | SEP 3 | JUN 4 | 275 | 8168 |
| THIEF RIVER | APR 4 | NOV 3 | 214 | 5083 | APR 16 | OCT 21 | 189 | 3463 | MAY 11 | OCT 1 | 144 | 1764 | AUG 16 | JUN 19 | 308 | 10325 |
| TRACY | MAR 26 | NOV 16 | 236 | 6224 | APR 7 | OCT 31 | 208 | 4437 | APR 25 | OCT 12 | 171 | 2526 | SEP 4 | JUN 5 | 275 | 8230 |
| TWO HARBORS | APR 3 | NOV 13 | 225 | 4411 | APR 20 | OCT 25 | 189 | 2760 | MAY 31 | OCT 1 | 124 | 1146 | JUL 1 | JUN 30 | 365 | 9765 |
| VIRGINIA | APR 3 | NOV 5 | 217 | 4812 | APR 17 | OCT 21 | 188 | 3190 | MAY 15 | SEP 28 | 137 | 1511 | JUL 18 | JUN 27 | 345 | 10172 |
| WADENA | APR 1 | NOV 6 | 222 | 5396 | APR 12 | OCT 24 | 196 | 3716 | MAY 6 | OCT 4 | 152 | 1946 | AUG 22 | JUN 15 | 298 | 9491 |
| WALKER | APR 2 | NOV 7 | 220 | 5108 | APR 15 | OCT 24 | 193 | 3455 | MAY 11 | OCT 2 | 145 | 1717 | AUG 11 | JUN 21 | 315 | 9795 |
| WARROAD | APR 7 | NOV 2 | 210 | 4720 | APR 21 | OCT 20 | 183 | 3150 | MAY 18 | SEP 27 | 133 | 1519 | JUL 21 | JUN 25 | 340 | 10811 |
| WASECA | MAR 27 | NOV 16 | 235 | 5957 | APR 7 | OCT 30 | 207 | 4187 | APR 26 | OCT 10 | 168 | 2299 | AUG 30 | JUN 8 | 283 | 8458 |
| WHEATON | MAR 28 | NOV 12 | 230 | 6035 | APR 8 | OCT 29 | 205 | 4287 | APR 29 | OCT 11 | 166 | 2426 | SEP 3 | JUN 8 | 279 | 8722 |
| WILLMAR | MAR 29 | NOV 13 | 230 | 6002 | APR 9 | OCT 29 | 204 | 4247 | APR 27 | OCT 11 | 168 | 2374 | SEP 1 | JUN 8 | 281 | 8702 |
| WINDOM | MAR 26 | NOV 18 | 238 | 6226 | APR 7 | OCT 31 | 208 | 4410 | APR 25 | OCT 12 | 171 | 2496 | SEP 3 | JUN 6 | 277 | 8183 |
| WINNEBAGO | MAR 25 | NOV 18 | 239 | 6258 | APR 6 | NOV 1 | 210 | 4445 | APR 23 | OCT 13 | 174 | 2527 | SEP 4 | JUN 5 | 275 | 8129 |
| WINNIBIGOSISH | APR 4 | NOV 5 | 216 | 5038 | APR 16 | OCT 22 | 190 | 3414 | MAY 13 | OCT 1 | 142 | 1705 | AUG 10 | JUN 19 | 314 | 9985 |
| WINONA | MAR 22 | NOV 22 | 246 | 6514 | APR 3 | NOV 5 | 217 | 4661 | APR 20 | OCT 15 | 179 | 2677 | SEP 7 | JUN 4 | 271 | 7687 |
| WORTHINGTON | MAR 26 | NOV 16 | 236 | 6116 | APR 6 | OCT 31 | 209 | 4325 | APR 25 | OCT 11 | 170 | 2421 | SEP 2 | JUN 7 | 279 | 8239 |
| ZUMBROTA | MAR 27 | NOV 16 | 235 | 5949 | APR 7 | OCT 30 | 207 | 4173 | APR 27 | OCT 11 | 168 | 2265 | AUG 30 | JUN 9 | 284 | 8450 |

DEGREE DAY SEASONS ARE TAKEN AS THE TIME PERIOD FOR WHICH THE AVERAGE DAILY TEMPERATURE EQUALS OR EXCEEDS THE BASE TEMPERATURE USED FOR DEGREE DAY CALCULATIONS ABOVE THAT BASE, OR AS THE TIME PERIOD WHEN TEMPERATURE IS BELOW THE BASE FOR DEGREE DAY SUMMATIONS BELOW THE BASE.

Appendix Table 4. Normal total growing degree days, $T_b$ = 40°F, at selected dates and adjusted to an 8 a.m. observation time.

| | APRIL | | | MAY | | | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 |
| ADA | 29 | 80 | 160 | 275 | 426 | 633 | 852 | 1098 | 1366 | 1653 | 1955 | 2297 | 2604 | 2892 | 3174 | 3391 | 3570 | 3715 | 3828 | 3910 | 3967 |
| ALBERT LEA | 38 | 103 | 202 | 339 | 516 | 755 | 1008 | 1288 | 1590 | 1907 | 2233 | 2596 | 2918 | 3223 | 3526 | 3766 | 3973 | 4148 | 4291 | 4400 | 4478 |
| ALEXANDRIA FAA AP | 28 | 77 | 158 | 275 | 430 | 641 | 866 | 1118 | 1393 | 1689 | 2000 | 2351 | 2662 | 2954 | 3239 | 3460 | 3643 | 3793 | 3910 | 3995 | 4053 |
| ARGYLE 4 E | 22 | 63 | 132 | 235 | 376 | 572 | 784 | 1019 | 1273 | 1542 | 1824 | 2143 | 2430 | 2699 | 2960 | 3156 | 3314 | 3438 | 3534 | 3605 | 3653 |
| ARTICHOKE LAKE | 32 | 88 | 175 | 290 | 462 | 684 | 819 | 1181 | 1468 | 1774 | 2094 | 2454 | 2774 | 3074 | 3370 | 3601 | 3797 | 3959 | 4087 | 4182 | 4247 |
| AUSTIN 3 S | 39 | 101 | 194 | 321 | 485 | 708 | 944 | 1208 | 1492 | 1791 | 2098 | 2437 | 2738 | 3022 | 3306 | 3532 | 3726 | 3890 | 4022 | 4120 | 4189 |
| BABBITT 2 SE | 9 | 34 | 84 | 166 | 282 | 449 | 631 | 837 | 1063 | 1308 | 1566 | 1858 | 2114 | 2349 | 2570 | 2732 | 2862 | 2965 | 3047 | 3109 | 3151 |
| BAUDETTE | 14 | 43 | 95 | 178 | 296 | 464 | 648 | 859 | 1091 | 1342 | 1607 | 1903 | 2164 | 2404 | 2631 | 2799 | 2933 | 3038 | 3118 | 3176 | 3215 |
| BEMIDJI AP | 17 | 52 | 112 | 204 | 331 | 511 | 708 | 932 | 1179 | 1446 | 1728 | 2044 | 2322 | 2579 | 2824 | 3007 | 3156 | 3273 | 3364 | 3430 | 3474 |
| BENSON | 35 | 94 | 186 | 315 | 484 | 713 | 955 | 1223 | 1513 | 1822 | 2145 | 2507 | 2829 | 3131 | 3428 | 3658 | 3852 | 4011 | 4138 | 4232 | 4297 |
| BIG FALLS | 15 | 46 | 99 | 181 | 298 | 465 | 649 | 860 | 1090 | 1339 | 1600 | 1893 | 2153 | 2392 | 2617 | 2781 | 2912 | 3015 | 3097 | 3158 | 3202 |
| BROWNS VALLEY | 31 | 86 | 172 | 294 | 454 | 672 | 903 | 1163 | 1447 | 1751 | 2070 | 2431 | 2755 | 3059 | 3358 | 3591 | 3787 | 3948 | 4078 | 4174 | 4240 |
| CAMBRIDGE ST HOSP | 31 | 87 | 175 | 300 | 463 | 680 | 910 | 1164 | 1441 | 1737 | 2045 | 2390 | 2694 | 2977 | 3253 | 3468 | 3650 | 3801 | 3922 | 4012 | 4074 |
| CAMPBELL | 32 | 85 | 166 | 282 | 436 | 649 | 878 | 1133 | 1409 | 1700 | 2004 | 2346 | 2655 | 2947 | 3234 | 3454 | 3635 | 3780 | 3892 | 3974 | 4031 |
| CANBY | 40 | 104 | 200 | 332 | 503 | 737 | 987 | 1266 | 1569 | 1891 | 2226 | 2602 | 2939 | 3256 | 3569 | 3814 | 4023 | 4199 | 4342 | 4452 | 4530 |
| CASS LAKE | 21 | 58 | 118 | 208 | 332 | 510 | 708 | 934 | 1182 | 1446 | 1721 | 2028 | 2302 | 2558 | 2803 | 2987 | 3134 | 3248 | 3337 | 3403 | 3448 |
| CHASKA | 35 | 99 | 197 | 334 | 511 | 749 | 998 | 1275 | 1572 | 1886 | 2212 | 2575 | 2897 | 3199 | 3496 | 3730 | 3930 | 4098 | 4234 | 4337 | 4408 |
| CLOQUET FOR RES CEN | 11 | 36 | 83 | 156 | 260 | 410 | 578 | 774 | 997 | 1243 | 1505 | 1800 | 2059 | 2296 | 2522 | 2692 | 2830 | 2940 | 3025 | 3086 | 3126 |
| COLLEGEVILLE ST JOHN | 32 | 88 | 176 | 301 | 464 | 683 | 914 | 1171 | 1450 | 1748 | 2060 | 2410 | 2721 | 3014 | 3300 | 3522 | 3710 | 3865 | 3991 | 4085 | 4151 |
| CROOKSTON NW EXP STA | 23 | 64 | 132 | 234 | 374 | 570 | 782 | 1020 | 1280 | 1557 | 1849 | 2180 | 2478 | 2758 | 3030 | 3236 | 3403 | 3535 | 3638 | 3712 | 3763 |
| DETROIT LAKES 1 NNE | 17 | 51 | 109 | 197 | 321 | 497 | 690 | 910 | 1151 | 1408 | 1680 | 1985 | 2259 | 2514 | 2759 | 2941 | 3086 | 3198 | 3282 | 3343 | 3384 |
| DULUTH WSO | 12 | 39 | 88 | 165 | 270 | 420 | 587 | 781 | 1001 | 1244 | 1504 | 1797 | 2058 | 2295 | 2525 | 2700 | 2846 | 2965 | 3059 | 3128 | 3174 |
| FAIRMONT | 46 | 120 | 230 | 380 | 571 | 826 | 1092 | 1384 | 1695 | 2021 | 2356 | 2727 | 3058 | 3371 | 3684 | 3936 | 4155 | 4343 | 4497 | 4614 | 4699 |
| FARIBAULT | 38 | 103 | 201 | 336 | 508 | 740 | 986 | 1259 | 1555 | 1866 | 2189 | 2545 | 2861 | 3159 | 3453 | 3688 | 3892 | 4065 | 4205 | 4311 | 4384 |
| FARMINGTON 3 NW | 39 | 106 | 206 | 344 | 520 | 754 | 1000 | 1270 | 1561 | 1867 | 2184 | 2538 | 2853 | 3149 | 3441 | 3671 | 3867 | 4034 | 4170 | 4274 | 4349 |
| FERGUS FALLS | 25 | 72 | 150 | 265 | 420 | 632 | 858 | 1109 | 1382 | 1675 | 1983 | 2331 | 2642 | 2934 | 3218 | 3435 | 3614 | 3760 | 3874 | 3957 | 4014 |
| FOSSTON | 23 | 66 | 136 | 238 | 374 | 565 | 771 | 1002 | 1255 | 1525 | 1810 | 2133 | 2422 | 2691 | 2949 | 3143 | 3300 | 3427 | 3528 | 3605 | 3658 |
| GLENWOOD | 28 | 79 | 161 | 281 | 438 | 653 | 881 | 1135 | 1411 | 1707 | 2017 | 2366 | 2677 | 2968 | 3252 | 3471 | 3656 | 3807 | 3927 | 4017 | 4078 |
| GRAND MARAIS | 4 | 16 | 41 | 82 | 144 | 237 | 347 | 482 | 644 | 832 | 1043 | 1291 | 1517 | 1732 | 1942 | 2104 | 2237 | 2341 | 2419 | 2472 | 2507 |
| GRAND MEADOW | 37 | 100 | 195 | 326 | 494 | 721 | 961 | 1226 | 1511 | 1808 | 2116 | 2456 | 2759 | 3046 | 3331 | 3558 | 3754 | 3919 | 4054 | 4157 | 4231 |
| GRAND RAPIDS NC SCHL | 17 | 50 | 107 | 195 | 318 | 488 | 675 | 888 | 1122 | 1375 | 1641 | 1939 | 2201 | 2443 | 2672 | 2843 | 2981 | 3091 | 3178 | 3241 | 3285 |
| GULL LAKE DAM | 20 | 59 | 126 | 227 | 364 | 558 | 767 | 1004 | 1265 | 1544 | 1838 | 2166 | 2457 | 2727 | 2988 | 3188 | 3353 | 3487 | 3594 | 3673 | 3726 |
| HALLOCK | 20 | 61 | 129 | 231 | 369 | 563 | 774 | 1011 | 1270 | 1546 | 1833 | 2156 | 2443 | 2710 | 2966 | 3159 | 3313 | 3434 | 3527 | 3594 | 3640 |
| HINCKLEY | 19 | 58 | 125 | 226 | 361 | 549 | 750 | 977 | 1225 | 1492 | 1772 | 2088 | 2368 | 2628 | 2878 | 3067 | 3222 | 3347 | 3446 | 3519 | 3569 |
| INTERNATIONAL FALLS | 14 | 43 | 98 | 182 | 301 | 471 | 657 | 870 | 1106 | 1360 | 1628 | 1927 | 2189 | 2429 | 2654 | 2821 | 2954 | 3059 | 3141 | 3201 | 3242 |
| ITASCA ST PARK SCHL | 16 | 47 | 102 | 186 | 305 | 477 | 666 | 883 | 1122 | 1379 | 1650 | 1954 | 2225 | 2475 | 2713 | 2891 | 3034 | 3147 | 3235 | 3301 | 3346 |
| JORDAN 1 S | 38 | 101 | 196 | 328 | 497 | 723 | 960 | 1222 | 1505 | 1804 | 2115 | 2460 | 2765 | 3051 | 3332 | 3553 | 3742 | 3902 | 4033 | 4131 | 4201 |
| LEECH LAKE DAM | 17 | 50 | 108 | 197 | 321 | 498 | 694 | 917 | 1164 | 1429 | 1708 | 2020 | 2295 | 2549 | 2792 | 2976 | 3127 | 3250 | 3347 | 3419 | 3467 |
| LITCHFIELD | 35 | 93 | 183 | 311 | 477 | 704 | 945 | 1212 | 1501 | 1808 | 2127 | 2483 | 2801 | 3098 | 3388 | 3617 | 3810 | 3972 | 4103 | 4202 | 4272 |
| LITTLE FALLS 1 N | 27 | 75 | 152 | 264 | 413 | 617 | 835 | 1080 | 1349 | 1638 | 1937 | 2273 | 2570 | 2846 | 3114 | 3320 | 3493 | 3635 | 3747 | 3830 | 3886 |
| LONG PRAIRIE | 26 | 72 | 145 | 249 | 390 | 584 | 795 | 1034 | 1296 | 1578 | 1872 | 2201 | 2491 | 2761 | 3022 | 3221 | 3385 | 3519 | 3624 | 3702 | 3756 |
| MADISON SEWAGE PLANT | 37 | 98 | 190 | 319 | 487 | 715 | 958 | 1229 | 1523 | 1835 | 2160 | 2524 | 2848 | 3152 | 3449 | 3680 | 3876 | 4040 | 4173 | 4273 | 4342 |
| MAPLE PLAIN | 35 | 96 | 189 | 319 | 487 | 713 | 950 | 1212 | 1496 | 1798 | 2109 | 2458 | 2769 | 3060 | 3344 | 3567 | 3758 | 3918 | 4050 | 4152 | 4225 |
| MARSHALL | 38 | 103 | 202 | 339 | 516 | 756 | 1010 | 1292 | 1594 | 1913 | 2243 | 2612 | 2941 | 3252 | 3559 | 3801 | 4007 | 4180 | 4321 | 4429 | 4507 |
| MEADOWLANDS | 15 | 43 | 93 | 172 | 285 | 446 | 623 | 826 | 1051 | 1297 | 1557 | 1849 | 2106 | 2341 | 2565 | 2732 | 2867 | 2974 | 3058 | 3118 | 3159 |
| MILACA | 25 | 73 | 151 | 263 | 410 | 610 | 824 | 1064 | 1328 | 1611 | 1909 | 2243 | 2538 | 2813 | 3080 | 3285 | 3456 | 3595 | 3704 | 3783 | 3836 |
| MILAN | 36 | 94 | 183 | 308 | 472 | 695 | 933 | 1199 | 1487 | 1791 | 2109 | 2464 | 2782 | 3080 | 3373 | 3601 | 3792 | 3948 | 4071 | 4162 | 4225 |
| MINNEAPOLIS-ST PAUL | 44 | 118 | 227 | 374 | 559 | 803 | 1058 | 1339 | 1645 | 1969 | 2307 | 2683 | 3017 | 3330 | 3640 | 3888 | 4098 | 4277 | 4424 | 4534 | 4612 |
| MONTEVIDEO 1 SW | 34 | 95 | 189 | 322 | 495 | 728 | 973 | 1244 | 1536 | 1843 | 2163 | 2521 | 2841 | 3142 | 3438 | 3669 | 3865 | 4030 | 4165 | 4267 | 4338 |
| MOOSE LAKE 1 SSE | 13 | 41 | 92 | 171 | 283 | 442 | 618 | 821 | 1050 | 1303 | 1572 | 1875 | 2142 | 2389 | 2626 | 2807 | 2956 | 3077 | 3172 | 3240 | 3286 |
| MORA | 25 | 72 | 149 | 260 | 407 | 607 | 820 | 1059 | 1322 | 1606 | 1904 | 2238 | 2534 | 2807 | 3073 | 3277 | 3448 | 3588 | 3698 | 3778 | 3831 |
| MORRIS W C SCHOOL | 33 | 90 | 177 | 300 | 461 | 682 | 917 | 1178 | 1460 | 1757 | 2065 | 2412 | 2723 | 3017 | 3305 | 3528 | 3712 | 3860 | 3976 | 4061 | 4120 |
| NEW LONDON | 29 | 83 | 170 | 294 | 456 | 677 | 912 | 1175 | 1461 | 1766 | 2083 | 2437 | 2751 | 3044 | 3332 | 3556 | 3745 | 3902 | 4027 | 4120 | 4184 |
| NEW ULM | 43 | 112 | 215 | 356 | 536 | 778 | 1033 | 1315 | 1618 | 1937 | 2266 | 2631 | 2955 | 3261 | 3566 | 3808 | 4018 | 4195 | 4341 | 4451 | 4530 |
| OLIVIA | 40 | 104 | 200 | 335 | 510 | 748 | 999 | 1276 | 1574 | 1887 | 2211 | 2571 | 2891 | 3192 | 3489 | 3724 | 3926 | 4097 | 4236 | 4342 | 4417 |
| PARK RAPIDS | 16 | 51 | 113 | 208 | 339 | 526 | 730 | 959 | 1210 | 1479 | 1762 | 2082 | 2368 | 2635 | 2891 | 3083 | 3237 | 3360 | 3455 | 3525 | 3573 |
| PINE RIVER DAM | 17 | 52 | 114 | 211 | 343 | 528 | 728 | 955 | 1205 | 1475 | 1759 | 2078 | 2355 | 2613 | 2861 | 3050 | 3208 | 3333 | 3434 | 3507 | 3557 |
| PIPESTONE | 28 | 80 | 162 | 281 | 439 | 657 | 890 | 1152 | 1436 | 1738 | 2052 | 2404 | 2719 | 3016 | 3308 | 3534 | 3723 | 3876 | 3997 | 4084 | 4144 |
| POKEGAMA DAM | 18 | 53 | 112 | 202 | 325 | 499 | 690 | 907 | 1147 | 1405 | 1677 | 1983 | 2254 | 2504 | 2743 | 2923 | 3069 | 3186 | 3278 | 3346 | 3393 |
| PRESTON | 36 | 94 | 182 | 304 | 461 | 676 | 904 | 1160 | 1437 | 1729 | 2031 | 2367 | 2665 | 2945 | 3223 | 3442 | 3628 | 3783 | 3907 | 3999 | 4062 |
| RED LAKE FALLS | 25 | 68 | 139 | 242 | 379 | 570 | 778 | 1009 | 1263 | 1537 | 1824 | 2147 | 2436 | 2705 | 2965 | 3162 | 3322 | 3451 | 3551 | 3624 | 3675 |
| RED LAKE INDIAN | 15 | 48 | 105 | 197 | 325 | 508 | 707 | 933 | 1180 | 1444 | 1722 | 2035 | 2314 | 2573 | 2819 | 3003 | 3151 | 3270 | 3365 | 3437 | 3488 |
| ROCHESTER WSO | 37 | 99 | 194 | 325 | 494 | 721 | 962 | 1230 | 1518 | 1821 | 2134 | 2482 | 2790 | 3081 | 3370 | 3600 | 3798 | 3966 | 4103 | 4207 | 4280 |
| ROSEAU 1 E | 16 | 48 | 102 | 185 | 301 | 468 | 652 | 862 | 1094 | 1344 | 1606 | 1900 | 2159 | 2397 | 2622 | 2788 | 2920 | 3022 | 3102 | 3160 | 3200 |
| ROSEMOUNT AGRI EXP | 33 | 90 | 177 | 298 | 457 | 674 | 906 | 1168 | 1447 | 1745 | 2055 | 2398 | 2703 | 2989 | 3270 | 3490 | 3678 | 3835 | 3962 | 4058 | 4124 |
| ST CLOUD WSO | 30 | 84 | 169 | 280 | 440 | 663 | 888 | 1139 | 1411 | 1703 | 2007 | 2347 | 2648 | 2928 | 3202 | 3415 | 3595 | 3744 | 3862 | 3949 | 4009 |
| ST PETER 2 SW | 39 | 108 | 213 | 356 | 539 | 784 | 1040 | 1323 | 1626 | 1945 | 2275 | 2640 | 2965 | 3271 | 3575 | 3816 | 4023 | 4199 | 4342 | 4452 | 4530 |
| SANDY LAKE DAM | 17 | 50 | 110 | 201 | 327 | 505 | 699 | 919 | 1162 | 1422 | 1696 | 2004 | 2276 | 2527 | 2767 | 2949 | 3099 | 3221 | 3319 | 3391 | 3442 |
| SPRINGFIELD 1 NW | 38 | 102 | 202 | 341 | 520 | 764 | 1021 | 1304 | 1607 | 1923 | 2246 | 2602 | 2918 | 3215 | 3512 | 3749 | 3954 | 4127 | 4268 | 4375 | 4450 |
| THIEF RIVER FALLS | 19 | 57 | 122 | 219 | 351 | 536 | 737 | 963 | 1211 | 1477 | 1757 | 2073 | 2357 | 2622 | 2876 | 3067 | 3219 | 3338 | 3428 | 3493 | 3537 |
| TRACY | 34 | 95 | 189 | 322 | 496 | 733 | 985 | 1264 | 1565 | 1881 | 2210 | 2578 | 2907 | 3216 | 3521 | 3760 | 3963 | 4135 | 4275 | 4381 | 4455 |
| TWO HARBORS | 7 | 24 | 56 | 107 | 178 | 284 | 404 | 553 | 732 | 942 | 1178 | 1452 | 1701 | 1934 | 2163 | 2341 | 2488 | 2607 | 2697 | 2760 | 2800 |
| VIRGINIA | 13 | 42 | 95 | 180 | 299 | 468 | 653 | 864 | 1097 | 1349 | 1615 | 1913 | 2175 | 2416 | 2644 | 2815 | 2953 | 3063 | 3150 | 3213 | 3256 |
| WADENA 3 S | 21 | 62 | 134 | 240 | 383 | 582 | 795 | 1035 | 1296 | 1575 | 1868 | 2199 | 2495 | 2772 | 3038 | 3240 | 3405 | 3537 | 3641 | 3717 | 3770 |
| WALKER | 17 | 53 | 115 | 210 | 340 | 522 | 719 | 942 | 1186 | 1450 | 1728 | 2043 | 2322 | 2580 | 2826 | 3011 | 3163 | 3286 | 3386 | 3461 | 3514 |
| WARROAD | 11 | 36 | 83 | 159 | 269 | 431 | 615 | 827 | 1063 | 1318 | 1586 | 1886 | 2152 | 2397 | 2630 | 2802 | 2939 | 3046 | 3128 | 3186 | 3226 |
| WASECA EXP STA | 31 | 88 | 179 | 308 | 477 | 706 | 947 | 1214 | 1501 | 1803 | 2113 | 2458 | 2763 | 3051 | 3336 | 3561 | 3753 | 3914 | 4044 | 4140 | 4207 |
| WHEATON | 36 | 94 | 182 | 306 | 469 | 693 | 933 | 1201 | 1492 | 1800 | 2123 | 2485 | 2810 | 3118 | 3421 | 3658 | 3857 | 4021 | 4153 | 4251 | 4319 |
| WILLMAR ST HOSP | 35 | 94 | 185 | 312 | 478 | 704 | 943 | 1210 | 1499 | 1806 | 2125 | 2480 | 2795 | 3092 | 3384 | 3615 | 3813 | 3978 | 4112 | 4212 | 4283 |
| WINDOM | 41 | 106 | 202 | 334 | 505 | 739 | 989 | 1268 | 1570 | 1888 | 2214 | 2576 | 2897 | 3199 | 3499 | 3736 | 3940 | 4110 | 4248 | 4354 | 4432 |
| WINNEBAGO | 44 | 113 | 215 | 353 | 530 | 769 | 1022 | 1302 | 1601 | 1914 | 2236 | 2593 | 2911 | 3213 | 3514 | 3753 | 3959 | 4132 | 4274 | 4382 | 4459 |
| WINNIBIGOSHISH DAM | 16 | 48 | 106 | 196 | 322 | 503 | 701 | 928 | 1177 | 1446 | 1727 | 2042 | 2321 | 2578 | 2822 | 3005 | 3154 | 3272 | 3365 | 3433 | 3478 |
| WINONA | 49 | 128 | 242 | 393 | 580 | 826 | 1083 | 1366 | 1671 | 1991 | 2322 | 2690 | 3017 | 3326 | 3633 | 3879 | 4093 | 4278 | 4432 | 4552 | 4642 |
| WORTHINGTON | 40 | 105 | 200 | 333 | 505 | 738 | 984 | 1258 | 1552 | 1861 | 2181 | 2537 | 2854 | 3152 | 3446 | 3677 | 3873 | 4037 | 4170 | 4270 | 4343 |
| ZUMBROTA | 36 | 96 | 186 | 310 | 470 | 688 | 921 | 1183 | 1467 | 1768 | 2080 | 2428 | 2736 | 3026 | 3311 | 3536 | 3729 | 3891 | 4024 | 4125 | 4197 |
| FARGO ND WSO | 30 | 82 | 165 | 285 | 442 | 656 | 883 | 1135 | 1411 | 1706 | 2019 | 2371 | 2687 | 2984 | 3272 | 3494 | 3678 | 3827 | 3943 | 4029 | 4088 |
| SIOUX FALLS SD WSO | 47 | 120 | 226 | 369 | 550 | 792 | 1046 | 1333 | 1643 | 1974 | 2321 | 2709 | 3055 | 3381 | 3703 | 3957 | 4173 | 4353 | 4497 | 4605 | 4680 |
| LA CROSSE WI WSO | 48 | 126 | 245 | 401 | 595 | 848 | 1109 | 1395 | 1702 | 2028 | 2362 | 2737 | 3071 | 3387 | 3703 | 3957 | 4179 | 4370 | 4529 | 4651 | 4740 |

Appendix Table 5. Normal total growing degree days, $T_b$ = 45°F, at selected dates and adjusted to an 8 a.m. observation time.

| | APRIL | | | MAY | | | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 |
| ADA | 14 | 42 | 91 | 166 | 272 | 425 | 594 | 780 | 1008 | 1245 | 1498 | 1784 | 2041 | 2279 | 2506 | 2673 | 2803 | 2901 | 2972 | 3022 | 3054 |
| ALBERT LEA | 19 | 55 | 116 | 207 | 334 | 516 | 718 | 948 | 1201 | 1469 | 1745 | 2052 | 2324 | 2579 | 2827 | 3017 | 3173 | 3299 | 3397 | 3468 | 3515 |
| ALEXANDRIA FAA AP | 13 | 40 | 89 | 166 | 274 | 431 | 606 | 807 | 1033 | 1278 | 1541 | 1836 | 2097 | 2339 | 2569 | 2739 | 2874 | 2976 | 3051 | 3102 | 3135 |
| ARGYLE 4 E | 10 | 31 | 71 | 136 | 233 | 377 | 538 | 724 | 928 | 1147 | 1379 | 1642 | 1879 | 2099 | 2304 | 2450 | 2559 | 2638 | 2696 | 2737 | 2764 |
| ARTICHOKE LAKE | 16 | 47 | 99 | 180 | 295 | 460 | 645 | 857 | 1094 | 1351 | 1622 | 1926 | 2195 | 2446 | 2687 | 2868 | 3013 | 3126 | 3211 | 3269 | 3306 |
| AUSTIN 3 S | 20 | 54 | 110 | 194 | 310 | 477 | 663 | 877 | 1112 | 1361 | 1618 | 1902 | 2153 | 2387 | 2615 | 2791 | 2935 | 3050 | 3137 | 3198 | 3238 |
| BABBITT 2 SE | 1 | 10 | 36 | 85 | 162 | 280 | 413 | 568 | 744 | 938 | 1146 | 1382 | 1590 | 1775 | 1941 | 2053 | 2136 | 2196 | 2242 | 2277 | 2302 |
| BAUDETTE | 4 | 17 | 46 | 96 | 174 | 292 | 428 | 588 | 770 | 971 | 1185 | 1427 | 1638 | 1828 | 2000 | 2119 | 2206 | 2268 | 2313 | 2344 | 2365 |
| BEMIDJI AP | 7 | 23 | 56 | 114 | 200 | 328 | 476 | 640 | 847 | 1054 | 1295 | 1558 | 1785 | 1992 | 2181 | 2315 | 2415 | 2488 | 2541 | 2578 | 2602 |
| BENSON | 17 | 50 | 107 | 193 | 314 | 488 | 679 | 897 | 1138 | 1397 | 1670 | 1977 | 2249 | 2501 | 2743 | 2923 | 3067 | 3177 | 3260 | 3318 | 3355 |
| BIG FALLS | 5 | 18 | 46 | 96 | 171 | 288 | 424 | 584 | 764 | 962 | 1173 | 1412 | 1622 | 1811 | 1981 | 2096 | 2179 | 2239 | 2285 | 2320 | 2345 |
| BROWNS VALLEY | 14 | 42 | 93 | 172 | 283 | 445 | 627 | 836 | 1071 | 1325 | 1595 | 1900 | 2173 | 2427 | 2672 | 2855 | 3001 | 3114 | 3199 | 3258 | 3296 |
| CAMBRIDGE ST HOSP | 14 | 45 | 98 | 180 | 294 | 457 | 635 | 840 | 1067 | 1313 | 1572 | 1861 | 2115 | 2348 | 2569 | 2734 | 2865 | 2968 | 3046 | 3101 | 3138 |
| CAMPBELL | 16 | 44 | 92 | 167 | 274 | 433 | 611 | 817 | 1043 | 1284 | 1538 | 1825 | 2083 | 2326 | 2557 | 2728 | 2859 | 2956 | 3027 | 3076 | 3108 |
| CANBY | 21 | 58 | 118 | 206 | 330 | 508 | 707 | 937 | 1190 | 1462 | 1748 | 2068 | 2354 | 2622 | 2880 | 3076 | 3234 | 3361 | 3459 | 3531 | 3578 |
| CASS LAKE | 9 | 28 | 61 | 115 | 197 | 324 | 473 | 649 | 847 | 1060 | 1285 | 1538 | 1763 | 1968 | 2158 | 2291 | 2389 | 2460 | 2511 | 2548 | 2574 |
| CHASKA | 16 | 50 | 110 | 202 | 330 | 511 | 710 | 936 | 1184 | 1449 | 1725 | 2032 | 2304 | 2556 | 2798 | 2982 | 3132 | 3251 | 3341 | 3406 | 3447 |
| CLOQUET FOR RES CEN | 3 | 12 | 34 | 74 | 137 | 236 | 355 | 501 | 674 | 869 | 1081 | 1321 | 1530 | 1718 | 1889 | 2008 | 2097 | 2162 | 2210 | 2242 | 2264 |
| COLLEGEVILLE ST JOHN | 16 | 47 | 101 | 184 | 300 | 464 | 645 | 852 | 1081 | 1329 | 1591 | 1886 | 2147 | 2389 | 2621 | 2793 | 2931 | 3038 | 3120 | 3178 | 3217 |
| CROOKSTON NW EXP STA | 10 | 31 | 70 | 133 | 228 | 370 | 532 | 721 | 930 | 1158 | 1400 | 1676 | 1923 | 2153 | 2370 | 2526 | 2644 | 2731 | 2793 | 2837 | 2866 |
| DETROIT LAKES 1 NNE | 6 | 21 | 50 | 101 | 179 | 301 | 444 | 614 | 805 | 1013 | 1234 | 1485 | 1708 | 1914 | 2103 | 2235 | 2330 | 2396 | 2442 | 2474 | 2496 |
| DULUTH WSO | 4 | 15 | 39 | 81 | 145 | 244 | 361 | 504 | 674 | 868 | 1078 | 1316 | 1525 | 1714 | 1888 | 2014 | 2111 | 2186 | 2241 | 2281 | 2306 |
| FAIRMONT | 24 | 68 | 139 | 244 | 386 | 585 | 801 | 1043 | 1304 | 1580 | 1865 | 2181 | 2461 | 2724 | 2983 | 3185 | 3354 | 3492 | 3600 | 3676 | 3730 |
| FARIBAULT | 19 | 55 | 115 | 205 | 329 | 505 | 700 | 923 | 1169 | 1431 | 1703 | 2005 | 2270 | 2517 | 2758 | 2943 | 3096 | 3219 | 3313 | 3380 | 3423 |
| FARMINGTON 3 NW | 20 | 58 | 121 | 215 | 342 | 520 | 715 | 936 | 1177 | 1433 | 1701 | 2000 | 2264 | 2510 | 2747 | 2927 | 3073 | 3191 | 3283 | 3350 | 3395 |
| FERGUS FALLS | 10 | 34 | 79 | 153 | 259 | 416 | 591 | 792 | 1016 | 1259 | 1517 | 1810 | 2071 | 2313 | 2541 | 2708 | 2838 | 2936 | 3008 | 3058 | 3091 |
| FOSSTON | 11 | 33 | 74 | 138 | 232 | 370 | 526 | 707 | 910 | 1130 | 1365 | 1632 | 1871 | 2091 | 2294 | 2438 | 2547 | 2628 | 2690 | 2736 | 2768 |
| GLENWOOD | 12 | 39 | 88 | 165 | 275 | 434 | 611 | 815 | 1042 | 1288 | 1549 | 1843 | 2103 | 2344 | 2573 | 2742 | 2877 | 2980 | 3057 | 3111 | 3147 |
| GRAND MARAIS | 0 | 1 | 7 | 21 | 46 | 92 | 154 | 239 | 351 | 489 | 650 | 843 | 1021 | 1185 | 1340 | 1450 | 1532 | 1590 | 1629 | 1653 | 1668 |
| GRAND MEADOW | 18 | 52 | 110 | 197 | 318 | 490 | 680 | 896 | 1130 | 1379 | 1635 | 1921 | 2174 | 2410 | 2640 | 2817 | 2962 | 3079 | 3169 | 3234 | 3278 |
| GRAND RAPIDS NC SCHL | 6 | 21 | 51 | 104 | 183 | 304 | 442 | 604 | 788 | 991 | 1207 | 1450 | 1663 | 1854 | 2028 | 2149 | 2238 | 2304 | 2352 | 2387 | 2411 |
| GULL LAKE DAM | 8 | 27 | 64 | 127 | 221 | 361 | 521 | 708 | 919 | 1148 | 1392 | 1665 | 1906 | 2126 | 2332 | 2481 | 2597 | 2684 | 2749 | 2796 | 2826 |
| HALLOCK | 9 | 30 | 69 | 134 | 228 | 371 | 532 | 720 | 928 | 1153 | 1391 | 1659 | 1897 | 2114 | 2315 | 2457 | 2563 | 2639 | 2695 | 2735 | 2761 |
| HINCKLEY | 5 | 21 | 55 | 114 | 202 | 335 | 486 | 663 | 861 | 1078 | 1309 | 1569 | 1800 | 2010 | 2204 | 2343 | 2447 | 2525 | 2583 | 2624 | 2652 |
| INTERNATIONAL FALLS | 4 | 17 | 46 | 98 | 177 | 296 | 434 | 597 | 782 | 986 | 1204 | 1448 | 1661 | 1850 | 2020 | 2137 | 2222 | 2284 | 2330 | 2364 | 2387 |
| ITASCA ST PARK SCHL | 6 | 20 | 49 | 99 | 176 | 296 | 436 | 603 | 791 | 999 | 1219 | 1469 | 1690 | 1890 | 2073 | 2201 | 2296 | 2364 | 2415 | 2452 | 2478 |
| JORDAN 1 S | 19 | 54 | 113 | 201 | 321 | 492 | 679 | 891 | 1124 | 1374 | 1634 | 1924 | 2179 | 2415 | 2641 | 2812 | 2951 | 3062 | 3148 | 3211 | 3252 |
| LEECH LAKE DAM | 6 | 21 | 52 | 105 | 187 | 313 | 459 | 632 | 828 | 1044 | 1272 | 1529 | 1754 | 1959 | 2147 | 2281 | 2383 | 2460 | 2517 | 2558 | 2586 |
| LITCHFIELD | 17 | 50 | 105 | 190 | 308 | 480 | 670 | 887 | 1127 | 1384 | 1653 | 1954 | 2221 | 2468 | 2705 | 2882 | 3026 | 3139 | 3226 | 3289 | 3330 |
| LITTLE FALLS 1 N | 12 | 37 | 83 | 155 | 258 | 408 | 577 | 772 | 990 | 1228 | 1479 | 1759 | 2006 | 2233 | 2445 | 2602 | 2725 | 2819 | 2890 | 2939 | 2971 |
| LONG PRAIRIE | 13 | 37 | 78 | 144 | 239 | 381 | 542 | 730 | 943 | 1174 | 1418 | 1692 | 1933 | 2153 | 2358 | 2507 | 2621 | 2708 | 2773 | 2819 | 2850 |
| MADISON SEWAGE PLANT | 19 | 53 | 109 | 194 | 314 | 486 | 679 | 900 | 1145 | 1407 | 1682 | 1990 | 2264 | 2517 | 2760 | 2942 | 3087 | 3202 | 3290 | 3352 | 3393 |
| MAPLE PLAIN | 17 | 50 | 107 | 193 | 313 | 483 | 669 | 882 | 1116 | 1366 | 1629 | 1923 | 2184 | 2425 | 2655 | 2827 | 2968 | 3080 | 3169 | 3235 | 3280 |
| MARSHALL | 19 | 55 | 115 | 207 | 334 | 518 | 721 | 953 | 1206 | 1476 | 1756 | 2069 | 2348 | 2609 | 2861 | 3053 | 3209 | 3333 | 3429 | 3499 | 3546 |
| MEADOWLANDS | 5 | 16 | 41 | 87 | 158 | 268 | 396 | 549 | 724 | 919 | 1129 | 1366 | 1574 | 1759 | 1927 | 2044 | 2131 | 2194 | 2240 | 2274 | 2296 |
| MILACA | 11 | 35 | 80 | 151 | 251 | 397 | 560 | 751 | 964 | 1198 | 1446 | 1725 | 1970 | 2195 | 2406 | 2561 | 2681 | 2772 | 2839 | 2885 | 2914 |
| MILAN | 18 | 51 | 105 | 188 | 304 | 473 | 660 | 876 | 1114 | 1369 | 1637 | 1937 | 2204 | 2452 | 2691 | 2869 | 3010 | 3117 | 3197 | 3253 | 3289 |
| MINNEAPOLIS-ST PAUL | 23 | 67 | 137 | 239 | 375 | 564 | 768 | 1000 | 1256 | 1530 | 1818 | 2139 | 2422 | 2685 | 2941 | 3137 | 3299 | 3429 | 3529 | 3601 | 3647 |
| MONTEVIDEO 1 SW | 16 | 48 | 105 | 193 | 316 | 493 | 687 | 908 | 1150 | 1409 | 1679 | 1981 | 2250 | 2501 | 2743 | 2924 | 3071 | 3186 | 3275 | 3338 | 3380 |
| MOOSE LAKE 1 SSE | 3 | 14 | 38 | 83 | 153 | 260 | 386 | 539 | 718 | 921 | 1140 | 1388 | 1605 | 1802 | 1984 | 2114 | 2214 | 2290 | 2346 | 2384 | 2409 |
| MORA | 10 | 34 | 78 | 148 | 249 | 395 | 557 | 746 | 960 | 1193 | 1442 | 1721 | 1966 | 2180 | 2400 | 2555 | 2675 | 2767 | 2835 | 2881 | 2911 |
| MORRIS W C SCHOOL | 16 | 48 | 101 | 183 | 297 | 463 | 647 | 859 | 1091 | 1338 | 1597 | 1888 | 2149 | 2393 | 2627 | 2798 | 2933 | 3033 | 3107 | 3158 | 3191 |
| NEW LONDON | 14 | 43 | 95 | 176 | 291 | 457 | 642 | 855 | 1091 | 1346 | 1613 | 1912 | 2175 | 2418 | 2651 | 2825 | 2965 | 3073 | 3154 | 3211 | 3247 |
| NEW ULM | 22 | 61 | 125 | 220 | 350 | 536 | 740 | 973 | 1227 | 1496 | 1775 | 2085 | 2358 | 2614 | 2864 | 3057 | 3216 | 3344 | 3443 | 3513 | 3560 |
| OLIVIA | 21 | 57 | 118 | 209 | 336 | 518 | 718 | 945 | 1194 | 1458 | 1732 | 2036 | 2308 | 2556 | 2799 | 2984 | 3136 | 3258 | 3352 | 3420 | 3465 |
| PARK RAPIDS | 5 | 20 | 53 | 110 | 197 | 331 | 484 | 663 | 864 | 1084 | 1317 | 1582 | 1818 | 2034 | 2235 | 2377 | 2482 | 2559 | 2615 | 2655 | 2682 |
| PINE RIVER DAM | 6 | 22 | 56 | 115 | 203 | 335 | 486 | 663 | 862 | 1082 | 1316 | 1578 | 1808 | 2016 | 2208 | 2347 | 2453 | 2534 | 2594 | 2636 | 2663 |
| PIPESTONE | 12 | 37 | 83 | 157 | 266 | 427 | 610 | 822 | 1057 | 1309 | 1574 | 1870 | 2135 | 2382 | 2619 | 2795 | 2933 | 3038 | 3114 | 3166 | 3199 |
| POKEGAMA DAM | 7 | 23 | 55 | 109 | 190 | 313 | 454 | 621 | 811 | 1019 | 1241 | 1492 | 1713 | 1913 | 2097 | 2227 | 2324 | 2396 | 2449 | 2487 | 2513 |
| PRESTON | 17 | 48 | 100 | 179 | 290 | 451 | 630 | 836 | 1062 | 1304 | 1556 | 1837 | 2085 | 2316 | 2539 | 2707 | 2843 | 2949 | 3029 | 3084 | 3120 |
| RED LAKE FALLS | 12 | 35 | 77 | 142 | 235 | 373 | 530 | 712 | 917 | 1140 | 1378 | 1646 | 1885 | 2104 | 2309 | 2456 | 2567 | 2651 | 2712 | 2755 | 2784 |
| RED LAKE INDIAN | 5 | 20 | 52 | 109 | 196 | 328 | 479 | 654 | 850 | 1064 | 1292 | 1551 | 1780 | 1989 | 2180 | 2313 | 2412 | 2486 | 2542 | 2585 | 2616 |
| ROCHESTER WSO | 18 | 53 | 111 | 198 | 319 | 491 | 682 | 899 | 1138 | 1391 | 1654 | 1947 | 2205 | 2446 | 2680 | 2860 | 3007 | 3126 | 3218 | 3284 | 3328 |
| ROSEAU 1 E | 6 | 21 | 51 | 101 | 177 | 294 | 429 | 589 | 771 | 970 | 1182 | 1421 | 1630 | 1819 | 1989 | 2106 | 2191 | 2252 | 2297 | 2330 | 2352 |
| ROSEMOUNT AGRI EXP | 16 | 47 | 99 | 178 | 290 | 453 | 634 | 844 | 1076 | 1324 | 1583 | 1872 | 2127 | 2362 | 2588 | 2758 | 2895 | 3004 | 3087 | 3147 | 3186 |
| ST CLOUD WSO | 14 | 43 | 94 | 173 | 285 | 443 | 618 | 819 | 1042 | 1284 | 1538 | 1823 | 2074 | 2304 | 2522 | 2685 | 2815 | 2916 | 2992 | 3045 | 3078 |
| ST PETER 2 SW | 19 | 57 | 122 | 220 | 353 | 542 | 747 | 980 | 1234 | 1504 | 1783 | 2093 | 2368 | 2624 | 2873 | 3064 | 3221 | 3347 | 3444 | 3514 | 3561 |
| SANDY LAKE DAM | 6 | 20 | 52 | 106 | 189 | 315 | 459 | 629 | 821 | 1032 | 1256 | 1508 | 1730 | 1932 | 2117 | 2248 | 2349 | 2425 | 2482 | 2525 | 2553 |
| SPRINGFIELD 1 NW | 18 | 53 | 114 | 207 | 338 | 525 | 731 | 965 | 1218 | 1485 | 1758 | 2058 | 2324 | 2571 | 2814 | 3001 | 3155 | 3279 | 3373 | 3441 | 3485 |
| THIEF RIVER FALLS | 8 | 28 | 65 | 126 | 215 | 348 | 499 | 675 | 873 | 1089 | 1319 | 1580 | 1814 | 2028 | 2228 | 2369 | 2474 | 2548 | 2601 | 2638 | 2662 |
| TRACY | 16 | 48 | 105 | 193 | 317 | 497 | 698 | 927 | 1179 | 1446 | 1725 | 2037 | 2315 | 2575 | 2825 | 3014 | 3168 | 3290 | 3384 | 3452 | 3497 |
| TWO HARBORS | 1 | 5 | 17 | 38 | 74 | 130 | 203 | 301 | 430 | 590 | 775 | 895 | 1194 | 1378 | 1551 | 1678 | 1775 | 1847 | 1897 | 1929 | 1947 |
| VIRGINIA | 3 | 15 | 42 | 92 | 169 | 287 | 422 | 583 | 766 | 968 | 1183 | 1427 | 1640 | 1831 | 2003 | 2124 | 2213 | 2279 | 2328 | 2364 | 2389 |
| WADENA 3 S | 8 | 26 | 68 | 134 | 231 | 376 | 539 | 728 | 940 | 1169 | 1412 | 1688 | 1934 | 2160 | 2372 | 2524 | 2640 | 2725 | 2788 | 2833 | 2863 |
| WALKER | 6 | 23 | 57 | 115 | 202 | 331 | 479 | 651 | 845 | 1059 | 1288 | 1547 | 1776 | 1984 | 2176 | 2311 | 2414 | 2492 | 2552 | 2597 | 2627 |
| WARROAD | 4 | 14 | 39 | 84 | 155 | 268 | 403 | 565 | 750 | 954 | 1172 | 1418 | 1634 | 1829 | 2007 | 2130 | 2219 | 2283 | 2329 | 2361 | 2383 |
| WASECA EXP STA | 13 | 43 | 97 | 181 | 301 | 474 | 664 | 882 | 1119 | 1371 | 1632 | 1921 | 2176 | 2414 | 2644 | 2819 | 2961 | 3073 | 3158 | 3218 | 3257 |
| WHEATON | 18 | 50 | 104 | 186 | 303 | 473 | 663 | 881 | 1122 | 1381 | 1653 | 1960 | 2235 | 2493 | 2741 | 2928 | 3078 | 3193 | 3280 | 3342 | 3382 |
| WILLMAR ST HOSP | 18 | 51 | 106 | 191 | 309 | 479 | 668 | 885 | 1125 | 1382 | 1651 | 1950 | 2215 | 2462 | 2700 | 2881 | 3028 | 3144 | 3234 | 3297 | 3339 |
| WINDOM | 22 | 59 | 118 | 206 | 328 | 506 | 706 | 935 | 1188 | 1455 | 1732 | 2038 | 2309 | 2561 | 2806 | 2994 | 3147 | 3268 | 3361 | 3429 | 3476 |
| WINNEBAGO | 23 | 63 | 127 | 221 | 351 | 535 | 738 | 968 | 1217 | 1481 | 1752 | 2054 | 2323 | 2574 | 2820 | 3009 | 3165 | 3289 | 3385 | 3454 | 3501 |
| WINNIBIGOSHISH DAM | 5 | 20 | 51 | 106 | 190 | 318 | 467 | 643 | 843 | 1061 | 1293 | 1553 | 1782 | 1988 | 2178 | 2311 | 2410 | 2483 | 2537 | 2575 | 2601 |
| WINONA | 25 | 72 | 146 | 252 | 392 | 584 | 791 | 1024 | 1278 | 1548 | 1830 | 2143 | 2420 | 2678 | 2930 | 3126 | 3290 | 3426 | 3533 | 3614 | 3669 |
| WORTHINGTON | 20 | 56 | 115 | 203 | 327 | 505 | 701 | 925 | 1169 | 1429 | 1699 | 2000 | 2266 | 2514 | 2753 | 2934 | 3080 | 3195 | 3283 | 3347 | 3390 |
| ZUMBROTA | 18 | 50 | 104 | 185 | 297 | 461 | 644 | 855 | 1090 | 1341 | 1603 | 1895 | 2154 | 2393 | 2624 | 2798 | 2941 | 3054 | 3143 | 3207 | 3250 |
| FARGO ND WSO | 14 | 43 | 94 | 174 | 285 | 445 | 622 | 824 | 1050 | 1296 | 1558 | 1856 | 2121 | 2368 | 2602 | 2773 | 2907 | 3009 | 3085 | 3137 | 3172 |
| SIOUX FALLS SD WSO | 25 | 67 | 133 | 231 | 363 | 550 | 755 | 990 | 1251 | 1532 | 1829 | 2162 | 2457 | 2733 | 3001 | 3205 | 3371 | 3501 | 3600 | 3669 | 3713 |
| LA CROSSE WI WSO | 25 | 71 | 147 | 257 | 402 | 600 | 811 | 1047 | 1304 | 1578 | 1864 | 2184 | 2468 | 2734 | 2995 | 3199 | 3371 | 3512 | 3624 | 3705 | 3760 |

Appendix Table 6. Normal total growing degree days, $T_b$ = 50°F, at selected dates and adjusted to an 8 a.m. observation time.

| | APRIL | | | MAY | | | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 |
| ADA | 6 | 19 | 45 | 89 | 156 | 259 | 380 | 526 | 694 | 881 | 1083 | 1315 | 1522 | 1710 | 1892 | 2000 | 2084 | 2141 | 2180 | 2206 | 2224 |
| ALBERT LEA | 8 | 25 | 55 | 107 | 187 | 314 | 466 | 647 | 850 | 1067 | 1293 | 1546 | 1769 | 1973 | 2165 | 2304 | 2410 | 2489 | 2547 | 2589 | 2616 |
| ALEXANDRIA FAA AP | 5 | 18 | 43 | 88 | 156 | 263 | 389 | 540 | 715 | 912 | 1123 | 1363 | 1575 | 1767 | 1942 | 2063 | 2150 | 2211 | 2252 | 2279 | 2296 |
| ARGYLE 4 E | 3 | 12 | 32 | 69 | 129 | 225 | 338 | 473 | 627 | 795 | 977 | 1186 | 1373 | 1543 | 1694 | 1792 | 1858 | 1899 | 1928 | 1948 | 1963 |
| ARTICHOKE LAKE | 7 | 21 | 48 | 94 | 165 | 270 | 412 | 575 | 762 | 969 | 1190 | 1439 | 1658 | 1859 | 2044 | 2176 | 2273 | 2341 | 2389 | 2421 | 2441 |
| AUSTIN 3 S | 9 | 25 | 53 | 101 | 174 | 289 | 426 | 589 | 774 | 973 | 1179 | 1409 | 1610 | 1795 | 1967 | 2092 | 2187 | 2257 | 2308 | 2340 | 2361 |
| BABBITT 2 SE | 0 | 0 | 12 | 39 | 85 | 158 | 245 | 351 | 476 | 620 | 778 | 959 | 1116 | 1252 | 1365 | 1433 | 1476 | 1504 | 1525 | 1542 | 1556 |
| BAUDETTE | 0 | 4 | 18 | 46 | 92 | 166 | 255 | 366 | 497 | 647 | 812 | 999 | 1160 | 1300 | 1418 | 1493 | 1540 | 1570 | 1590 | 1604 | 1614 |
| BEMIDJI AP | 1 | 7 | 24 | 56 | 108 | 191 | 292 | 415 | 562 | 729 | 911 | 1117 | 1295 | 1452 | 1587 | 1674 | 1731 | 1769 | 1794 | 1812 | 1825 |
| BENSON | 7 | 22 | 52 | 104 | 182 | 303 | 445 | 613 | 804 | 1013 | 1236 | 1487 | 1709 | 1912 | 2098 | 2229 | 2324 | 2391 | 2437 | 2468 | 2488 |
| BIG FALLS | 0 | 5 | 17 | 43 | 87 | 160 | 249 | 359 | 489 | 637 | 799 | 983 | 1142 | 1281 | 1397 | 1468 | 1512 | 1540 | 1561 | 1578 | 1592 |
| BROWNS VALLEY | 4 | 16 | 40 | 84 | 153 | 262 | 394 | 554 | 738 | 942 | 1162 | 1412 | 1635 | 1840 | 2029 | 2163 | 2261 | 2330 | 2378 | 2409 | 2429 |
| CAMBRIDGE ST HOSP | 5 | 18 | 46 | 93 | 164 | 275 | 404 | 559 | 736 | 931 | 1140 | 1374 | 1579 | 1762 | 1928 | 2043 | 2126 | 2186 | 2229 | 2259 | 2278 |
| CAMPBELL | 6 | 19 | 43 | 85 | 152 | 260 | 389 | 545 | 720 | 912 | 1115 | 1348 | 1556 | 1748 | 1925 | 2048 | 2131 | 2187 | 2224 | 2250 | 2267 |
| CANBY | 10 | 28 | 61 | 113 | 194 | 319 | 469 | 648 | 852 | 1074 | 1309 | 1575 | 1811 | 2028 | 2231 | 2377 | 2488 | 2569 | 2629 | 2670 | 2698 |
| CASS LAKE | 3 | 11 | 26 | 55 | 104 | 185 | 288 | 414 | 561 | 724 | 899 | 1097 | 1271 | 1427 | 1562 | 1649 | 1705 | 1740 | 1764 | 1782 | 1796 |
| CHASKA | 5 | 20 | 50 | 103 | 185 | 312 | 461 | 637 | 835 | 1050 | 1276 | 1528 | 1750 | 1952 | 2139 | 2273 | 2373 | 2445 | 2497 | 2533 | 2555 |
| CLOQUET FOR RES CEN | 0 | 2 | 10 | 29 | 61 | 117 | 190 | 286 | 408 | 553 | 715 | 900 | 1060 | 1197 | 1313 | 1386 | 1433 | 1463 | 1484 | 1499 | 1510 |
| COLLEGEVILLE ST JOHN | 6 | 21 | 50 | 99 | 173 | 286 | 418 | 575 | 754 | 952 | 1163 | 1403 | 1615 | 1807 | 1983 | 2106 | 2196 | 2260 | 2306 | 2338 | 2359 |
| CROOKSTON NW EXP STA | 3 | 12 | 30 | 65 | 122 | 216 | 329 | 467 | 627 | 804 | 996 | 1217 | 1415 | 1595 | 1757 | 1865 | 1938 | 1986 | 2018 | 2040 | 2055 |
| DETROIT LAKES 1 NNE | 1 | 6 | 17 | 40 | 83 | 157 | 252 | 372 | 512 | 670 | 841 | 1037 | 1211 | 1368 | 1500 | 1584 | 1636 | 1666 | 1684 | 1698 | 1708 |
| DULUTH WSO | 0 | 3 | 13 | 33 | 66 | 121 | 191 | 285 | 404 | 547 | 707 | 891 | 1050 | 1189 | 1309 | 1388 | 1443 | 1482 | 1509 | 1529 | 1542 |
| FAIRMONT | 11 | 33 | 73 | 139 | 235 | 380 | 546 | 737 | 949 | 1175 | 1410 | 1671 | 1901 | 2115 | 2318 | 2469 | 2589 | 2680 | 2747 | 2794 | 2824 |
| FARIBAULT | 8 | 25 | 56 | 108 | 186 | 309 | 454 | 627 | 823 | 1036 | 1258 | 1504 | 1720 | 1917 | 2102 | 2237 | 2340 | 2416 | 2471 | 2508 | 2530 |
| FARMINGTON 3 NW | 9 | 27 | 61 | 117 | 200 | 326 | 471 | 641 | 832 | 1039 | 1256 | 1500 | 1715 | 1911 | 2093 | 2222 | 2319 | 2392 | 2446 | 2485 | 2511 |
| FERGUS FALLS | 3 | 12 | 33 | 73 | 138 | 243 | 368 | 520 | 694 | 887 | 1095 | 1332 | 1544 | 1735 | 1909 | 2027 | 2110 | 2166 | 2205 | 2232 | 2250 |
| FOSSTON | 4 | 14 | 34 | 71 | 128 | 219 | 327 | 458 | 610 | 780 | 965 | 1178 | 1367 | 1538 | 1685 | 1782 | 1848 | 1892 | 1924 | 1948 | 1967 |
| GLENWOOD | 4 | 15 | 39 | 83 | 151 | 259 | 386 | 540 | 717 | 913 | 1124 | 1362 | 1573 | 1764 | 1938 | 2057 | 2144 | 2204 | 2246 | 2275 | 2294 |
| GRAND MARAIS | 0 | 0 | 0 | 3 | 8 | 22 | 46 | 88 | 153 | 241 | 352 | 491 | 618 | 733 | 833 | 894 | 932 | 953 | 965 | 973 | 979 |
| GRAND MEADOW | 7 | 22 | 52 | 103 | 181 | 302 | 443 | 608 | 792 | 990 | 1197 | 1428 | 1631 | 1818 | 1992 | 2118 | 2214 | 2285 | 2338 | 2375 | 2399 |
| GRAND RAPIDS NC SCHL | 1 | 6 | 20 | 48 | 94 | 168 | 259 | 372 | 506 | 658 | 824 | 1012 | 1175 | 1316 | 1436 | 1510 | 1558 | 1589 | 1610 | 1627 | 1639 |
| GULL LAKE DAM | 2 | 9 | 27 | 62 | 119 | 211 | 323 | 459 | 619 | 798 | 992 | 1211 | 1402 | 1572 | 1723 | 1823 | 1893 | 1941 | 1974 | 1998 | 2013 |
| HALLOCK | 3 | 11 | 31 | 68 | 128 | 222 | 336 | 473 | 631 | 805 | 993 | 1207 | 1395 | 1563 | 1711 | 1806 | 1869 | 1909 | 1937 | 1957 | 1972 |
| HINCKLEY | 0 | 2 | 15 | 42 | 91 | 173 | 276 | 402 | 550 | 717 | 897 | 1173 | 1284 | 1444 | 1583 | 1673 | 1732 | 1770 | 1797 | 1817 | 1831 |
| INTERNATIONAL FALLS | 0 | 4 | 17 | 46 | 93 | 169 | 260 | 374 | 508 | 662 | 830 | 1010 | 1182 | 1322 | 1438 | 1510 | 1555 | 1584 | 1604 | 1620 | 1633 |
| ITASCA ST PARK SCHL | 1 | 6 | 19 | 45 | 89 | 164 | 257 | 373 | 511 | 668 | 839 | 1034 | 1204 | 1355 | 1484 | 1566 | 1619 | 1653 | 1677 | 1695 | 1708 |
| JORDAN 1 S | 8 | 24 | 55 | 107 | 184 | 301 | 438 | 600 | 784 | 983 | 1194 | 1429 | 1634 | 1820 | 1991 | 2111 | 2201 | 2268 | 2317 | 2353 | 2376 |
| LEECH LAKE DAM | 1 | 6 | 20 | 48 | 96 | 176 | 274 | 397 | 543 | 708 | 886 | 1088 | 1264 | 1418 | 1551 | 1638 | 1696 | 1736 | 1764 | 1785 | 1799 |
| LITCHFIELD | 7 | 22 | 51 | 101 | 177 | 297 | 437 | 605 | 794 | 1001 | 1220 | 1466 | 1683 | 1880 | 2062 | 2190 | 2285 | 2353 | 2404 | 2439 | 2462 |
| LITTLE FALLS 1 N | 4 | 15 | 38 | 79 | 144 | 245 | 364 | 509 | 677 | 864 | 1065 | 1291 | 1488 | 1664 | 1822 | 1929 | 2006 | 2060 | 2097 | 2123 | 2140 |
| LONG PRAIRIE | 5 | 15 | 36 | 72 | 130 | 222 | 335 | 473 | 635 | 816 | 1010 | 1229 | 1421 | 1591 | 1741 | 1840 | 1909 | 1956 | 1989 | 2013 | 2030 |
| MADISON SEWAGE PLANT | 8 | 25 | 54 | 103 | 179 | 298 | 441 | 612 | 807 | 1020 | 1245 | 1498 | 1721 | 1925 | 2112 | 2244 | 2341 | 2411 | 2460 | 2495 | 2517 |
| MAPLE PLAIN | 8 | 21 | 51 | 101 | 177 | 294 | 431 | 593 | 777 | 978 | 1191 | 1430 | 1640 | 1831 | 2008 | 2130 | 2222 | 2291 | 2344 | 2382 | 2409 |
| MARSHALL | 8 | 24 | 55 | 108 | 189 | 319 | 472 | 653 | 857 | 1077 | 1307 | 1564 | 1793 | 2004 | 2202 | 2344 | 2450 | 2529 | 2587 | 2628 | 2655 |
| MEADOWLANDS | 0 | 3 | 14 | 37 | 76 | 142 | 223 | 326 | 450 | 595 | 755 | 938 | 1095 | 1231 | 1345 | 1416 | 1461 | 1491 | 1511 | 1527 | 1538 |
| MILACA | 3 | 13 | 34 | 73 | 134 | 229 | 344 | 484 | 648 | 831 | 1029 | 1253 | 1449 | 1624 | 1780 | 1884 | 1957 | 2006 | 2039 | 2062 | 2077 |
| MILAN | 8 | 24 | 52 | 101 | 175 | 292 | 430 | 595 | 783 | 989 | 1206 | 1451 | 1668 | 1867 | 2050 | 2178 | 2272 | 2337 | 2381 | 2411 | 2430 |
| MINNEAPOLIS-ST PAUL | 10 | 32 | 72 | 136 | 227 | 363 | 517 | 699 | 904 | 1129 | 1367 | 1633 | 1866 | 2079 | 2279 | 2426 | 2539 | 2623 | 2684 | 2725 | 2750 |
| MONTEVIDEO 1 SW | 6 | 19 | 47 | 97 | 174 | 296 | 440 | 612 | 804 | 1013 | 1233 | 1480 | 1699 | 1900 | 2086 | 2218 | 2316 | 2386 | 2436 | 2471 | 2493 |
| MOOSE LAKE 1 SSE | 0 | 1 | 11 | 33 | 70 | 132 | 212 | 315 | 443 | 594 | 764 | 957 | 1125 | 1272 | 1399 | 1482 | 1538 | 1576 | 1603 | 1622 | 1635 |
| MORA | 3 | 12 | 33 | 72 | 133 | 228 | 342 | 481 | 644 | 828 | 1026 | 1251 | 1446 | 1620 | 1775 | 1879 | 1953 | 2003 | 2037 | 2061 | 2076 |
| MORRIS W C SCHOOL | 7 | 22 | 50 | 97 | 170 | 285 | 421 | 582 | 764 | 961 | 1169 | 1406 | 1617 | 1811 | 1990 | 2112 | 2199 | 2258 | 2297 | 2324 | 2341 |
| NEW LONDON | 5 | 18 | 44 | 91 | 164 | 278 | 413 | 576 | 763 | 967 | 1185 | 1428 | 1642 | 1835 | 2013 | 2138 | 2229 | 2294 | 2339 | 2369 | 2388 |
| NEW ULM | 9 | 27 | 61 | 117 | 201 | 333 | 487 | 669 | 874 | 1093 | 1322 | 1576 | 1800 | 2006 | 2201 | 2343 | 2452 | 2533 | 2591 | 2631 | 2656 |
| OLIVIA | 9 | 27 | 60 | 115 | 198 | 327 | 477 | 654 | 853 | 1067 | 1291 | 1540 | 1760 | 1961 | 2148 | 2283 | 2386 | 2462 | 2518 | 2557 | 2583 |
| PARK RAPIDS | 0 | 5 | 19 | 48 | 99 | 184 | 289 | 418 | 568 | 737 | 921 | 1131 | 1317 | 1483 | 1629 | 1723 | 1785 | 1824 | 1851 | 1870 | 1884 |
| PINE RIVER DAM | 0 | 6 | 21 | 53 | 106 | 191 | 293 | 420 | 569 | 739 | 922 | 1130 | 1310 | 1468 | 1605 | 1695 | 1757 | 1798 | 1827 | 1848 | 1862 |
| PIPESTONE | 2 | 10 | 30 | 68 | 133 | 241 | 374 | 536 | 721 | 923 | 1137 | 1379 | 1594 | 1791 | 1973 | 2098 | 2188 | 2249 | 2289 | 2316 | 2332 |
| POKEGAMA DAM | 1 | 7 | 22 | 51 | 98 | 175 | 269 | 387 | 525 | 683 | 856 | 1052 | 1223 | 1373 | 1503 | 1585 | 1639 | 1675 | 1699 | 1718 | 1731 |
| PRESTON | 6 | 19 | 46 | 91 | 161 | 272 | 402 | 557 | 733 | 925 | 1127 | 1353 | 1552 | 1733 | 1900 | 2018 | 2105 | 2166 | 2210 | 2239 | 2257 |
| RED LAKE FALLS | 5 | 15 | 36 | 73 | 130 | 221 | 329 | 462 | 617 | 790 | 977 | 1190 | 1379 | 1548 | 1698 | 1798 | 1866 | 1912 | 1943 | 1966 | 1981 |
| RED LAKE INDIAN | 0 | 5 | 21 | 53 | 106 | 193 | 297 | 423 | 568 | 732 | 910 | 1114 | 1294 | 1452 | 1589 | 1675 | 1731 | 1768 | 1795 | 1818 | 1836 |
| ROCHESTER WSO | 7 | 23 | 53 | 104 | 182 | 302 | 444 | 611 | 800 | 1003 | 1216 | 1453 | 1662 | 1854 | 2032 | 2160 | 2258 | 2331 | 2385 | 2423 | 2448 |
| ROSEAU 1 E | 1 | 7 | 21 | 48 | 93 | 166 | 255 | 365 | 496 | 645 | 808 | 992 | 1151 | 1290 | 1408 | 1481 | 1528 | 1558 | 1578 | 1594 | 1606 |
| ROSEMOUNT AGRI EXP | 6 | 20 | 47 | 92 | 163 | 274 | 407 | 566 | 748 | 946 | 1155 | 1389 | 1594 | 1780 | 1950 | 2070 | 2159 | 2223 | 2270 | 2303 | 2325 |
| ST CLOUD WSO | 5 | 18 | 44 | 90 | 159 | 266 | 392 | 543 | 716 | 907 | 1112 | 1342 | 1542 | 1723 | 1886 | 1999 | 2082 | 2141 | 2182 | 2210 | 2228 |
| ST PETER 2 SW | 7 | 24 | 58 | 116 | 203 | 337 | 493 | 676 | 880 | 1099 | 1329 | 1584 | 1809 | 2015 | 2209 | 2349 | 2455 | 2534 | 2592 | 2632 | 2658 |
| SANDY LAKE DAM | 0 | 5 | 19 | 47 | 95 | 174 | 270 | 390 | 532 | 692 | 866 | 1064 | 1236 | 1387 | 1518 | 1602 | 1658 | 1696 | 1723 | 1745 | 1761 |
| SPRINGFIELD 1 NW | 8 | 22 | 52 | 107 | 191 | 324 | 480 | 664 | 868 | 1084 | 1307 | 1553 | 1768 | 1966 | 2153 | 2289 | 2393 | 2470 | 2526 | 2563 | 2587 |
| THIEF RIVER FALLS | 3 | 11 | 29 | 63 | 117 | 204 | 308 | 434 | 582 | 747 | 927 | 1134 | 1317 | 1482 | 1627 | 1722 | 1785 | 1824 | 1849 | 1867 | 1879 |
| TRACY | 6 | 19 | 47 | 96 | 175 | 301 | 451 | 630 | 832 | 1050 | 1279 | 1536 | 1763 | 1973 | 2168 | 2308 | 2413 | 2490 | 2545 | 2584 | 2609 |
| TWO HARBORS | 0 | 0 | 3 | 11 | 23 | 44 | 77 | 129 | 209 | 318 | 453 | 619 | 769 | 903 | 1022 | 1099 | 1152 | 1185 | 1206 | 1218 | 1225 |
| VIRGINIA | 0 | 2 | 14 | 40 | 83 | 156 | 245 | 356 | 489 | 640 | 806 | 995 | 1158 | 1299 | 1418 | 1492 | 1540 | 1571 | 1594 | 1612 | 1625 |
| WADENA 3 S | 1 | 9 | 27 | 62 | 121 | 216 | 330 | 469 | 630 | 809 | 1003 | 1224 | 1420 | 1598 | 1753 | 1857 | 1928 | 1974 | 2006 | 2029 | 2045 |
| WALKER | 1 | 7 | 23 | 54 | 105 | 188 | 288 | 410 | 554 | 718 | 896 | 1101 | 1280 | 1438 | 1575 | 1664 | 1723 | 1764 | 1795 | 1818 | 1835 |
| WARROAD | 0 | 3 | 15 | 38 | 80 | 150 | 239 | 351 | 486 | 639 | 808 | 999 | 1165 | 1310 | 1434 | 1511 | 1561 | 1592 | 1612 | 1627 | 1639 |
| WASECA EXP STA | 4 | 15 | 40 | 87 | 162 | 281 | 422 | 590 | 777 | 979 | 1189 | 1423 | 1629 | 1817 | 1991 | 2116 | 2209 | 2276 | 2324 | 2357 | 2378 |
| WHEATON | 7 | 22 | 51 | 100 | 176 | 295 | 436 | 604 | 794 | 1003 | 1225 | 1478 | 1703 | 1910 | 2104 | 2241 | 2343 | 2415 | 2465 | 2499 | 2521 |
| WILLMAR ST HOSP | 8 | 23 | 52 | 102 | 177 | 295 | 434 | 601 | 791 | 998 | 1217 | 1462 | 1677 | 1874 | 2056 | 2187 | 2285 | 2357 | 2409 | 2444 | 2467 |
| WINDOM | 10 | 29 | 60 | 110 | 199 | 314 | 463 | 643 | 846 | 1063 | 1290 | 1541 | 1762 | 1964 | 2154 | 2291 | 2395 | 2471 | 2526 | 2565 | 2591 |
| WINNEBAGO | 10 | 30 | 65 | 123 | 209 | 342 | 495 | 675 | 874 | 1087 | 1309 | 1556 | 1774 | 1976 | 2167 | 2308 | 2412 | 2491 | 2548 | 2588 | 2614 |
| WINNIBIGOSHISH DAM | 1 | 6 | 20 | 49 | 98 | 181 | 282 | 408 | 557 | 725 | 906 | 1112 | 1291 | 1447 | 1582 | 1667 | 1723 | 1759 | 1785 | 1804 | 1818 |
| WINONA | 11 | 35 | 77 | 144 | 240 | 380 | 538 | 721 | 925 | 1145 | 1376 | 1634 | 1882 | 2070 | 2267 | 2412 | 2526 | 2615 | 2682 | 2731 | 2763 |
| WORTHINGTON | 8 | 25 | 56 | 108 | 188 | 313 | 460 | 634 | 828 | 1038 | 1258 | 1504 | 1720 | 1919 | 2102 | 2233 | 2330 | 2400 | 2451 | 2487 | 2511 |
| ZUMBROTA | 7 | 22 | 49 | 94 | 165 | 277 | 410 | 577 | 758 | 957 | 1169 | 1406 | 1615 | 1805 | 1980 | 2104 | 2197 | 2266 | 2317 | 2354 | 2378 |
| FARGO ND WSO | 6 | 19 | 47 | 94 | 166 | 275 | 403 | 558 | 731 | 927 | 1139 | 1382 | 1598 | 1794 | 1973 | 2096 | 2184 | 2245 | 2287 | 2316 | 2335 |
| SIOUX FALLS SD WSO | 11 | 31 | 67 | 126 | 214 | 347 | 502 | 687 | 898 | 1130 | 1377 | 1654 | 1900 | 2126 | 2338 | 2492 | 2609 | 2694 | 2754 | 2793 | 2817 |
| LA CROSSE WI WSO | 10 | 33 | 77 | 146 | 245 | 389 | 550 | 736 | 943 | 1167 | 1403 | 1668 | 1902 | 2118 | 2324 | 2477 | 2599 | 2693 | 2764 | 2812 | 2843 |

Appendix Table 7. Normal total growing degree days, $T_b$ = 55°F, at selected dates and adjusted to an 8 a.m. observation time.

| | APRIL | | | MAY | | | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 |
| ADA | 2 | 7 | 19 | 41 | 79 | 140 | 217 | 314 | 432 | 569 | 721 | 898 | 1055 | 1193 | 1312 | 1386 | 1433 | 1460 | 1476 | 1488 | 1497 |
| ALBERT LEA | 3 | 9 | 21 | 44 | 87 | 165 | 268 | 399 | 551 | 718 | 894 | 1092 | 1265 | 1420 | 1557 | 1645 | 1703 | 1742 | 1770 | 1792 | 1808 |
| ALEXANDRIA FAA AP | 1 | 6 | 18 | 40 | 78 | 142 | 222 | 324 | 450 | 596 | 758 | 943 | 1104 | 1245 | 1367 | 1443 | 1492 | 1521 | 1539 | 1551 | 1559 |
| ARGYLE 4 E | 0 | 3 | 12 | 30 | 63 | 119 | 189 | 275 | 379 | 497 | 630 | 784 | 920 | 1040 | 1140 | 1198 | 1230 | 1246 | 1256 | 1265 | 1272 |
| ARTICHOKE LAKE | 2 | 8 | 19 | 41 | 79 | 145 | 233 | 346 | 483 | 640 | 811 | 1005 | 1174 | 1324 | 1456 | 1540 | 1595 | 1629 | 1651 | 1665 | 1675 |
| AUSTIN 3 S | 3 | 9 | 21 | 43 | 82 | 152 | 242 | 356 | 490 | 639 | 796 | 971 | 1122 | 1256 | 1374 | 1452 | 1503 | 1537 | 1560 | 1575 | 1587 |
| BABBITT 2 SE | 0 | 0 | 3 | 17 | 41 | 80 | 127 | 188 | 266 | 360 | 469 | 595 | 702 | 790 | 856 | 891 | 907 | 916 | 922 | 930 | 937 |
| BAUDETTE | 0 | 0 | 5 | 20 | 45 | 84 | 133 | 197 | 280 | 381 | 497 | 628 | 739 | 829 | 900 | 939 | 959 | 970 | 977 | 982 | 986 |
| BEMIDJI AP | 0 | 0 | 8 | 24 | 52 | 99 | 158 | 235 | 333 | 451 | 583 | 734 | 861 | 968 | 1052 | 1100 | 1127 | 1141 | 1150 | 1157 | 1163 |
| BENSON | 2 | 8 | 21 | 47 | 92 | 167 | 261 | 379 | 520 | 679 | 852 | 1048 | 1220 | 1372 | 1505 | 1588 | 1642 | 1675 | 1695 | 1710 | 1719 |
| BIG FALLS | 0 | 0 | 5 | 18 | 40 | 78 | 127 | 192 | 274 | 373 | 486 | 614 | 723 | 813 | 882 | 918 | 935 | 944 | 951 | 958 | 965 |
| BROWNS VALLEY | 1 | 4 | 13 | 32 | 68 | 133 | 218 | 327 | 461 | 615 | 785 | 981 | 1153 | 1307 | 1443 | 1530 | 1587 | 1622 | 1643 | 1657 | 1667 |
| CAMBRIDGE ST HOSP | 1 | 5 | 17 | 40 | 79 | 144 | 226 | 331 | 458 | 603 | 762 | 941 | 1096 | 1229 | 1342 | 1411 | 1455 | 1482 | 1501 | 1515 | 1525 |
| CAMPBELL | 2 | 6 | 16 | 36 | 72 | 137 | 220 | 326 | 451 | 592 | 746 | 923 | 1081 | 1223 | 1346 | 1423 | 1469 | 1495 | 1510 | 1521 | 1529 |
| CANBY | 4 | 12 | 26 | 53 | 99 | 178 | 280 | 410 | 563 | 735 | 920 | 1131 | 1317 | 1484 | 1633 | 1731 | 1798 | 1843 | 1873 | 1895 | 1910 |
| CASS LAKE | 0 | 3 | 9 | 23 | 48 | 93 | 154 | 233 | 331 | 445 | 570 | 713 | 836 | 942 | 1027 | 1075 | 1100 | 1112 | 1120 | 1128 | 1135 |
| CHASKA | 1 | 5 | 16 | 41 | 86 | 165 | 265 | 391 | 538 | 703 | 879 | 1076 | 1248 | 1400 | 1533 | 1619 | 1675 | 1710 | 1734 | 1750 | 1762 |
| CLOQUET FOR RES CEN | 0 | 0 | 2 | 10 | 24 | 48 | 82 | 134 | 207 | 303 | 416 | 546 | 655 | 743 | 810 | 845 | 864 | 873 | 880 | 885 | 890 |
| COLLEGEVILLE ST JOHN | 2 | 7 | 21 | 46 | 88 | 156 | 241 | 348 | 476 | 624 | 786 | 971 | 1132 | 1274 | 1396 | 1473 | 1523 | 1555 | 1575 | 1590 | 1601 |
| CROOKSTON NW EXP STA | 0 | 3 | 10 | 27 | 56 | 110 | 179 | 269 | 378 | 505 | 647 | 813 | 960 | 1090 | 1200 | 1265 | 1304 | 1324 | 1336 | 1346 | 1353 |
| DETROIT LAKES 1 NNE | 0 | 1 | 4 | 13 | 31 | 68 | 120 | 191 | 281 | 389 | 511 | 652 | 775 | 880 | 964 | 1009 | 1030 | 1038 | 1041 | 1046 | 1051 |
| DULUTH WSO | 0 | 0 | 3 | 12 | 25 | 49 | 81 | 130 | 201 | 294 | 405 | 533 | 642 | 732 | 803 | 844 | 869 | 884 | 895 | 903 | 909 |
| FAIRMONT | 4 | 13 | 32 | 68 | 125 | 221 | 337 | 479 | 641 | 817 | 1001 | 1208 | 1388 | 1551 | 1699 | 1802 | 1875 | 1926 | 1962 | 1987 | 2003 |
| FARIBAULT | 3 | 9 | 22 | 46 | 89 | 164 | 261 | 384 | 530 | 692 | 864 | 1056 | 1222 | 1369 | 1499 | 1585 | 1643 | 1681 | 1706 | 1723 | 1735 |
| FARMINGTON 3 NW | 3 | 10 | 25 | 54 | 101 | 179 | 277 | 397 | 537 | 694 | 861 | 1050 | 1215 | 1361 | 1488 | 1570 | 1625 | 1661 | 1688 | 1708 | 1722 |
| FERGUS FALLS | 0 | 3 | 10 | 28 | 62 | 122 | 201 | 304 | 428 | 571 | 729 | 912 | 1073 | 1214 | 1335 | 1409 | 1453 | 1479 | 1495 | 1507 | 1517 |
| FOSSTON | 0 | 4 | 13 | 32 | 63 | 114 | 179 | 263 | 364 | 485 | 620 | 778 | 916 | 1035 | 1134 | 1191 | 1223 | 1242 | 1255 | 1266 | 1276 |
| GLENWOOD | 0 | 4 | 14 | 34 | 71 | 134 | 215 | 319 | 445 | 591 | 752 | 936 | 1097 | 1237 | 1357 | 1431 | 1478 | 1506 | 1523 | 1537 | 1546 |
| GRAND MARAIS | 0 | 0 | 0 | 1 | 1 | 2 | 6 | 20 | 47 | 93 | 156 | 239 | 315 | 381 | 432 | 457 | 467 | 470 | 471 | 472 | 475 |
| GRAND MEADOW | 1 | 6 | 19 | 45 | 89 | 164 | 258 | 374 | 507 | 655 | 812 | 988 | 1141 | 1278 | 1398 | 1476 | 1529 | 1564 | 1588 | 1606 | 1619 |
| GRAND RAPIDS NC SCHL | 0 | 0 | 6 | 19 | 43 | 81 | 131 | 197 | 282 | 385 | 501 | 634 | 748 | 838 | 908 | 948 | 965 | 974 | 981 | 988 | 994 |
| GULL LAKE DAM | 0 | 1 | 9 | 26 | 56 | 109 | 176 | 264 | 373 | 502 | 646 | 810 | 950 | 1070 | 1168 | 1227 | 1261 | 1281 | 1294 | 1304 | 1312 |
| HALLOCK | 0 | 3 | 11 | 30 | 63 | 119 | 189 | 278 | 385 | 510 | 648 | 807 | 947 | 1068 | 1166 | 1223 | 1253 | 1269 | 1279 | 1288 | 1297 |
| HINCKLEY | 0 | 0 | 2 | 12 | 34 | 75 | 132 | 209 | 306 | 423 | 554 | 705 | 834 | 943 | 1031 | 1079 | 1105 | 1118 | 1126 | 1134 | 1141 |
| INTERNATIONAL FALLS | 0 | 0 | 5 | 20 | 44 | 85 | 137 | 208 | 292 | 398 | 516 | 650 | 762 | 852 | 921 | 957 | 975 | 984 | 991 | 997 | 1003 |
| ITASCA ST PARK SCHL | 0 | 1 | 6 | 18 | 39 | 78 | 130 | 200 | 290 | 397 | 518 | 658 | 777 | 878 | 958 | 1002 | 1025 | 1037 | 1045 | 1053 | 1059 |
| JORDAN 1 S | 2 | 9 | 22 | 47 | 90 | 161 | 250 | 363 | 495 | 645 | 805 | 985 | 1141 | 1276 | 1393 | 1467 | 1515 | 1547 | 1570 | 1588 | 1600 |
| LEECH LAKE DAM | 0 | 0 | 6 | 19 | 44 | 86 | 142 | 218 | 313 | 428 | 558 | 705 | 829 | 933 | 1016 | 1063 | 1089 | 1104 | 1115 | 1123 | 1131 |
| LITCHFIELD | 2 | 8 | 21 | 45 | 88 | 162 | 255 | 373 | 513 | 670 | 839 | 1030 | 1197 | 1343 | 1471 | 1552 | 1606 | 1640 | 1663 | 1681 | 1693 |
| LITTLE FALLS 1 N | 0 | 3 | 14 | 35 | 70 | 129 | 204 | 299 | 416 | 553 | 704 | 875 | 1022 | 1147 | 1252 | 1316 | 1356 | 1380 | 1396 | 1407 | 1415 |
| LONG PRAIRIE | 1 | 5 | 14 | 31 | 61 | 113 | 181 | 271 | 383 | 513 | 658 | 822 | 963 | 1082 | 1180 | 1238 | 1271 | 1290 | 1303 | 1314 | 1322 |
| MADISON SEWAGE PLANT | 3 | 10 | 22 | 45 | 87 | 160 | 255 | 377 | 521 | 683 | 858 | 1057 | 1230 | 1383 | 1517 | 1602 | 1656 | 1690 | 1713 | 1729 | 1741 |
| MAPLE PLAIN | 2 | 7 | 19 | 43 | 85 | 156 | 246 | 359 | 493 | 644 | 807 | 991 | 1151 | 1291 | 1413 | 1490 | 1542 | 1577 | 1603 | 1624 | 1639 |
| MARSHALL | 2 | 8 | 20 | 45 | 90 | 170 | 275 | 406 | 560 | 729 | 909 | 1112 | 1291 | 1452 | 1595 | 1689 | 1752 | 1794 | 1823 | 1844 | 1858 |
| MEADOWLANDS | 0 | 0 | 3 | 14 | 33 | 65 | 106 | 162 | 238 | 334 | 445 | 572 | 679 | 767 | 833 | 868 | 886 | 894 | 901 | 907 | 913 |
| MILACA | 0 | 3 | 11 | 29 | 60 | 114 | 184 | 275 | 388 | 521 | 670 | 839 | 984 | 1109 | 1211 | 1272 | 1307 | 1326 | 1339 | 1348 | 1356 |
| MILAN | 3 | 9 | 22 | 46 | 87 | 159 | 250 | 366 | 504 | 659 | 827 | 1017 | 1183 | 1332 | 1461 | 1544 | 1597 | 1629 | 1648 | 1662 | 1671 |
| MINNEAPOLIS-ST PAUL | 3 | 12 | 32 | 66 | 120 | 208 | 314 | 446 | 601 | 776 | 964 | 1175 | 1358 | 1521 | 1667 | 1765 | 1834 | 1881 | 1912 | 1933 | 1945 |
| MONTEVIDEO 1 SW | 1 | 5 | 15 | 38 | 79 | 153 | 249 | 370 | 513 | 671 | 841 | 1034 | 1202 | 1353 | 1485 | 1570 | 1626 | 1660 | 1683 | 1698 | 1709 |
| MOOSE LAKE 1 SSE | 0 | 0 | 2 | 12 | 28 | 57 | 96 | 152 | 232 | 333 | 453 | 592 | 710 | 806 | 885 | 928 | 953 | 967 | 977 | 985 | 991 |
| MORA | 0 | 2 | 10 | 29 | 61 | 115 | 183 | 273 | 386 | 519 | 668 | 838 | 983 | 1107 | 1209 | 1270 | 1306 | 1326 | 1339 | 1349 | 1356 |
| MORRIS W C SCHOOL | 2 | 8 | 20 | 44 | 85 | 156 | 245 | 357 | 488 | 635 | 793 | 975 | 1136 | 1280 | 1404 | 1483 | 1531 | 1558 | 1574 | 1585 | 1594 |
| NEW LONDON | 1 | 5 | 17 | 40 | 80 | 149 | 237 | 350 | 485 | 640 | 808 | 996 | 1160 | 1302 | 1426 | 1505 | 1557 | 1588 | 1608 | 1621 | 1630 |
| NEW ULM | 3 | 9 | 23 | 50 | 97 | 180 | 285 | 418 | 571 | 741 | 919 | 1119 | 1293 | 1449 | 1589 | 1681 | 1744 | 1786 | 1813 | 1833 | 1846 |
| OLIVIA | 4 | 11 | 26 | 54 | 101 | 183 | 285 | 413 | 561 | 725 | 899 | 1094 | 1263 | 1413 | 1546 | 1634 | 1693 | 1733 | 1760 | 1780 | 1794 |
| PARK RAPIDS | 0 | 0 | 5 | 18 | 43 | 89 | 149 | 229 | 329 | 447 | 581 | 736 | 871 | 987 | 1082 | 1135 | 1164 | 1178 | 1188 | 1196 | 1203 |
| PINE RIVER DAM | 0 | 0 | 6 | 22 | 49 | 95 | 154 | 233 | 333 | 452 | 586 | 739 | 868 | 976 | 1061 | 1110 | 1138 | 1154 | 1164 | 1172 | 1179 |
| PIPESTONE | 0 | 1 | 6 | 21 | 53 | 110 | 201 | 313 | 447 | 599 | 763 | 950 | 1115 | 1262 | 1389 | 1468 | 1517 | 1544 | 1560 | 1571 | 1579 |
| POKEGAMA DAM | 0 | 1 | 7 | 20 | 44 | 85 | 139 | 210 | 300 | 408 | 531 | 671 | 791 | 892 | 971 | 1015 | 1039 | 1051 | 1059 | 1066 | 1073 |
| PRESTON | 1 | 5 | 16 | 38 | 77 | 144 | 228 | 334 | 460 | 601 | 753 | 925 | 1074 | 1204 | 1317 | 1388 | 1434 | 1462 | 1480 | 1493 | 1502 |
| RED LAKE FALLS | 1 | 5 | 14 | 33 | 63 | 115 | 181 | 266 | 371 | 494 | 632 | 790 | 928 | 1047 | 1146 | 1205 | 1240 | 1260 | 1272 | 1282 | 1289 |
| RED LAKE INDIAN | 0 | 0 | 6 | 23 | 53 | 103 | 165 | 244 | 341 | 455 | 583 | 732 | 860 | 969 | 1056 | 1103 | 1128 | 1141 | 1151 | 1161 | 1172 |
| ROCHESTER WSO | 2 | 8 | 21 | 46 | 89 | 164 | 258 | 376 | 514 | 667 | 830 | 1013 | 1172 | 1313 | 1437 | 1517 | 1570 | 1606 | 1631 | 1651 | 1665 |
| ROSEAU 1 E | 0 | 1 | 7 | 20 | 43 | 82 | 132 | 197 | 280 | 380 | 492 | 621 | 732 | 823 | 895 | 935 | 955 | 965 | 972 | 978 | 984 |
| ROSEMOUNT AGRI EXP | 1 | 6 | 17 | 40 | 79 | 146 | 232 | 342 | 472 | 619 | 779 | 958 | 1113 | 1249 | 1365 | 1438 | 1486 | 1516 | 1537 | 1553 | 1565 |
| ST CLOUD WSO | 1 | 5 | 16 | 39 | 77 | 140 | 219 | 321 | 443 | 585 | 740 | 914 | 1065 | 1195 | 1305 | 1373 | 1417 | 1444 | 1462 | 1475 | 1484 |
| ST PETER 2 SW | 1 | 7 | 20 | 48 | 98 | 183 | 291 | 423 | 578 | 745 | 925 | 1126 | 1301 | 1458 | 1595 | 1685 | 1746 | 1785 | 1812 | 1832 | 1846 |
| SANDY LAKE DAM | 0 | 0 | 5 | 18 | 42 | 83 | 137 | 209 | 301 | 412 | 537 | 680 | 801 | 902 | 982 | 1027 | 1051 | 1064 | 1074 | 1083 | 1091 |
| SPRINGFIELD 1 NW | 1 | 6 | 17 | 43 | 90 | 174 | 282 | 415 | 569 | 735 | 907 | 1098 | 1264 | 1412 | 1544 | 1631 | 1690 | 1729 | 1755 | 1773 | 1785 |
| THIEF RIVER FALLS | 0 | 3 | 11 | 27 | 56 | 105 | 167 | 248 | 346 | 463 | 593 | 744 | 877 | 991 | 1086 | 1142 | 1173 | 1189 | 1198 | 1204 | 1210 |
| TRACY | 1 | 5 | 15 | 37 | 79 | 157 | 258 | 388 | 539 | 707 | 886 | 1088 | 1265 | 1424 | 1566 | 1658 | 1720 | 1760 | 1787 | 1806 | 1820 |
| TWO HARBORS | 0 | 0 | 0 | 3 | 6 | 9 | 17 | 36 | 76 | 140 | 227 | 338 | 438 | 524 | 593 | 632 | 652 | 662 | 667 | 670 | 673 |
| VIRGINIA | 0 | 0 | 3 | 15 | 36 | 73 | 122 | 189 | 273 | 376 | 492 | 626 | 739 | 832 | 904 | 942 | 961 | 970 | 977 | 985 | 992 |
| WADENA 3 S | 0 | 1 | 8 | 24 | 54 | 107 | 177 | 267 | 377 | 506 | 650 | 816 | 961 | 1088 | 1193 | 1255 | 1291 | 1310 | 1322 | 1332 | 1340 |
| WALKER | 0 | 0 | 7 | 22 | 48 | 93 | 150 | 226 | 321 | 435 | 565 | 713 | 841 | 950 | 1037 | 1086 | 1114 | 1130 | 1142 | 1153 | 1162 |
| WARROAD | 0 | 0 | 4 | 16 | 37 | 75 | 124 | 190 | 276 | 381 | 499 | 635 | 751 | 847 | 922 | 963 | 985 | 996 | 1002 | 1008 | 1013 |
| WASECA EXP STA | 0 | 2 | 11 | 32 | 72 | 144 | 237 | 354 | 491 | 642 | 803 | 982 | 1138 | 1275 | 1396 | 1473 | 1524 | 1556 | 1578 | 1593 | 1604 |
| WHEATON | 2 | 8 | 20 | 46 | 90 | 165 | 259 | 377 | 517 | 675 | 848 | 1045 | 1220 | 1377 | 1517 | 1608 | 1668 | 1706 | 1730 | 1746 | 1756 |
| WILLMAR ST HOSP | 3 | 8 | 21 | 46 | 88 | 160 | 252 | 369 | 508 | 665 | 834 | 1024 | 1189 | 1335 | 1463 | 1547 | 1602 | 1639 | 1663 | 1680 | 1692 |
| WINDOM | 4 | 12 | 25 | 49 | 93 | 171 | 273 | 403 | 555 | 723 | 899 | 1096 | 1267 | 1419 | 1554 | 1643 | 1703 | 1742 | 1769 | 1788 | 1802 |
| WINNEBAGO | 3 | 11 | 28 | 58 | 110 | 196 | 301 | 431 | 580 | 742 | 914 | 1107 | 1275 | 1427 | 1563 | 1654 | 1717 | 1758 | 1787 | 1806 | 1820 |
| WINNIBIGOSHISH DAM | 0 | 0 | 6 | 20 | 45 | 90 | 149 | 227 | 326 | 444 | 576 | 726 | 854 | 961 | 1045 | 1091 | 1115 | 1128 | 1137 | 1145 | 1152 |
| WINONA | 3 | 13 | 34 | 72 | 131 | 224 | 334 | 467 | 620 | 790 | 971 | 1175 | 1353 | 1511 | 1653 | 1749 | 1817 | 1865 | 1901 | 1927 | 1945 |
| WORTHINGTON | 3 | 8 | 22 | 48 | 93 | 172 | 271 | 395 | 539 | 698 | 868 | 1059 | 1226 | 1374 | 1504 | 1587 | 1642 | 1677 | 1701 | 1718 | 1731 |
| ZUMBROTA | 2 | 7 | 18 | 39 | 77 | 144 | 232 | 344 | 477 | 627 | 789 | 972 | 1131 | 1271 | 1391 | 1468 | 1518 | 1551 | 1575 | 1594 | 1607 |
| FARGO ND WSO | 1 | 6 | 19 | 44 | 85 | 152 | 234 | 338 | 464 | 609 | 772 | 959 | 1125 | 1271 | 1397 | 1476 | 1526 | 1556 | 1575 | 1589 | 1599 |
| SIOUX FALLS SD WSO | 4 | 12 | 27 | 57 | 108 | 193 | 301 | 436 | 597 | 779 | 976 | 1199 | 1394 | 1570 | 1728 | 1834 | 1907 | 1954 | 1984 | 2003 | 2015 |
| LA CROSSE WI WSO | 3 | 12 | 32 | 70 | 130 | 225 | 337 | 473 | 629 | 803 | 990 | 1200 | 1384 | 1550 | 1701 | 1804 | 1879 | 1932 | 1970 | 1995 | 2012 |

Appendix Table 8. Normal total growing degree days, $T_b$ = 60°F, at selected dates and adjusted to an 8 a.m. observation time.

| | APRIL | | | MAY | | | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 |
| ADA | 0 | 1 | 6 | 17 | 35 | 66 | 106 | 160 | 232 | 321 | 425 | 547 | 653 | 743 | 814 | 854 | 874 | 884 | 888 | 893 | 897 |
| ALBERT LEA | 1 | 3 | 5 | 13 | 31 | 70 | 129 | 211 | 312 | 429 | 556 | 699 | 821 | 926 | 1010 | 1057 | 1082 | 1096 | 1105 | 1115 | 1125 |
| ALEXANDRIA FAA AP | 0 | 1 | 6 | 16 | 34 | 65 | 107 | 166 | 245 | 343 | 456 | 585 | 695 | 786 | 859 | 899 | 921 | 932 | 938 | 942 | 945 |
| ARGYLE 4 E | 0 | 0 | 3 | 12 | 28 | 55 | 89 | 135 | 193 | 265 | 349 | 448 | 535 | 608 | 665 | 693 | 705 | 708 | 709 | 712 | 716 |
| ARTICHOKE LAKE | 1 | 2 | 6 | 14 | 30 | 63 | 110 | 178 | 266 | 374 | 495 | 633 | 752 | 851 | 932 | 978 | 1003 | 1015 | 1022 | 1027 | 1032 |
| AUSTIN 3 S | 1 | 2 | 6 | 15 | 32 | 66 | 116 | 185 | 271 | 371 | 479 | 599 | 699 | 783 | 850 | 889 | 910 | 922 | 929 | 936 | 941 |
| BABBITT 2 SE | 0 | 0 | 0 | 8 | 19 | 35 | 55 | 82 | 121 | 172 | 234 | 306 | 367 | 414 | 446 | 460 | 463 | 464 | 465 | 467 | 471 |
| BAUDETTE | 0 | 0 | 1 | 9 | 21 | 37 | 57 | 86 | 128 | 186 | 254 | 333 | 396 | 444 | 477 | 493 | 499 | 502 | 503 | 504 | 506 |
| BEMIDJI AP | 0 | 0 | 2 | 10 | 23 | 44 | 72 | 112 | 167 | 240 | 324 | 420 | 498 | 558 | 601 | 621 | 630 | 634 | 636 | 638 | 640 |
| BENSON | 0 | 1 | 7 | 18 | 40 | 79 | 131 | 203 | 295 | 405 | 528 | 670 | 790 | 892 | 974 | 1019 | 1043 | 1055 | 1061 | 1066 | 1071 |
| BIG FALLS | 0 | 0 | 1 | 7 | 17 | 33 | 53 | 83 | 126 | 182 | 248 | 325 | 386 | 434 | 466 | 480 | 484 | 485 | 486 | 489 | 492 |
| BROWNS VALLEY | 0 | 0 | 3 | 10 | 25 | 56 | 100 | 164 | 248 | 353 | 474 | 614 | 736 | 840 | 925 | 974 | 1001 | 1014 | 1020 | 1025 | 1029 |
| CAMBRIDGE ST HOSP | 0 | 0 | 5 | 14 | 32 | 63 | 105 | 165 | 244 | 340 | 450 | 574 | 678 | 763 | 828 | 862 | 879 | 887 | 893 | 898 | 903 |
| CAMPBELL | 0 | 1 | 5 | 13 | 30 | 61 | 105 | 166 | 242 | 334 | 439 | 561 | 668 | 761 | 835 | 876 | 896 | 904 | 908 | 911 | 916 |
| CANBY | 1 | 4 | 9 | 21 | 42 | 85 | 145 | 228 | 332 | 454 | 590 | 746 | 881 | 998 | 1095 | 1153 | 1187 | 1206 | 1218 | 1228 | 1235 |
| CASS LAKE | 0 | 0 | 2 | 8 | 19 | 40 | 69 | 111 | 166 | 233 | 310 | 398 | 472 | 531 | 575 | 596 | 604 | 606 | 607 | 609 | 613 |
| CHASKA | 0 | 0 | 3 | 13 | 33 | 73 | 129 | 208 | 303 | 417 | 544 | 686 | 808 | 910 | 992 | 1037 | 1062 | 1074 | 1081 | 1087 | 1093 |
| CLOQUET FOR RES CEN | 0 | 0 | 0 | 4 | 9 | 15 | 25 | 45 | 81 | 134 | 199 | 275 | 336 | 381 | 410 | 422 | 426 | 427 | 428 | 430 | 432 |
| COLLEGEVILLE ST JOHN | 0 | 1 | 7 | 19 | 39 | 73 | 117 | 179 | 259 | 358 | 471 | 600 | 710 | 801 | 874 | 914 | 938 | 947 | 954 | 960 | 965 |
| CROOKSTON NW EXP STA | 0 | 0 | 3 | 10 | 23 | 47 | 81 | 129 | 192 | 271 | 364 | 474 | 571 | 652 | 716 | 750 | 765 | 771 | 773 | 776 | 780 |
| DETROIT LAKES 1 NNE | 0 | 0 | 1 | 3 | 9 | 22 | 42 | 75 | 122 | 184 | 257 | 344 | 417 | 476 | 518 | 536 | 539 | 540 | 541 | 541 | 542 |
| DULUTH WSO | 0 | 0 | 1 | 4 | 9 | 15 | 24 | 41 | 74 | 124 | 187 | 262 | 323 | 370 | 404 | 420 | 427 | 431 | 434 | 437 | 440 |
| FAIRMONT | 1 | 4 | 11 | 27 | 57 | 111 | 183 | 276 | 387 | 513 | 648 | 800 | 930 | 1043 | 1139 | 1198 | 1235 | 1258 | 1273 | 1284 | 1293 |
| FARIBAULT | 1 | 2 | 6 | 15 | 34 | 72 | 126 | 202 | 297 | 410 | 532 | 669 | 785 | 882 | 960 | 1005 | 1030 | 1044 | 1052 | 1059 | 1064 |
| FARMINGTON 3 NW | 0 | 2 | 8 | 21 | 43 | 84 | 138 | 211 | 301 | 408 | 527 | 660 | 774 | 869 | 945 | 989 | 1013 | 1027 | 1037 | 1045 | 1053 |
| FERGUS FALLS | 0 | 0 | 2 | 9 | 22 | 50 | 91 | 149 | 226 | 321 | 431 | 558 | 668 | 761 | 834 | 873 | 892 | 899 | 903 | 908 | 913 |
| FOSSTON | 0 | 0 | 4 | 13 | 27 | 51 | 83 | 126 | 183 | 256 | 343 | 445 | 533 | 607 | 663 | 690 | 703 | 707 | 710 | 715 | 720 |
| GLENWOOD | 0 | 0 | 3 | 12 | 29 | 58 | 99 | 158 | 236 | 334 | 446 | 575 | 685 | 776 | 847 | 885 | 904 | 913 | 918 | 923 | 927 |
| GRAND MARAIS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 25 | 51 | 86 | 117 | 142 | 159 | 162 | 162 | 163 | 163 | 163 | 163 |
| GRAND MEADOW | 0 | 0 | 5 | 16 | 38 | 77 | 130 | 199 | 284 | 382 | 490 | 611 | 713 | 799 | 869 | 908 | 930 | 943 | 951 | 959 | 965 |
| GRAND RAPIDS NC SCHL | 0 | 0 | 1 | 8 | 18 | 33 | 53 | 83 | 127 | 185 | 255 | 333 | 397 | 445 | 477 | 490 | 495 | 496 | 497 | 499 | 501 |
| GULL LAKE DAM | 0 | 0 | 2 | 10 | 24 | 48 | 80 | 126 | 189 | 271 | 365 | 473 | 563 | 635 | 688 | 714 | 727 | 732 | 735 | 738 | 742 |
| HALLOCK | 0 | 0 | 3 | 12 | 28 | 56 | 92 | 140 | 201 | 277 | 366 | 472 | 566 | 644 | 703 | 732 | 742 | 744 | 746 | 749 | 754 |
| HINCKLEY | 0 | 0 | 0 | 4 | 11 | 25 | 46 | 81 | 134 | 203 | 286 | 380 | 459 | 520 | 563 | 582 | 588 | 590 | 591 | 593 | 597 |
| INTERNATIONAL FALLS | 0 | 0 | 1 | 8 | 20 | 38 | 61 | 94 | 141 | 202 | 273 | 353 | 417 | 468 | 498 | 511 | 516 | 517 | 518 | 520 | 523 |
| ITASCA ST PARK SCHL | 0 | 0 | 1 | 7 | 15 | 31 | 54 | 87 | 134 | 196 | 269 | 353 | 424 | 480 | 520 | 539 | 546 | 548 | 549 | 552 | 555 |
| JORDAN 1 S | 0 | 2 | 7 | 17 | 37 | 72 | 120 | 188 | 270 | 370 | 481 | 606 | 710 | 795 | 861 | 898 | 918 | 929 | 937 | 944 | 951 |
| LEECH LAKE DAM | 0 | 0 | 1 | 8 | 18 | 36 | 60 | 96 | 149 | 217 | 298 | 390 | 465 | 523 | 564 | 584 | 592 | 595 | 598 | 601 | 604 |
| LITCHFIELD | 0 | 2 | 6 | 17 | 37 | 75 | 128 | 200 | 292 | 400 | 520 | 655 | 770 | 867 | 944 | 988 | 1011 | 1024 | 1032 | 1039 | 1045 |
| LITTLE FALLS 1 N | 0 | 0 | 4 | 14 | 31 | 59 | 95 | 147 | 217 | 305 | 407 | 523 | 618 | 695 | 752 | 783 | 798 | 806 | 811 | 815 | 819 |
| LONG PRAIRIE | 0 | 0 | 4 | 12 | 25 | 46 | 81 | 129 | 195 | 278 | 373 | 482 | 572 | 644 | 697 | 723 | 734 | 738 | 742 | 746 | 750 |
| MADISON SEWAGE PLANT | 1 | 3 | 7 | 16 | 35 | 72 | 125 | 200 | 295 | 408 | 533 | 676 | 799 | 903 | 986 | 1032 | 1056 | 1068 | 1075 | 1081 | 1087 |
| MAPLE PLAIN | 0 | 1 | 5 | 15 | 34 | 69 | 118 | 186 | 272 | 375 | 488 | 617 | 726 | 817 | 889 | 930 | 954 | 967 | 978 | 987 | 995 |
| MARSHALL | 1 | 2 | 5 | 14 | 34 | 75 | 136 | 220 | 323 | 443 | 573 | 721 | 849 | 959 | 1051 | 1105 | 1135 | 1152 | 1163 | 1172 | 1180 |
| MEADOWLANDS | 0 | 0 | 1 | 6 | 13 | 24 | 39 | 62 | 98 | 150 | 214 | 288 | 348 | 394 | 424 | 437 | 441 | 441 | 442 | 444 | 446 |
| MILACA | 0 | 0 | 3 | 10 | 24 | 47 | 80 | 129 | 196 | 281 | 380 | 494 | 588 | 664 | 719 | 747 | 758 | 762 | 764 | 768 | 771 |
| MILAN | 1 | 2 | 7 | 17 | 37 | 74 | 125 | 195 | 284 | 390 | 508 | 643 | 759 | 858 | 937 | 982 | 1007 | 1018 | 1024 | 1029 | 1033 |
| MINNEAPOLIS-ST PAUL | 0 | 3 | 11 | 27 | 55 | 103 | 166 | 250 | 356 | 481 | 619 | 775 | 908 | 1021 | 1115 | 1172 | 1207 | 1228 | 1240 | 1249 | 1254 |
| MONTEVIDEO 1 SW | 0 | 1 | 3 | 11 | 28 | 64 | 118 | 192 | 285 | 395 | 516 | 653 | 771 | 871 | 953 | 999 | 1024 | 1036 | 1043 | 1048 | 1053 |
| MOOSE LAKE 1 SSE | 0 | 0 | 0 | 5 | 11 | 19 | 31 | 54 | 93 | 151 | 223 | 308 | 378 | 432 | 470 | 487 | 494 | 496 | 499 | 501 | 504 |
| MORA | 0 | 0 | 2 | 11 | 24 | 48 | 80 | 128 | 194 | 280 | 380 | 494 | 589 | 666 | 722 | 749 | 762 | 766 | 769 | 772 | 776 |
| MORRIS W C SCHOOL | 0 | 2 | 7 | 17 | 37 | 73 | 123 | 189 | 272 | 369 | 479 | 605 | 715 | 810 | 886 | 928 | 949 | 957 | 961 | 965 | 969 |
| NEW LONDON | 0 | 0 | 5 | 15 | 33 | 68 | 115 | 181 | 268 | 373 | 492 | 625 | 737 | 830 | 904 | 946 | 969 | 980 | 987 | 991 | 994 |
| NEW ULM | 1 | 2 | 6 | 16 | 38 | 81 | 143 | 226 | 330 | 449 | 578 | 723 | 846 | 952 | 1038 | 1089 | 1117 | 1133 | 1142 | 1150 | 1156 |
| OLIVIA | 1 | 3 | 9 | 21 | 44 | 87 | 147 | 227 | 326 | 440 | 565 | 704 | 823 | 923 | 1005 | 1053 | 1081 | 1096 | 1106 | 1115 | 1122 |
| PARK RAPIDS | 0 | 0 | 1 | 7 | 17 | 35 | 61 | 99 | 154 | 226 | 311 | 411 | 495 | 563 | 614 | 638 | 647 | 650 | 651 | 654 | 657 |
| PINE RIVER DAM | 0 | 0 | 1 | 9 | 20 | 40 | 66 | 106 | 161 | 234 | 319 | 416 | 495 | 556 | 599 | 619 | 627 | 630 | 632 | 635 | 638 |
| PIPESTONE | 0 | 0 | 1 | 5 | 16 | 44 | 88 | 153 | 238 | 340 | 455 | 587 | 701 | 797 | 873 | 915 | 935 | 943 | 946 | 950 | 953 |
| POKEGAMA DAM | 0 | 0 | 2 | 8 | 18 | 35 | 59 | 93 | 141 | 204 | 278 | 363 | 433 | 489 | 528 | 546 | 552 | 554 | 555 | 558 | 561 |
| PRESTON | 0 | 0 | 4 | 14 | 32 | 66 | 111 | 172 | 249 | 342 | 446 | 562 | 660 | 741 | 804 | 838 | 856 | 865 | 870 | 874 | 879 |
| RED LAKE FALLS | 0 | 1 | 5 | 13 | 27 | 51 | 84 | 129 | 190 | 266 | 354 | 458 | 544 | 617 | 673 | 702 | 715 | 721 | 724 | 727 | 731 |
| RED LAKE INDIAN | 0 | 0 | 1 | 10 | 24 | 48 | 79 | 120 | 174 | 242 | 322 | 415 | 494 | 558 | 603 | 624 | 631 | 632 | 634 | 638 | 644 |
| ROCHESTER WSO | 0 | 1 | 6 | 16 | 37 | 76 | 129 | 201 | 290 | 394 | 508 | 636 | 745 | 836 | 909 | 950 | 972 | 984 | 993 | 1001 | 1009 |
| ROSEAU 1 E | 0 | 0 | 2 | 8 | 18 | 35 | 57 | 88 | 130 | 185 | 250 | 326 | 390 | 442 | 480 | 497 | 503 | 504 | 505 | 507 | 510 |
| ROSEMOUNT AGRI EXP | 0 | 1 | 5 | 15 | 34 | 67 | 112 | 174 | 256 | 354 | 465 | 590 | 694 | 779 | 845 | 881 | 900 | 911 | 918 | 925 | 930 |
| ST CLOUD WSO | 0 | 0 | 5 | 14 | 32 | 62 | 103 | 160 | 235 | 328 | 434 | 553 | 652 | 733 | 796 | 830 | 847 | 856 | 861 | 866 | 870 |
| ST PETER 2 SW | 0 | 1 | 5 | 16 | 39 | 84 | 147 | 230 | 333 | 452 | 582 | 728 | 853 | 959 | 1045 | 1093 | 1120 | 1133 | 1142 | 1151 | 1158 |
| SANDY LAKE DAM | 0 | 0 | 1 | 7 | 17 | 33 | 55 | 90 | 139 | 204 | 281 | 369 | 442 | 498 | 537 | 554 | 561 | 563 | 565 | 568 | 572 |
| SPRINGFIELD 1 NW | 0 | 1 | 4 | 13 | 35 | 79 | 142 | 227 | 329 | 445 | 569 | 705 | 820 | 917 | 997 | 1043 | 1069 | 1083 | 1092 | 1098 | 1104 |
| THIEF RIVER FALLS | 0 | 0 | 3 | 11 | 24 | 47 | 77 | 119 | 175 | 246 | 328 | 425 | 507 | 575 | 628 | 655 | 667 | 671 | 672 | 674 | 677 |
| TRACY | 0 | 1 | 3 | 10 | 28 | 67 | 125 | 206 | 307 | 425 | 555 | 702 | 829 | 938 | 1028 | 1081 | 1111 | 1126 | 1136 | 1144 | 1151 |
| TWO HARBORS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 16 | 48 | 91 | 152 | 206 | 251 | 283 | 297 | 299 | 300 | 301 | 301 | 302 |
| VIRGINIA | 0 | 0 | 1 | 5 | 14 | 28 | 50 | 81 | 126 | 184 | 253 | 332 | 399 | 450 | 488 | 501 | 505 | 505 | 508 | 509 | 513 |
| WADENA 3 S | 0 | 0 | 2 | 8 | 21 | 45 | 77 | 124 | 188 | 270 | 365 | 476 | 571 | 650 | 710 | 741 | 754 | 759 | 761 | 765 | 769 |
| WALKER | 0 | 0 | 2 | 8 | 20 | 39 | 65 | 102 | 155 | 223 | 304 | 398 | 477 | 539 | 585 | 607 | 616 | 620 | 623 | 627 | 632 |
| WARROAD | 0 | 0 | 1 | 7 | 16 | 32 | 53 | 84 | 130 | 189 | 260 | 342 | 410 | 463 | 500 | 518 | 524 | 525 | 526 | 528 | 531 |
| WASECA EXP STA | 0 | 0 | 2 | 9 | 26 | 61 | 111 | 181 | 268 | 370 | 481 | 605 | 710 | 798 | 868 | 908 | 929 | 939 | 946 | 952 | 958 |
| WHEATON | 0 | 1 | 6 | 19 | 41 | 81 | 134 | 206 | 296 | 405 | 528 | 671 | 795 | 903 | 991 | 1044 | 1073 | 1089 | 1097 | 1103 | 1107 |
| WILLMAR ST HOSP | 0 | 2 | 7 | 17 | 37 | 73 | 124 | 195 | 285 | 392 | 511 | 649 | 760 | 856 | 933 | 977 | 1002 | 1016 | 1024 | 1031 | 1037 |
| WINDOM | 2 | 4 | 8 | 17 | 37 | 78 | 139 | 222 | 325 | 443 | 570 | 712 | 831 | 933 | 1017 | 1066 | 1093 | 1108 | 1118 | 1126 | 1133 |
| WINNEBAGO | 0 | 3 | 9 | 24 | 50 | 98 | 161 | 243 | 342 | 455 | 577 | 715 | 833 | 934 | 1019 | 1069 | 1099 | 1116 | 1127 | 1135 | 1142 |
| WINNIBIGOSHISH DAM | 0 | 0 | 1 | 8 | 19 | 38 | 64 | 103 | 158 | 230 | 313 | 408 | 486 | 546 | 589 | 607 | 614 | 616 | 618 | 621 | 624 |
| WINONA | 0 | 3 | 12 | 31 | 63 | 116 | 184 | 269 | 373 | 494 | 625 | 774 | 901 | 1009 | 1098 | 1152 | 1184 | 1205 | 1220 | 1232 | 1241 |
| WORTHINGTON | 0 | 2 | 6 | 17 | 38 | 81 | 138 | 215 | 310 | 420 | 540 | 676 | 792 | 891 | 970 | 1015 | 1039 | 1052 | 1060 | 1067 | 1074 |
| ZUMBROTA | 0 | 1 | 5 | 13 | 30 | 63 | 110 | 176 | 260 | 362 | 475 | 603 | 711 | 801 | 871 | 910 | 930 | 941 | 950 | 958 | 965 |
| FARGO ND WSO | 0 | 1 | 6 | 18 | 39 | 73 | 117 | 178 | 256 | 354 | 467 | 599 | 714 | 811 | 889 | 933 | 956 | 967 | 973 | 978 | 983 |
| SIOUX FALLS SD WSO | 1 | 3 | 9 | 21 | 45 | 92 | 157 | 246 | 358 | 491 | 638 | 806 | 951 | 1076 | 1182 | 1246 | 1284 | 1305 | 1317 | 1324 | 1330 |
| LA CROSSE WI WSO | 0 | 2 | 10 | 28 | 59 | 112 | 181 | 268 | 375 | 499 | 635 | 790 | 925 | 1040 | 1138 | 1198 | 1235 | 1259 | 1274 | 1286 | 1295 |

Appendix Table 9. Normal total growing degree days (or cooling degree days), $T_b$ = 65°F, at selected dates and adjusted to an 8 a.m. observation time.

| | APRIL | | | MAY | | | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 |
| ADA | 0 | 0 | 2 | 6 | 14 | 26 | 41 | 65 | 101 | 149 | 208 | 278 | 338 | 386 | 422 | 438 | 445 | 446 | 447 | 448 | 450 |
| ALBERT LEA | 0 | 1 | 1 | 2 | 7 | 21 | 46 | 87 | 142 | 212 | 290 | 379 | 451 | 509 | 549 | 566 | 571 | 572 | 573 | 577 | 582 |
| ALEXANDRIA FAA AP | 0 | 0 | 1 | 6 | 13 | 25 | 41 | 68 | 108 | 164 | 231 | 307 | 368 | 416 | 449 | 466 | 473 | 475 | 477 | 478 | 479 |
| ARGYLE 4 E | 0 | 0 | 1 | 4 | 11 | 21 | 34 | 52 | 77 | 110 | 151 | 202 | 246 | 283 | 309 | 319 | 320 | 321 | 322 | 322 | 323 |
| ARTICHOKE LAKE | 0 | 0 | 1 | 4 | 9 | 20 | 40 | 72 | 119 | 182 | 255 | 338 | 406 | 460 | 499 | 517 | 525 | 528 | 529 | 530 | 532 |
| AUSTIN 3 S | 0 | 0 | 1 | 4 | 10 | 23 | 44 | 77 | 123 | 180 | 243 | 311 | 363 | 402 | 428 | 441 | 446 | 449 | 451 | 453 | 455 |
| BABBITT 2 SE | 0 | 0 | 0 | 3 | 8 | 13 | 19 | 28 | 41 | 61 | 86 | 117 | 142 | 162 | 175 | 176 | 177 | 178 | 179 | 179 | 180 |
| BAUDETTE | 0 | 0 | 0 | 4 | 9 | 14 | 19 | 28 | 44 | 69 | 99 | 135 | 162 | 181 | 193 | 197 | 198 | 198 | 198 | 199 | 199 |
| BEMIDJI AP | 0 | 0 | 0 | 4 | 10 | 17 | 26 | 42 | 67 | 103 | 146 | 194 | 231 | 257 | 272 | 278 | 280 | 280 | 280 | 281 | 282 |
| BENSON | 0 | 0 | 2 | 7 | 15 | 30 | 53 | 87 | 137 | 203 | 279 | 367 | 438 | 493 | 533 | 551 | 559 | 561 | 562 | 563 | 565 |
| BIG FALLS | 0 | 0 | 0 | 3 | 7 | 11 | 17 | 27 | 43 | 68 | 98 | 132 | 159 | 178 | 189 | 191 | 192 | 192 | 193 | 193 | 194 |
| BROWNS VALLEY | 0 | 0 | 0 | 3 | 8 | 18 | 34 | 62 | 107 | 167 | 241 | 327 | 399 | 458 | 501 | 522 | 531 | 534 | 535 | 537 | 538 |
| CAMBRIDGE ST HOSP | 0 | 0 | 1 | 5 | 11 | 22 | 37 | 63 | 102 | 155 | 219 | 291 | 349 | 392 | 421 | 433 | 437 | 438 | 438 | 440 | 442 |
| CAMPBELL | 0 | 0 | 1 | 4 | 10 | 22 | 40 | 66 | 103 | 152 | 210 | 280 | 339 | 388 | 425 | 442 | 448 | 448 | 448 | 449 | 451 |
| CANBY | 0 | 1 | 3 | 7 | 15 | 33 | 61 | 105 | 165 | 242 | 331 | 432 | 517 | 586 | 639 | 666 | 680 | 685 | 689 | 693 | 698 |
| CASS LAKE | 0 | 0 | 0 | 3 | 7 | 14 | 25 | 42 | 66 | 96 | 132 | 173 | 206 | 232 | 248 | 254 | 255 | 255 | 256 | 256 | 257 |
| CHASKA | 0 | 0 | 0 | 4 | 10 | 24 | 47 | 83 | 136 | 204 | 282 | 371 | 443 | 500 | 539 | 557 | 564 | 565 | 566 | 568 | 571 |
| CLOQUET FOR RES CEN | 0 | 0 | 0 | 2 | 3 | 3 | 4 | 8 | 21 | 42 | 71 | 103 | 127 | 144 | 152 | 153 | 154 | 154 | 155 | 155 | 155 |
| COLLEGEVILLE ST JOHN | 0 | 0 | 2 | 7 | 16 | 28 | 45 | 71 | 112 | 168 | 234 | 310 | 370 | 417 | 449 | 464 | 471 | 474 | 475 | 477 | 479 |
| CROOKSTON NW EXP STA | 0 | 0 | 0 | 3 | 8 | 16 | 29 | 48 | 76 | 114 | 181 | 219 | 270 | 311 | 342 | 356 | 359 | 359 | 360 | 360 | 361 |
| DETROIT LAKES 1 NNE | 0 | 0 | 0 | 1 | 3 | 5 | 9 | 19 | 37 | 63 | 98 | 136 | 169 | 194 | 209 | 211 | 211 | 212 | 212 | 213 | 213 |
| DULUTH WSO | 0 | 0 | 0 | 2 | 3 | 3 | 3 | 7 | 17 | 38 | 61 | 92 | 117 | 136 | 148 | 152 | 153 | 154 | 154 | 155 | 156 |
| FAIRMONT | 0 | 0 | 3 | 8 | 22 | 46 | 82 | 132 | 198 | 276 | 364 | 461 | 541 | 607 | 657 | 684 | 698 | 705 | 710 | 715 | 719 |
| FARIBAULT | 0 | 0 | 1 | 4 | 10 | 24 | 47 | 83 | 135 | 201 | 276 | 359 | 426 | 477 | 513 | 530 | 537 | 539 | 541 | 542 | 545 |
| FARMINGTON 3 NW | 0 | 0 | 2 | 7 | 16 | 32 | 54 | 88 | 138 | 198 | 269 | 348 | 412 | 461 | 496 | 512 | 519 | 523 | 526 | 529 | 532 |
| FERGUS FALLS | 0 | 0 | 0 | 2 | 7 | 15 | 31 | 57 | 95 | 148 | 212 | 286 | 350 | 400 | 436 | 452 | 457 | 457 | 457 | 459 | 461 |
| FOSSTON | 0 | 0 | 1 | 5 | 11 | 19 | 30 | 47 | 71 | 106 | 149 | 201 | 246 | 283 | 309 | 320 | 323 | 322 | 322 | 324 | 326 |
| GLENWOOD | 0 | 0 | 1 | 5 | 10 | 20 | 34 | 59 | 98 | 154 | 221 | 298 | 361 | 408 | 440 | 454 | 459 | 460 | 461 | 463 | 464 |
| GRAND MARAIS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 11 | 19 | 26 | 31 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| GRAND MEADOW | 0 | 0 | 1 | 6 | 14 | 30 | 53 | 85 | 129 | 184 | 245 | 313 | 367 | 409 | 438 | 451 | 457 | 460 | 462 | 465 | 467 |
| GRAND RAPIDS NC SCHL | 0 | 0 | 0 | 3 | 7 | 11 | 16 | 25 | 42 | 67 | 97 | 132 | 158 | 178 | 186 | 189 | 189 | 189 | 189 | 189 | 190 |
| GULL LAKE DAM | 0 | 0 | 0 | 4 | 10 | 17 | 28 | 46 | 74 | 115 | 164 | 220 | 265 | 298 | 320 | 328 | 331 | 331 | 331 | 332 | 334 |
| HALLOCK | 0 | 0 | 1 | 4 | 11 | 22 | 37 | 57 | 84 | 120 | 166 | 223 | 276 | 320 | 352 | 360 | 362 | 364 | 365 | 366 | 367 |
| HINCKLEY | 0 | 0 | 0 | 2 | 4 | 5 | 9 | 19 | 39 | 70 | 109 | 154 | 189 | 213 | 227 | 230 | 231 | 231 | 232 | 232 | 233 |
| INTERNATIONAL FALLS | 0 | 0 | 0 | 3 | 8 | 14 | 22 | 34 | 53 | 80 | 113 | 149 | 177 | 196 | 207 | 209 | 210 | 210 | 211 | 211 | 212 |
| ITASCA ST PARK SCHL | 0 | 0 | 0 | 2 | 5 | 10 | 17 | 28 | 47 | 73 | 105 | 142 | 174 | 198 | 214 | 219 | 220 | 220 | 221 | 221 | 221 |
| JORDAN 1 S | 0 | 0 | 1 | 6 | 13 | 25 | 44 | 74 | 117 | 173 | 237 | 307 | 363 | 403 | 431 | 443 | 448 | 451 | 453 | 456 | 458 |
| LEECH LAKE DAM | 0 | 0 | 0 | 3 | 7 | 12 | 19 | 31 | 53 | 84 | 123 | 167 | 201 | 225 | 240 | 245 | 247 | 247 | 247 | 248 | 249 |
| LITCHFIELD | 0 | 0 | 2 | 6 | 13 | 28 | 52 | 87 | 138 | 202 | 275 | 356 | 422 | 473 | 509 | 527 | 534 | 537 | 539 | 541 | 544 |
| LITTLE FALLS 1 N | 0 | 0 | 1 | 6 | 13 | 22 | 34 | 55 | 88 | 135 | 191 | 254 | 303 | 338 | 361 | 371 | 375 | 377 | 378 | 379 | 380 |
| LONG PRAIRIE | 0 | 0 | 1 | 4 | 9 | 16 | 27 | 47 | 77 | 119 | 170 | 228 | 274 | 307 | 328 | 336 | 338 | 338 | 339 | 340 | 341 |
| MADISON SEWAGE PLANT | 0 | 0 | 2 | 5 | 11 | 25 | 48 | 85 | 137 | 204 | 282 | 371 | 445 | 503 | 545 | 564 | 572 | 573 | 574 | 576 | 579 |
| MAPLE PLAIN | 0 | 0 | 1 | 4 | 11 | 24 | 45 | 77 | 123 | 181 | 249 | 324 | 386 | 433 | 467 | 484 | 491 | 495 | 498 | 502 | 505 |
| MARSHALL | 0 | 0 | 1 | 3 | 9 | 25 | 52 | 95 | 154 | 226 | 309 | 402 | 491 | 544 | 592 | 616 | 627 | 631 | 634 | 637 | 641 |
| MEADOWLANDS | 0 | 0 | 0 | 2 | 5 | 7 | 10 | 16 | 28 | 48 | 74 | 105 | 130 | 148 | 159 | 161 | 161 | 161 | 162 | 162 | 162 |
| MILACA | 0 | 0 | 0 | 4 | 8 | 15 | 26 | 45 | 76 | 120 | 174 | 235 | 284 | 319 | 341 | 347 | 348 | 349 | 350 | 351 | 352 |
| MILAN | 0 | 0 | 2 | 6 | 13 | 28 | 50 | 83 | 131 | 193 | 265 | 347 | 415 | 468 | 508 | 527 | 535 | 537 | 538 | 539 | 541 |
| MINNEAPOLIS-ST PAUL | 0 | 0 | 3 | 10 | 22 | 43 | 72 | 115 | 177 | 256 | 346 | 449 | 532 | 598 | 647 | 674 | 687 | 694 | 698 | 701 | 703 |
| MONTEVIDEO 1 SW | 0 | 0 | 0 | 2 | 7 | 20 | 42 | 77 | 128 | 193 | 268 | 353 | 422 | 476 | 516 | 535 | 543 | 545 | 546 | 547 | 549 |
| MOOSE LAKE 1 SSE | 0 | 0 | 0 | 2 | 4 | 5 | 6 | 11 | 25 | 49 | 82 | 122 | 154 | 177 | 190 | 195 | 195 | 195 | 195 | 196 | 197 |
| MORA | 0 | 0 | 0 | 4 | 9 | 16 | 26 | 44 | 75 | 120 | 175 | 238 | 288 | 325 | 349 | 357 | 359 | 359 | 359 | 360 | 361 |
| MORRIS W C SCHOOL | 0 | 0 | 2 | 6 | 13 | 28 | 50 | 81 | 123 | 177 | 240 | 313 | 375 | 426 | 464 | 482 | 488 | 488 | 488 | 489 | 491 |
| NEW LONDON | 0 | 0 | 1 | 6 | 13 | 25 | 43 | 72 | 118 | 180 | 252 | 332 | 396 | 444 | 478 | 494 | 501 | 504 | 506 | 507 | 508 |
| NEW ULM | 0 | 0 | 1 | 4 | 12 | 28 | 56 | 98 | 156 | 228 | 309 | 399 | 472 | 529 | 571 | 590 | 599 | 602 | 604 | 606 | 609 |
| OLIVIA | 0 | 0 | 2 | 7 | 16 | 34 | 61 | 102 | 157 | 226 | 303 | 388 | 458 | 512 | 552 | 571 | 581 | 585 | 587 | 590 | 593 |
| PARK RAPIDS | 0 | 0 | 0 | 3 | 6 | 11 | 17 | 30 | 52 | 85 | 127 | 177 | 218 | 249 | 269 | 276 | 277 | 277 | 278 | 278 | 279 |
| PINE RIVER DAM | 0 | 0 | 0 | 3 | 8 | 14 | 22 | 36 | 59 | 93 | 135 | 181 | 218 | 244 | 259 | 264 | 265 | 265 | 266 | 266 | 267 |
| PIPESTONE | 0 | 0 | 0 | 1 | 4 | 11 | 27 | 55 | 98 | 156 | 225 | 303 | 367 | 417 | 452 | 467 | 473 | 473 | 473 | 474 | 475 |
| POKEGAMA DAM | 0 | 0 | 0 | 3 | 6 | 12 | 19 | 32 | 51 | 78 | 110 | 148 | 178 | 201 | 215 | 219 | 220 | 220 | 221 | 221 | 222 |
| PRESTON | 0 | 0 | 1 | 5 | 13 | 25 | 43 | 70 | 109 | 160 | 219 | 284 | 335 | 373 | 398 | 409 | 412 | 414 | 414 | 416 | 417 |
| RED LAKE FALLS | 0 | 0 | 1 | 4 | 9 | 19 | 32 | 51 | 78 | 113 | 155 | 206 | 250 | 286 | 313 | 324 | 326 | 327 | 328 | 329 | 330 |
| RED LAKE INDIAN | 0 | 0 | 0 | 4 | 10 | 20 | 31 | 48 | 71 | 102 | 140 | 185 | 222 | 251 | 271 | 274 | 275 | 276 | 278 | 279 | 280 |
| ROCHESTER WSO | 0 | 0 | 1 | 5 | 13 | 28 | 52 | 87 | 135 | 196 | 264 | 339 | 400 | 446 | 478 | 493 | 498 | 500 | 502 | 505 | 508 |
| ROSEAU 1 E | 0 | 0 | 0 | 3 | 6 | 12 | 20 | 31 | 46 | 67 | 94 | 127 | 156 | 181 | 198 | 202 | 203 | 203 | 204 | 204 | 205 |
| ROSEMOUNT AGRI EXP | 0 | 0 | 1 | 6 | 13 | 25 | 41 | 68 | 109 | 165 | 231 | 303 | 359 | 400 | 426 | 438 | 443 | 445 | 448 | 450 | 451 |
| ST CLOUD WSO | 0 | 0 | 1 | 5 | 11 | 22 | 37 | 62 | 99 | 149 | 208 | 274 | 327 | 367 | 394 | 406 | 411 | 412 | 413 | 414 | 416 |
| ST PETER 2 SW | 0 | 0 | 1 | 5 | 13 | 31 | 58 | 100 | 157 | 228 | 310 | 402 | 477 | 536 | 578 | 597 | 604 | 605 | 607 | 609 | 613 |
| SANDY LAKE DAM | 0 | 0 | 0 | 3 | 6 | 10 | 16 | 27 | 47 | 76 | 113 | 155 | 188 | 211 | 225 | 229 | 230 | 230 | 230 | 230 | 232 |
| SPRINGFIELD 1 NW | 0 | 0 | 1 | 3 | 10 | 28 | 56 | 99 | 156 | 225 | 300 | 382 | 447 | 498 | 534 | 551 | 559 | 561 | 563 | 565 | 567 |
| THIEF RIVER FALLS | 0 | 0 | 1 | 4 | 9 | 17 | 29 | 46 | 71 | 105 | 146 | 194 | 235 | 267 | 290 | 300 | 303 | 303 | 303 | 303 | 304 |
| TRACY | 0 | 0 | 0 | 2 | 7 | 21 | 46 | 86 | 142 | 214 | 296 | 389 | 467 | 530 | 578 | 601 | 612 | 615 | 618 | 620 | 623 |
| TWO HARBORS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 12 | 29 | 52 | 73 | 90 | 102 | 103 | 103 | 103 | 104 | 104 | 104 |
| VIRGINIA | 0 | 0 | 0 | 2 | 5 | 9 | 16 | 27 | 44 | 68 | 99 | 135 | 164 | 187 | 201 | 202 | 203 | 204 | 205 | 206 | 206 |
| WADENA 3 S | 0 | 0 | 0 | 3 | 7 | 14 | 25 | 43 | 71 | 112 | 162 | 223 | 274 | 314 | 342 | 353 | 356 | 356 | 356 | 356 | 358 |
| WALKER | 0 | 0 | 0 | 3 | 7 | 13 | 21 | 35 | 57 | 89 | 129 | 175 | 213 | 241 | 259 | 266 | 268 | 268 | 269 | 270 | 271 |
| WARROAD | 0 | 0 | 0 | 3 | 7 | 11 | 18 | 29 | 46 | 72 | 104 | 141 | 171 | 193 | 208 | 212 | 213 | 213 | 214 | 214 | 215 |
| WASECA EXP STA | 0 | 0 | 0 | 2 | 7 | 19 | 39 | 71 | 115 | 170 | 234 | 304 | 361 | 406 | 437 | 452 | 457 | 459 | 460 | 462 | 464 |
| WHEATON | 0 | 0 | 2 | 7 | 17 | 34 | 57 | 92 | 141 | 205 | 280 | 369 | 444 | 506 | 553 | 577 | 588 | 592 | 594 | 596 | 598 |
| WILLMAR ST HOSP | 0 | 0 | 2 | 6 | 13 | 27 | 48 | 81 | 129 | 192 | 263 | 344 | 408 | 458 | 493 | 510 | 518 | 521 | 524 | 526 | 528 |
| WINDOM | 1 | 1 | 2 | 4 | 11 | 28 | 57 | 101 | 161 | 234 | 313 | 400 | 470 | 525 | 566 | 586 | 595 | 598 | 601 | 603 | 607 |
| WINNEBAGO | 0 | 0 | 2 | 9 | 20 | 42 | 72 | 114 | 169 | 236 | 311 | 396 | 465 | 520 | 561 | 583 | 594 | 598 | 601 | 604 | 607 |
| WINNIBIGOSHISH DAM | 0 | 0 | 0 | 3 | 8 | 13 | 21 | 35 | 58 | 92 | 133 | 179 | 215 | 241 | 256 | 261 | 262 | 262 | 262 | 262 | 283 |
| WINONA | 0 | 0 | 3 | 12 | 27 | 52 | 86 | 132 | 192 | 267 | 351 | 444 | 521 | 581 | 625 | 648 | 659 | 665 | 670 | 675 | 679 |
| WORTHINGTON | 0 | 0 | 1 | 5 | 14 | 31 | 57 | 96 | 148 | 213 | 286 | 367 | 435 | 488 | 527 | 546 | 553 | 555 | 557 | 559 | 562 |
| ZUMBROTA | 0 | 0 | 1 | 4 | 10 | 22 | 41 | 71 | 115 | 172 | 239 | 314 | 374 | 419 | 450 | 463 | 469 | 470 | 473 | 475 | 478 |
| FARGO ND WSO | 0 | 0 | 2 | 7 | 16 | 30 | 48 | 76 | 118 | 171 | 237 | 316 | 383 | 438 | 479 | 498 | 506 | 508 | 509 | 511 | 513 |
| SIOUX FALLS SD WSO | 0 | 0 | 2 | 6 | 16 | 36 | 68 | 117 | 186 | 273 | 372 | 486 | 580 | 658 | 717 | 749 | 765 | 772 | 775 | 777 | 779 |
| LA CROSSE WI WSO | 0 | 0 | 2 | 10 | 23 | 47 | 80 | 126 | 188 | 265 | 353 | 453 | 537 | 605 | 657 | 684 | 697 | 704 | 709 | 713 | 717 |

Appendix Table 10. Normal total growing degree days, $T_b$ = 70°F, at selected dates and adjusted to an 8 a.m. observation time.

| | APRIL | | | MAY | | | JUNE | | | JULY | | | AUGUST | | | SEPTEMBER | | | OCTOBER | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 |
| ADA | 0 | 0 | 0 | 2 | 5 | 8 | 12 | 20 | 33 | 53 | 78 | 108 | 134 | 154 | 167 | 172 | 173 | 173 | 173 | 173 | 174 |
| ALBERT LEA | 0 | 0 | 0 | 0 | 1 | 4 | 10 | 24 | 47 | 78 | 115 | 156 | 187 | 209 | 221 | 223 | 223 | 223 | 224 | 225 | 226 |
| ALEXANDRIA FAA AP | 0 | 0 | 0 | 2 | 5 | 7 | 11 | 20 | 36 | 60 | 90 | 124 | 148 | 167 | 178 | 182 | 183 | 184 | 184 | 184 | 184 |
| ARGYLE 4 E | 0 | 0 | 0 | 1 | 3 | 7 | 10 | 15 | 22 | 32 | 46 | 63 | 80 | 93 | 103 | 105 | 105 | 105 | 105 | 105 | 105 |
| ARTICHOKE LAKE | 0 | 0 | 0 | 1 | 2 | 4 | 10 | 21 | 40 | 67 | 100 | 136 | 165 | 185 | 198 | 203 | 205 | 205 | 205 | 205 | 205 |
| AUSTIN 3 S | 0 | 0 | 0 | 1 | 3 | 6 | 11 | 23 | 42 | 68 | 96 | 124 | 143 | 153 | 157 | 159 | 159 | 161 | 162 | 162 | 162 |
| BABBITT 2 SE | 0 | 0 | 0 | 1 | 2 | 4 | 5 | 7 | 10 | 14 | 21 | 29 | 36 | 42 | 46 | 46 | 46 | 46 | 47 | 47 | 47 |
| BAUDETTE | 0 | 0 | 0 | 2 | 3 | 4 | 5 | 7 | 11 | 17 | 27 | 37 | 45 | 50 | 53 | 54 | 54 | 54 | 54 | 54 | 54 |
| BEMIDJI AP | 0 | 0 | 0 | 2 | 4 | 5 | 7 | 11 | 20 | 33 | 48 | 65 | 78 | 85 | 89 | 89 | 89 | 90 | 90 | 90 | 90 |
| BENSON | 0 | 0 | 0 | 3 | 5 | 9 | 15 | 27 | 48 | 79 | 117 | 158 | 190 | 211 | 224 | 229 | 230 | 230 | 231 | 231 | 231 |
| BIG FALLS | 0 | 0 | 0 | 1 | 2 | 3 | 4 | 6 | 10 | 18 | 27 | 38 | 46 | 51 | 53 | 53 | 53 | 53 | 54 | 54 | 54 |
| BROWNS VALLEY | 0 | 0 | 0 | 1 | 3 | 4 | 7 | 15 | 33 | 59 | 94 | 135 | 167 | 192 | 208 | 214 | 216 | 217 | 217 | 217 | 217 |
| CAMBRIDGE ST HOSP | 0 | 0 | 0 | 2 | 4 | 5 | 9 | 16 | 30 | 52 | 79 | 111 | 134 | 150 | 160 | 162 | 162 | 162 | 163 | 163 | 163 |
| CAMPBELL | 0 | 0 | 0 | 1 | 3 | 6 | 11 | 18 | 31 | 50 | 73 | 101 | 125 | 144 | 158 | 163 | 163 | 163 | 163 | 163 | 163 |
| CANBY | 0 | 0 | 1 | 2 | 5 | 10 | 19 | 37 | 65 | 105 | 153 | 206 | 248 | 280 | 301 | 310 | 314 | 315 | 316 | 317 | 318 |
| CASS LAKE | 0 | 0 | 0 | 1 | 2 | 4 | 7 | 12 | 19 | 28 | 39 | 51 | 61 | 68 | 73 | 74 | 74 | 74 | 74 | 74 | 74 |
| CHASKA | 0 | 0 | 0 | 2 | 3 | 6 | 10 | 22 | 43 | 73 | 111 | 153 | 186 | 209 | 222 | 227 | 227 | 227 | 227 | 227 | 228 |
| CLOQUET FOR RES CEN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 9 | 16 | 25 | 31 | 35 | 36 | 36 | 36 | 36 | 37 | 37 | 37 |
| COLLEGEVILLE ST JOHN | 0 | 0 | 0 | 3 | 6 | 8 | 12 | 19 | 35 | 59 | 88 | 121 | 145 | 160 | 169 | 172 | 173 | 174 | 175 | 176 | 176 |
| CROOKSTON NW EXP STA | 0 | 0 | 0 | 1 | 2 | 4 | 8 | 13 | 21 | 33 | 48 | 68 | 87 | 103 | 115 | 116 | 117 | 118 | 118 | 119 | 119 |
| DETROIT LAKES 1 NNE | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 6 | 13 | 23 | 35 | 44 | 51 | 55 | 55 | 55 | 55 | 55 | 55 | 56 |
| DULUTH WSO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 12 | 20 | 27 | 31 | 34 | 35 | 35 | 35 | 36 | 35 | 36 |
| FAIRMONT | 0 | 0 | 1 | 3 | 7 | 15 | 28 | 49 | 79 | 118 | 163 | 212 | 251 | 278 | 299 | 307 | 310 | 312 | 313 | 314 | 316 |
| FARIBAULT | 0 | 0 | 0 | 1 | 3 | 6 | 11 | 24 | 45 | 75 | 110 | 148 | 176 | 195 | 205 | 208 | 209 | 209 | 209 | 210 | 210 |
| FARMINGTON 3 NW | 0 | 0 | 0 | 3 | 6 | 9 | 15 | 25 | 44 | 71 | 103 | 138 | 164 | 181 | 191 | 194 | 195 | 196 | 197 | 198 | 399 |
| FERGUS FALLS | 0 | 0 | 0 | 1 | 2 | 3 | 7 | 15 | 28 | 51 | 79 | 113 | 141 | 162 | 175 | 180 | 180 | 180 | 180 | 180 | 180 |
| FOSSTON | 0 | 0 | 0 | 1 | 3 | 6 | 9 | 13 | 20 | 30 | 44 | 63 | 80 | 94 | 104 | 105 | 106 | 106 | 107 | 107 | 107 |
| GLENWOOD | 0 | 0 | 0 | 2 | 4 | 5 | 7 | 13 | 29 | 53 | 85 | 121 | 148 | 165 | 175 | 178 | 178 | 179 | 179 | 179 | 179 |
| GRAND MARAIS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| GRAND MEADOW | 0 | 0 | 0 | 2 | 5 | 9 | 16 | 27 | 44 | 66 | 92 | 118 | 138 | 150 | 157 | 160 | 160 | 161 | 162 | 162 | 163 |
| GRAND RAPIDS NC SCHL | 0 | 0 | 0 | 1 | 2 | 3 | 3 | 5 | 9 | 16 | 24 | 34 | 41 | 45 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| GULL LAKE DAM | 0 | 0 | 0 | 2 | 3 | 5 | 7 | 11 | 20 | 34 | 51 | 71 | 86 | 96 | 103 | 104 | 104 | 104 | 104 | 104 | 105 |
| HALLOCK | 0 | 0 | 0 | 1 | 3 | 7 | 12 | 18 | 26 | 37 | 53 | 76 | 100 | 121 | 137 | 138 | 138 | 139 | 139 | 140 | 140 |
| HINCKLEY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 15 | 26 | 40 | 49 | 55 | 57 | 58 | 58 | 58 | 58 | 58 | 58 |
| INTERNATIONAL FALLS | 0 | 0 | 0 | 1 | 3 | 4 | 6 | 9 | 15 | 23 | 33 | 43 | 51 | 57 | 59 | 60 | 60 | 60 | 60 | 60 | 60 |
| ITASCA ST PARK SCHL | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 7 | 11 | 18 | 28 | 37 | 46 | 53 | 58 | 58 | 58 | 58 | 59 | 59 | 59 |
| JORDAN 1 S | 0 | 0 | 0 | 2 | 4 | 7 | 11 | 20 | 36 | 59 | 86 | 114 | 134 | 146 | 153 | 154 | 155 | 156 | 157 | 157 | 158 |
| LEECH LAKE DAM | 0 | 0 | 0 | 1 | 2 | 3 | 4 | 7 | 12 | 22 | 34 | 48 | 58 | 65 | 68 | 69 | 68 | 69 | 69 | 69 | 70 |
| LITCHFIELD | 0 | 0 | 0 | 2 | 4 | 8 | 15 | 29 | 50 | 80 | 114 | 151 | 179 | 198 | 209 | 213 | 214 | 215 | 215 | 216 | 217 |
| LITTLE FALLS 1 N | 0 | 0 | 0 | 2 | 5 | 7 | 9 | 14 | 25 | 42 | 64 | 88 | 106 | 117 | 122 | 124 | 124 | 125 | 125 | 126 | 126 |
| LONG PRAIRIE | 0 | 0 | 0 | 1 | 3 | 4 | 6 | 12 | 21 | 37 | 56 | 77 | 93 | 104 | 110 | 111 | 111 | 111 | 111 | 111 | 112 |
| MADISON SEWAGE PLANT | 0 | 0 | 0 | 1 | 3 | 6 | 13 | 26 | 48 | 79 | 117 | 159 | 193 | 218 | 234 | 240 | 240 | 240 | 241 | 241 | 241 |
| MAPLE PLAIN | 0 | 0 | 0 | 1 | 3 | 6 | 12 | 23 | 42 | 67 | 98 | 131 | 157 | 175 | 186 | 190 | 191 | 192 | 193 | 194 | 196 |
| MARSHALL | 0 | 0 | 0 | 1 | 2 | 6 | 14 | 30 | 55 | 90 | 131 | 177 | 214 | 241 | 259 | 267 | 269 | 269 | 270 | 271 | 272 |
| MEADOWLANDS | 0 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 5 | 9 | 16 | 24 | 31 | 36 | 39 | 39 | 39 | 39 | 39 | 39 | 39 |
| MILACA | 0 | 0 | 0 | 1 | 3 | 4 | 5 | 10 | 20 | 37 | 57 | 80 | 97 | 108 | 114 | 115 | 115 | 115 | 115 | 115 | 115 |
| MILAN | 0 | 0 | 0 | 2 | 4 | 8 | 14 | 26 | 46 | 74 | 108 | 147 | 177 | 198 | 212 | 218 | 219 | 219 | 219 | 220 | 220 |
| MINNEAPOLIS-ST PAUL | 0 | 0 | 1 | 4 | 8 | 14 | 23 | 40 | 68 | 109 | 158 | 213 | 255 | 284 | 303 | 311 | 315 | 317 | 318 | 319 | 319 |
| MONTEVIDEO 1 SW | 0 | 0 | 0 | 1 | 2 | 4 | 9 | 21 | 42 | 73 | 110 | 151 | 182 | 203 | 216 | 221 | 222 | 222 | 223 | 223 | 223 |
| MOOSE LAKE 1 SSE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 10 | 21 | 33 | 43 | 49 | 53 | 53 | 53 | 53 | 54 | 54 | 54 |
| MORA | 0 | 0 | 0 | 2 | 3 | 4 | 5 | 10 | 20 | 37 | 59 | 84 | 103 | 116 | 123 | 124 | 124 | 124 | 124 | 124 | 124 |
| MORRIS W C SCHOOL | 0 | 0 | 0 | 2 | 4 | 9 | 15 | 28 | 42 | 64 | 90 | 121 | 147 | 167 | 182 | 187 | 187 | 187 | 188 | 188 | 188 |
| NEW LONDON | 0 | 0 | 0 | 2 | 5 | 7 | 10 | 19 | 37 | 65 | 100 | 137 | 164 | 181 | 191 | 194 | 196 | 197 | 198 | 198 | 198 |
| NEW ULM | 0 | 0 | 0 | 1 | 3 | 7 | 15 | 30 | 54 | 88 | 128 | 170 | 201 | 223 | 234 | 239 | 239 | 240 | 240 | 241 | 241 |
| OLIVIA | 0 | 0 | 0 | 2 | 5 | 10 | 19 | 34 | 58 | 90 | 127 | 167 | 197 | 218 | 231 | 236 | 238 | 239 | 240 | 241 | 241 |
| PARK RAPIDS | 0 | 0 | 0 | 1 | 2 | 2 | 3 | 5 | 10 | 21 | 34 | 51 | 64 | 74 | 80 | 81 | 81 | 81 | 81 | 81 | 81 |
| PINE RIVER DAM | 0 | 0 | 0 | 1 | 2 | 4 | 5 | 8 | 15 | 25 | 38 | 52 | 63 | 70 | 74 | 75 | 75 | 75 | 75 | 75 | 75 |
| PIPESTONE | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 12 | 28 | 53 | 84 | 119 | 145 | 162 | 172 | 175 | 175 | 175 | 175 | 175 | 175 |
| POKEGAMA DAM | 0 | 0 | 0 | 1 | 2 | 3 | 5 | 8 | 13 | 20 | 28 | 38 | 47 | 53 | 57 | 57 | 57 | 57 | 57 | 57 | 57 |
| PRESTON | 0 | 0 | 0 | 2 | 6 | 8 | 12 | 20 | 35 | 56 | 81 | 108 | 126 | 137 | 143 | 144 | 144 | 145 | 145 | 145 | 145 |
| RED LAKE FALLS | 0 | 0 | 0 | 1 | 2 | 5 | 10 | 16 | 23 | 33 | 45 | 62 | 77 | 91 | 101 | 104 | 104 | 104 | 104 | 104 | 104 |
| RED LAKE INDIAN | 0 | 0 | 0 | 1 | 4 | 7 | 10 | 15 | 22 | 31 | 42 | 57 | 69 | 79 | 85 | 85 | 85 | 85 | 86 | 86 | 86 |
| ROCHESTER WSO | 0 | 0 | 0 | 2 | 4 | 8 | 15 | 28 | 48 | 75 | 107 | 140 | 165 | 181 | 190 | 192 | 193 | 193 | 193 | 194 | 195 |
| ROSEAU 1 E | 0 | 0 | 0 | 1 | 2 | 4 | 6 | 8 | 12 | 16 | 23 | 32 | 42 | 50 | 57 | 58 | 58 | 58 | 58 | 58 | 58 |
| ROSEMOUNT AGRI EXP | 0 | 0 | 0 | 3 | 5 | 7 | 10 | 17 | 33 | 57 | 87 | 119 | 140 | 152 | 157 | 159 | 159 | 160 | 162 | 162 | 162 |
| ST CLOUD WSO | 0 | 0 | 0 | 2 | 3 | 6 | 9 | 17 | 30 | 49 | 73 | 99 | 119 | 133 | 141 | 143 | 144 | 144 | 144 | 144 | 145 |
| ST PETER 2 SW | 0 | 0 | 0 | 2 | 4 | 8 | 15 | 30 | 54 | 87 | 127 | 171 | 205 | 229 | 243 | 244 | 245 | 246 | 247 | 247 | 248 |
| SANDY LAKE DAM | 0 | 0 | 0 | 1 | 2 | 2 | 3 | 5 | 10 | 19 | 31 | 44 | 54 | 61 | 64 | 64 | 64 | 64 | 65 | 65 | 65 |
| SPRINGFIELD 1 NW | 0 | 0 | 0 | 1 | 3 | 7 | 15 | 30 | 54 | 85 | 120 | 156 | 182 | 199 | 208 | 212 | 213 | 214 | 214 | 214 | 215 |
| THIEF RIVER FALLS | 0 | 0 | 0 | 1 | 3 | 5 | 8 | 13 | 21 | 33 | 47 | 64 | 78 | 89 | 98 | 99 | 99 | 99 | 99 | 99 | 99 |
| TRACY | 0 | 0 | 0 | 1 | 1 | 4 | 11 | 24 | 48 | 82 | 123 | 170 | 208 | 236 | 255 | 263 | 265 | 265 | 265 | 266 | 267 |
| TWO HARBORS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 7 | 13 | 18 | 22 | 25 | 25 | 26 | 25 | 25 | 25 | 25 |
| VIRGINIA | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 6 | 11 | 17 | 26 | 36 | 46 | 53 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| WADENA 3 S | 0 | 0 | 0 | 1 | 2 | 3 | 5 | 9 | 18 | 32 | 51 | 74 | 94 | 110 | 120 | 121 | 122 | 122 | 123 | 123 | 123 |
| WALKER | 0 | 0 | 0 | 1 | 2 | 3 | 5 | 8 | 15 | 25 | 38 | 54 | 66 | 75 | 81 | 82 | 82 | 82 | 82 | 83 | 83 |
| WARROAD | 0 | 0 | 0 | 1 | 2 | 3 | 5 | 7 | 11 | 18 | 28 | 39 | 48 | 55 | 59 | 60 | 60 | 60 | 60 | 60 | 60 |
| WASECA EXP STA | 0 | 0 | 0 | 1 | 2 | 4 | 9 | 19 | 34 | 55 | 80 | 108 | 129 | 145 | 155 | 158 | 158 | 158 | 158 | 159 | 159 |
| WHEATON | 0 | 0 | 0 | 3 | 6 | 12 | 19 | 31 | 51 | 80 | 116 | 159 | 195 | 222 | 241 | 250 | 252 | 253 | 253 | 253 | 254 |
| WILLMAR ST HOSP | 0 | 0 | 0 | 2 | 4 | 8 | 13 | 24 | 43 | 71 | 103 | 139 | 165 | 182 | 192 | 196 | 197 | 198 | 199 | 199 | 200 |
| WINDOM | 0 | 0 | 0 | 1 | 2 | 7 | 18 | 36 | 64 | 99 | 138 | 179 | 209 | 230 | 243 | 248 | 250 | 250 | 251 | 252 | 252 |
| WINNEBAGO | 0 | 0 | 0 | 3 | 8 | 15 | 25 | 41 | 64 | 96 | 132 | 171 | 202 | 223 | 237 | 243 | 245 | 246 | 247 | 248 | 249 |
| WINNIBIGOSHISH DAM | 0 | 0 | 0 | 1 | 2 | 4 | 5 | 8 | 15 | 25 | 38 | 53 | 64 | 72 | 75 | 76 | 76 | 76 | 76 | 76 | 76 |
| WINONA | 0 | 0 | 1 | 5 | 11 | 20 | 32 | 51 | 78 | 117 | 158 | 205 | 239 | 263 | 278 | 283 | 286 | 287 | 288 | 290 | 291 |
| WORTHINGTON | 0 | 0 | 0 | 1 | 4 | 9 | 18 | 33 | 55 | 83 | 118 | 153 | 182 | 204 | 218 | 223 | 224 | 224 | 224 | 224 | 225 |
| ZUMBROTA | 0 | 0 | 0 | 2 | 3 | 6 | 10 | 20 | 37 | 62 | 92 | 125 | 149 | 164 | 172 | 175 | 176 | 176 | 176 | 177 | 178 |
| FARGO ND WSO | 0 | 0 | 0 | 2 | 5 | 10 | 15 | 25 | 40 | 63 | 93 | 128 | 159 | 183 | 200 | 207 | 208 | 208 | 208 | 208 | 209 |
| SIOUX FALLS SD WSO | 0 | 0 | 0 | 2 | 5 | 11 | 22 | 44 | 79 | 128 | 185 | 249 | 300 | 338 | 364 | 375 | 380 | 381 | 382 | 383 | 383 |
| LA CROSSE WI WSO | 0 | 0 | 0 | 4 | 8 | 16 | 27 | 45 | 73 | 111 | 157 | 208 | 248 | 278 | 298 | 306 | 309 | 310 | 311 | 312 | 314 |

Appendix Table 11. Normal total heating degree days, $T_b$ = 65°F, for selected dates during the heating season and adjusted to a midnight observation time.

| | JUL 31 | AUG 31 | SEP 30 | OCT 31 | NOV 30 | DEC 31 | JAN 31 | FEB 28 | MAR 31 | APR 30 | MAY 31 | JUN 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADA | 24 | 68 | 318 | 907 | 2019 | 3652 | 5579 | 7127 | 8400 | 9097 | 9432 | 9522 |
| ALBERT LEA | 6 | 23 | 188 | 686 | 1645 | 3068 | 4721 | 6063 | 7190 | 7785 | 8028 | 8063 |
| ALEXANDRIA FAA AP | 18 | 49 | 288 | 861 | 1938 | 3513 | 5357 | 6849 | 8114 | 8815 | 9135 | 9216 |
| ARGYLE 4 E | 34 | 103 | 405 | 1044 | 2218 | 3946 | 5944 | 7586 | 8951 | 9700 | 10067 | 10171 |
| ARTICHOKE LAKE | 8 | 30 | 236 | 771 | 1810 | 3336 | 5129 | 6583 | 7797 | 8455 | 8741 | 8806 |
| AUSTIN 3 S | 21 | 47 | 249 | 773 | 1753 | 3196 | 4894 | 6270 | 7412 | 8026 | 8311 | 8375 |
| BABBITT 2 SE | 63 | 188 | 588 | 1258 | 2433 | 4098 | 5990 | 7541 | 8857 | 9671 | 10118 | 10281 |
| BAUDETTE | 59 | 169 | 539 | 1229 | 2419 | 4165 | 6196 | 7870 | 9280 | 10099 | 10545 | 10695 |
| BEMIDJI AP | 42 | 119 | 446 | 1105 | 2272 | 3974 | 5933 | 7521 | 8879 | 9662 | 10072 | 10203 |
| BENSON | 13 | 34 | 244 | 783 | 1813 | 3323 | 5106 | 6541 | 7726 | 8363 | 8643 | 8698 |
| BIG FALLS | 67 | 180 | 556 | 1244 | 2432 | 4143 | 6120 | 7719 | 9052 | 9844 | 10284 | 10439 |
| BROWNS VALLEY | 12 | 36 | 245 | 771 | 1798 | 3318 | 5080 | 6500 | 7686 | 8324 | 8618 | 8681 |
| CAMBRIDGE ST HOSP | 18 | 82 | 297 | 857 | 1892 | 3408 | 5181 | 6610 | 7801 | 8447 | 8740 | 8808 |
| CAMPBELL | 16 | 52 | 295 | 878 | 1960 | 3553 | 5390 | 6881 | 8101 | 8767 | 9086 | 9155 |
| CANBY | 10 | 27 | 207 | 704 | 1689 | 3137 | 4825 | 6187 | 7327 | 7949 | 8220 | 8269 |
| CASS LAKE | 41 | 120 | 451 | 1112 | 2266 | 3977 | 5917 | 7506 | 8835 | 9601 | 10015 | 10143 |
| CHASKA | 9 | 32 | 221 | 729 | 1701 | 3152 | 4868 | 6252 | 7379 | 7973 | 8221 | 8258 |
| CLOQUET FOR RES CEN | 61 | 168 | 521 | 1193 | 2320 | 3927 | 5775 | 7300 | 8601 | 9403 | 9869 | 10047 |
| COLLEGEVILLE ST JOHN | 15 | 42 | 266 | 809 | 1836 | 3352 | 5142 | 6588 | 7800 | 8462 | 8761 | 8826 |
| CROOKSTON NW EXP STA | 20 | 72 | 351 | 972 | 2129 | 3810 | 5785 | 7395 | 8734 | 9471 | 9833 | 9931 |
| DETROIT LAKES 1 NNE | 45 | 124 | 457 | 1114 | 2271 | 3937 | 5888 | 7486 | 8827 | 9586 | 9983 | 10110 |
| DULUTH WSO | 59 | 167 | 502 | 1149 | 2253 | 3840 | 5660 | 7157 | 8462 | 9283 | 9722 | 9904 |
| FAIRMONT | 7 | 23 | 176 | 644 | 1586 | 2999 | 4643 | 5959 | 7067 | 7637 | 7859 | 7891 |
| FARIBAULT | 10 | 33 | 212 | 706 | 1673 | 3106 | 4797 | 6169 | 7305 | 7908 | 8168 | 8212 |
| FARMINGTON 3 NW | 11 | 33 | 233 | 748 | 1730 | 3194 | 4918 | 6313 | 7464 | 8066 | 8325 | 8372 |
| FERGUS FALLS | 20 | 61 | 306 | 893 | 1981 | 3571 | 5435 | 6936 | 8182 | 8868 | 9179 | 9257 |
| FOSSTON | 30 | 100 | 405 | 1032 | 2179 | 3834 | 5774 | 7353 | 8669 | 9411 | 9788 | 9899 |
| GLENWOOD | 22 | 56 | 287 | 845 | 1885 | 3425 | 5218 | 6672 | 7884 | 8552 | 8857 | 8927 |
| GRAND MARAIS | 156 | 301 | 672 | 1335 | 2375 | 3835 | 5524 | 6960 | 8209 | 9041 | 9629 | 9972 |
| GRAND MEADOW | 15 | 43 | 243 | 754 | 1715 | 3154 | 4806 | 6152 | 7276 | 7880 | 8162 | 8220 |
| GRAND RAPIDS NC SCHL | 54 | 154 | 507 | 1171 | 2307 | 3946 | 5835 | 7371 | 8666 | 9436 | 9857 | 10002 |
| GULL LAKE DAM | 22 | 79 | 359 | 958 | 2040 | 3621 | 5466 | 6964 | 8228 | 8967 | 9337 | 9436 |
| HALLOCK | 31 | 129 | 442 | 1110 | 2297 | 4045 | 6061 | 7712 | 9096 | 9855 | 10231 | 10335 |
| HINCKLEY | 31 | 94 | 397 | 1012 | 2074 | 3627 | 5435 | 6907 | 8122 | 8814 | 9174 | 9280 |
| INTERNATIONAL FALLS | 54 | 165 | 534 | 1223 | 2426 | 4187 | 6199 | 7826 | 9206 | 10010 | 10448 | 10601 |
| ITASCA ST PARK SCHL | 43 | 134 | 477 | 1139 | 2302 | 3976 | 5913 | 7481 | 8808 | 9600 | 10025 | 10166 |
| JORDAN 1 S | 13 | 41 | 257 | 788 | 1785 | 3251 | 4973 | 6376 | 7541 | 8156 | 8430 | 8488 |
| LEECH LAKE DAM | 37 | 116 | 435 | 1071 | 2189 | 3779 | 5667 | 7201 | 8492 | 9261 | 9672 | 9795 |
| LITCHFIELD | 13 | 38 | 248 | 777 | 1796 | 3287 | 5042 | 6469 | 7656 | 8297 | 8582 | 8643 |
| LITTLE FALLS 1 N | 19 | 64 | 326 | 912 | 1982 | 3554 | 5392 | 6889 | 8136 | 8830 | 9170 | 9252 |
| LONG PRAIRIE | 25 | 82 | 363 | 971 | 2065 | 3654 | 5521 | 7048 | 8326 | 9041 | 9399 | 9496 |
| MADISON SEWAGE PLANT | 10 | 36 | 238 | 758 | 1759 | 3195 | 4921 | 6318 | 7477 | 8105 | 8380 | 8433 |
| MAPLE PLAIN | 16 | 50 | 269 | 802 | 1796 | 3273 | 5000 | 6403 | 7564 | 8184 | 8461 | 8526 |
| MARSHALL | 8 | 26 | 209 | 709 | 1683 | 3116 | 4777 | 6123 | 7247 | 7842 | 8088 | 8127 |
| MEADOWLANDS | 60 | 179 | 541 | 1220 | 2361 | 4005 | 5900 | 7448 | 8783 | 9575 | 10021 | 10184 |
| MILACA | 22 | 69 | 330 | 922 | 1975 | 3511 | 5308 | 6766 | 7986 | 8668 | 9003 | 9095 |
| MILAN | 15 | 44 | 264 | 814 | 1854 | 3370 | 5150 | 6590 | 7779 | 8425 | 8718 | 8779 |
| MINNEAPOLIS-ST PAUL | 10 | 29 | 202 | 687 | 1641 | 3061 | 4729 | 6071 | 7181 | 7754 | 7995 | 8036 |
| MONTEVIDEO 1 SW | 16 | 40 | 241 | 746 | 1751 | 3231 | 4972 | 6374 | 7526 | 8135 | 8391 | 8441 |
| MOOSE LAKE 1 SSE | 53 | 150 | 472 | 1117 | 2220 | 3823 | 5677 | 7203 | 8486 | 9260 | 9702 | 9862 |
| MORA | 24 | 79 | 341 | 930 | 1989 | 3533 | 5338 | 6806 | 8026 | 8708 | 9046 | 9139 |
| MORRIS W C SCHOOL | 15 | 49 | 285 | 855 | 1910 | 3469 | 5271 | 6739 | 7956 | 8613 | 8915 | 8981 |
| NEW LONDON | 15 | 44 | 266 | 803 | 1832 | 3350 | 5129 | 6575 | 7783 | 8442 | 8737 | 8795 |
| NEW ULM | 7 | 20 | 186 | 664 | 1621 | 3042 | 4714 | 6071 | 7184 | 7758 | 7998 | 8034 |
| OLIVIA | 10 | 33 | 223 | 728 | 1726 | 3204 | 4935 | 6337 | 7501 | 8120 | 8381 | 8427 |
| PARK RAPIDS | 32 | 94 | 401 | 1037 | 2179 | 3833 | 5751 | 7296 | 8593 | 9343 | 9723 | 9829 |
| PINE RIVER DAM | 29 | 102 | 403 | 1020 | 2109 | 3709 | 5579 | 7091 | 8361 | 9113 | 9499 | 9616 |
| PIPESTONE | 14 | 36 | 254 | 806 | 1833 | 3320 | 5041 | 6429 | 7582 | 8216 | 8509 | 8565 |
| POKEGAMA DAM | 40 | 127 | 458 | 1101 | 2220 | 3859 | 5754 | 7287 | 8592 | 9355 | 9769 | 9909 |
| PRESTON | 23 | 58 | 280 | 822 | 1798 | 3208 | 4859 | 6210 | 7333 | 7955 | 8266 | 8337 |
| RED LAKE FALLS | 22 | 90 | 387 | 1018 | 2184 | 3875 | 5868 | 7467 | 8836 | 9579 | 9952 | 10066 |
| RED LAKE INDIAN | 37 | 118 | 442 | 1089 | 2227 | 3920 | 5864 | 7455 | 8797 | 9586 | 10000 | 10128 |
| ROCHESTER WSO | 17 | 45 | 237 | 750 | 1722 | 3163 | 4843 | 6199 | 7347 | 7960 | 8238 | 8297 |
| ROSEAU 1 E | 56 | 184 | 561 | 1268 | 2500 | 4280 | 6351 | 8041 | 9491 | 10308 | 10751 | 10907 |
| ROSEMOUNT AGRI EXP | 20 | 49 | 270 | 810 | 1817 | 3300 | 5049 | 6473 | 7653 | 8297 | 8603 | 8663 |
| ST CLOUD WSO | 17 | 60 | 303 | 871 | 1927 | 3470 | 5269 | 6718 | 7936 | 8597 | 8903 | 8980 |
| ST PETER 2 SW | 7 | 25 | 193 | 679 | 1626 | 3051 | 4727 | 6071 | 7174 | 7746 | 7981 | 8014 |
| SANDY LAKE DAM | 45 | 131 | 450 | 1080 | 2178 | 3782 | 5640 | 7158 | 8440 | 9197 | 9598 | 9727 |
| SPRINGFIELD 1 NW | 6 | 26 | 203 | 695 | 1661 | 3105 | 4784 | 6142 | 7264 | 7852 | 8093 | 8127 |
| THIEF RIVER FALLS | 40 | 111 | 432 | 1091 | 2281 | 3999 | 6003 | 7642 | 9025 | 9798 | 10190 | 10318 |
| TRACY | 8 | 33 | 221 | 722 | 1700 | 3145 | 4813 | 6167 | 7302 | 7910 | 8162 | 8201 |
| TWO HARBORS | 114 | 232 | 559 | 1192 | 2214 | 3674 | 5363 | 6790 | 8025 | 8845 | 9407 | 9708 |
| VIRGINIA | 65 | 170 | 524 | 1201 | 2357 | 4019 | 5918 | 7462 | 8767 | 9551 | 9977 | 10132 |
| WADENA 3 S | 26 | 84 | 367 | 979 | 2077 | 3670 | 5541 | 7056 | 8324 | 9037 | 9384 | 9478 |
| WALKER | 41 | 120 | 438 | 1065 | 2182 | 3809 | 5696 | 7216 | 8502 | 9258 | 9651 | 9780 |
| WARROAD | 51 | 155 | 514 | 1206 | 2415 | 4170 | 6208 | 7885 | 9309 | 10160 | 10626 | 10778 |
| WASECA EXP STA | 10 | 42 | 251 | 784 | 1770 | 3239 | 4946 | 6328 | 7489 | 8107 | 8376 | 8424 |
| WHEATON | 12 | 37 | 240 | 766 | 1796 | 3312 | 5078 | 6511 | 7695 | 8338 | 8641 | 8698 |
| WILLMAR ST HOSP | 11 | 33 | 232 | 753 | 1771 | 3278 | 5053 | 6488 | 7687 | 8329 | 8613 | 8668 |
| WINDOM | 10 | 29 | 215 | 716 | 1671 | 3072 | 4747 | 6098 | 7227 | 7837 | 8102 | 8153 |
| WINNEBAGO | 12 | 33 | 216 | 710 | 1665 | 3107 | 4762 | 6094 | 7206 | 7794 | 8058 | 8102 |
| WINNIBIGOSHISH DAM | 34 | 111 | 435 | 1086 | 2222 | 3840 | 5766 | 7333 | 8659 | 9439 | 9845 | 9964 |
| WINONA | 9 | 23 | 162 | 640 | 1533 | 2906 | 4493 | 5779 | 6826 | 7373 | 7616 | 7660 |
| WORTHINGTON | 10 | 38 | 240 | 761 | 1737 | 3182 | 4834 | 6165 | 7290 | 7892 | 8162 | 8214 |
| ZUMBROTA | 16 | 46 | 252 | 776 | 1756 | 3198 | 4897 | 6287 | 7443 | 8066 | 8363 | 8425 |
| FARGO ND WSO | 16 | 55 | 296 | 881 | 1985 | 3606 | 5488 | 7013 | 8285 | 8973 | 9293 | 9373 |
| SIOUX FALLS SD WSO | 10 | 24 | 192 | 682 | 1642 | 3047 | 4677 | 5974 | 7048 | 7611 | 7855 | 7903 |
| LA CROSSE WI WSO | 7 | 20 | 163 | 612 | 1503 | 2852 | 4433 | 5713 | 6770 | 7306 | 7525 | 7560 |

Appendix Table 12. Normal total freezing degree days, $T_b$ = 32°F, for selected dates and adjusted to an 8 a.m. observation time.

| | OCTOBER | | | NOVEMBER | | | DECEMBER | | | JANUARY | | | FEBRUARY | | | MARCH | | | APRIL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 31 | 10 | 20 | 30 | 10 | 20 | 31 | 10 | 20 | 31 | 10 | 20 | 28 | 10 | 20 | 31 | 10 | 20 | 30 |
| ADA | 0 | 0 | 11 | 50 | 119 | 225 | 375 | 576 | 856 | 1152 | 1464 | 1798 | 2064 | 2292 | 2446 | 2604 | 2723 | 2807 | 2844 | 2848 | 2853 |
| ALBERT LEA | 0 | 0 | 6 | 24 | 59 | 120 | 215 | 351 | 548 | 760 | 984 | 1220 | 1409 | 1567 | 1672 | 1778 | 1855 | 1907 | 1925 | 1925 | 1925 |
| ALEXANDRIA FAA AP | 0 | 0 | 9 | 42 | 102 | 194 | 327 | 507 | 763 | 1034 | 1319 | 1620 | 1862 | 2069 | 2211 | 2362 | 2480 | 2567 | 2605 | 2607 | 2613 |
| ARGYLE 4 E | 0 | 0 | 16 | 61 | 144 | 273 | 451 | 683 | 994 | 1314 | 1648 | 2005 | 2302 | 2563 | 2745 | 2935 | 3080 | 3182 | 3227 | 3234 | 3238 |
| ARTICHOKE LAKE | 0 | 0 | 5 | 33 | 85 | 168 | 289 | 456 | 695 | 950 | 1218 | 1502 | 1732 | 1928 | 2061 | 2199 | 2305 | 2380 | 2407 | 2410 | 2414 |
| AUSTIN 3 S | 0 | 0 | 6 | 26 | 64 | 128 | 227 | 369 | 576 | 800 | 1039 | 1291 | 1494 | 1665 | 1780 | 1895 | 1981 | 2039 | 2055 | 2062 | 2063 |
| BABBITT 2 SE | 0 | 4 | 26 | 71 | 149 | 267 | 430 | 639 | 919 | 1206 | 1505 | 1823 | 2086 | 2315 | 2472 | 2632 | 2751 | 2836 | 2876 | 2889 | 2890 |
| BAUDETTE | 0 | 0 | 19 | 67 | 152 | 282 | 462 | 698 | 1016 | 1345 | 1689 | 2059 | 2367 | 2640 | 2830 | 3030 | 3184 | 3298 | 3348 | 3364 | 3365 |
| BEMIDJI AP | 0 | 0 | 17 | 63 | 143 | 265 | 435 | 657 | 958 | 1268 | 1590 | 1929 | 2205 | 2447 | 2615 | 2794 | 2935 | 3039 | 3086 | 3096 | 3100 |
| BENSON | 0 | 0 | 6 | 32 | 82 | 160 | 276 | 438 | 671 | 922 | 1188 | 1468 | 1692 | 1881 | 2008 | 2138 | 2237 | 2306 | 2328 | 2334 | 2336 |
| BIG FALLS | 0 | 1 | 24 | 73 | 158 | 283 | 456 | 681 | 985 | 1299 | 1627 | 1974 | 2259 | 2504 | 2671 | 2844 | 2976 | 3070 | 3113 | 3122 | 3125 |
| BROWNS VALLEY | 0 | 0 | 4 | 28 | 75 | 154 | 272 | 437 | 671 | 918 | 1177 | 1448 | 1665 | 1847 | 1970 | 2094 | 2187 | 2249 | 2263 | 2272 | 2272 |
| CAMBRIDGE ST HOSP | 0 | 0 | 9 | 35 | 85 | 164 | 282 | 445 | 678 | 927 | 1189 | 1465 | 1686 | 1872 | 1996 | 2122 | 2216 | 2281 | 2301 | 2306 | 2309 |
| CAMPBELL | 0 | 0 | 9 | 41 | 102 | 200 | 342 | 532 | 793 | 1063 | 1345 | 1643 | 1885 | 2094 | 2235 | 2378 | 2484 | 2555 | 2581 | 2584 | 2588 |
| CANBY | 0 | 0 | 6 | 27 | 67 | 134 | 236 | 381 | 591 | 814 | 1049 | 1295 | 1492 | 1657 | 1769 | 1886 | 1975 | 2038 | 2061 | 2064 | 2067 |
| CASS LAKE | 0 | 1 | 18 | 60 | 138 | 262 | 436 | 662 | 963 | 1268 | 1582 | 1915 | 2191 | 2434 | 2602 | 2777 | 2909 | 3002 | 3044 | 3054 | 3056 |
| CHASKA | 0 | 0 | 4 | 20 | 53 | 113 | 211 | 354 | 565 | 794 | 1037 | 1293 | 1498 | 1666 | 1776 | 1883 | 1958 | 2006 | 2014 | 2022 | 2022 |
| CLOQUET FOR RES CEN | 0 | 0 | 16 | 53 | 119 | 221 | 365 | 555 | 815 | 1086 | 1370 | 1675 | 1928 | 2148 | 2299 | 2453 | 2569 | 2651 | 2687 | 2696 | 2698 |
| COLLEGEVILLE ST JOHN | 0 | 0 | 7 | 33 | 81 | 159 | 276 | 439 | 674 | 927 | 1195 | 1477 | 1704 | 1895 | 2024 | 2157 | 2259 | 2331 | 2361 | 2362 | 2367 |
| CROOKSTON NW EXP STA | 0 | 0 | 13 | 59 | 139 | 258 | 421 | 635 | 930 | 1240 | 1568 | 1918 | 2206 | 2456 | 2628 | 2807 | 2945 | 3043 | 3085 | 3087 | 3093 |
| DETROIT LAKES 1 NNE | 0 | 0 | 9 | 53 | 130 | 246 | 405 | 614 | 901 | 1203 | 1522 | 1864 | 2145 | 2389 | 2556 | 2730 | 2862 | 2955 | 2993 | 2994 | 3001 |
| DULUTH WSO | 0 | 1 | 17 | 51 | 113 | 210 | 348 | 533 | 787 | 1050 | 1326 | 1618 | 1859 | 2069 | 2213 | 2365 | 2482 | 2568 | 2607 | 2618 | 2619 |
| FAIRMONT | 0 | 0 | 5 | 21 | 54 | 112 | 204 | 339 | 535 | 747 | 968 | 1198 | 1379 | 1530 | 1631 | 1737 | 1819 | 1876 | 1889 | 1897 | 1898 |
| FARIBAULT | 0 | 0 | 3 | 19 | 52 | 111 | 206 | 344 | 548 | 770 | 1005 | 1255 | 1455 | 1622 | 1732 | 1843 | 1923 | 1977 | 1990 | 1997 | 1998 |
| FARMINGTON 3 NW | 0 | 0 | 8 | 28 | 66 | 133 | 237 | 386 | 602 | 835 | 1082 | 1343 | 1553 | 1729 | 1846 | 1964 | 2050 | 2108 | 2124 | 2130 | 2131 |
| FERGUS FALLS | 0 | 0 | 11 | 45 | 106 | 201 | 338 | 524 | 786 | 1063 | 1354 | 1662 | 1910 | 2121 | 2262 | 2407 | 2515 | 2590 | 2615 | 2620 | 2623 |
| FOSSTON | 0 | 0 | 18 | 63 | 139 | 253 | 410 | 616 | 901 | 1201 | 1517 | 1854 | 2131 | 2369 | 2531 | 2700 | 2829 | 2921 | 2963 | 2972 | 2975 |
| GLENWOOD | 0 | 0 | 7 | 33 | 83 | 166 | 289 | 460 | 701 | 957 | 1225 | 1507 | 1734 | 1927 | 2057 | 2191 | 2291 | 2360 | 2384 | 2387 | 2391 |
| GRAND MARAIS | 0 | 0 | 4 | 24 | 65 | 135 | 241 | 386 | 590 | 807 | 1039 | 1293 | 1508 | 1697 | 1827 | 1957 | 2051 | 2113 | 2137 | 2139 | 2142 |
| GRAND MEADOW | 0 | 0 | 6 | 23 | 58 | 121 | 220 | 360 | 560 | 772 | 995 | 1229 | 1419 | 1579 | 1686 | 1793 | 1871 | 1922 | 1934 | 1940 | 1941 |
| GRAND RAPIDS NC SCHL | 0 | 0 | 16 | 55 | 125 | 232 | 385 | 586 | 861 | 1147 | 1446 | 1763 | 2021 | 2244 | 2396 | 2553 | 2672 | 2757 | 2795 | 2802 | 2805 |
| GULL LAKE DAM | 0 | 0 | 10 | 41 | 99 | 191 | 326 | 509 | 766 | 1037 | 1322 | 1624 | 1869 | 2079 | 2221 | 2367 | 2478 | 2557 | 2592 | 2598 | 2601 |
| HALLOCK | 0 | 2 | 25 | 74 | 159 | 291 | 474 | 711 | 1029 | 1355 | 1695 | 2057 | 2357 | 2621 | 2804 | 2995 | 3139 | 3242 | 3288 | 3298 | 3301 |
| HINCKLEY | 0 | 0 | 9 | 36 | 87 | 171 | 297 | 470 | 713 | 970 | 1242 | 1532 | 1768 | 1968 | 2100 | 2228 | 2318 | 2375 | 2385 | 2393 | 2394 |
| INTERNATIONAL FALLS | 0 | 0 | 23 | 73 | 162 | 296 | 482 | 723 | 1044 | 1372 | 1711 | 2068 | 2361 | 2616 | 2792 | 2978 | 3122 | 3226 | 3273 | 3285 | 3288 |
| ITASCA ST PARK SCHL | 0 | 0 | 18 | 63 | 142 | 259 | 422 | 634 | 924 | 1225 | 1539 | 1872 | 2144 | 2378 | 2539 | 2707 | 2837 | 2931 | 2976 | 2987 | 2989 |
| JORDAN 1 S | 0 | 0 | 8 | 29 | 70 | 138 | 243 | 391 | 605 | 837 | 1083 | 1343 | 1554 | 1734 | 1855 | 1978 | 2070 | 2133 | 2150 | 2157 | 2158 |
| LEECH LAKE DAM | 0 | 0 | 15 | 53 | 119 | 220 | 363 | 555 | 823 | 1107 | 1406 | 1724 | 1983 | 2205 | 2356 | 2512 | 2632 | 2718 | 2756 | 2763 | 2766 |
| LITCHFIELD | 0 | 0 | 7 | 32 | 78 | 151 | 262 | 418 | 643 | 885 | 1141 | 1412 | 1631 | 1817 | 1943 | 2074 | 2173 | 2242 | 2265 | 2270 | 2273 |
| LITTLE FALLS 1 N | 0 | 0 | 10 | 39 | 94 | 183 | 314 | 494 | 748 | 1016 | 1298 | 1598 | 1842 | 2051 | 2194 | 2341 | 2451 | 2529 | 2561 | 2564 | 2567 |
| LONG PRAIRIE | 0 | 0 | 13 | 48 | 110 | 205 | 343 | 528 | 788 | 1064 | 1356 | 1667 | 1921 | 2141 | 2292 | 2450 | 2571 | 2657 | 2695 | 2697 | 2703 |
| MADISON SEWAGE PLANT | 0 | 0 | 5 | 27 | 68 | 138 | 244 | 395 | 613 | 847 | 1094 | 1354 | 1563 | 1741 | 1861 | 1985 | 2080 | 2148 | 2168 | 2172 | 2174 |
| MAPLE PLAIN | 0 | 1 | 11 | 34 | 76 | 147 | 255 | 408 | 627 | 861 | 1108 | 1368 | 1578 | 1754 | 1872 | 1990 | 2076 | 2134 | 2150 | 2156 | 2157 |
| MARSHALL | 0 | 0 | 6 | 25 | 63 | 128 | 231 | 374 | 578 | 794 | 1019 | 1254 | 1441 | 1599 | 1704 | 1810 | 1888 | 1940 | 1951 | 1956 | 1959 |
| MEADOWLANDS | 0 | 0 | 19 | 60 | 131 | 239 | 391 | 594 | 872 | 1162 | 1463 | 1779 | 2038 | 2264 | 2425 | 2598 | 2737 | 2839 | 2884 | 2887 | 2894 |
| MILACA | 0 | 0 | 8 | 34 | 84 | 165 | 287 | 458 | 695 | 950 | 1219 | 1504 | 1735 | 1931 | 2061 | 2194 | 2291 | 2358 | 2382 | 2384 | 2388 |
| MILAN | 0 | 0 | 7 | 34 | 84 | 164 | 283 | 447 | 681 | 931 | 1196 | 1476 | 1702 | 1894 | 2023 | 2155 | 2255 | 2325 | 2351 | 2353 | 2357 |
| MINNEAPOLIS-ST PAUL | 0 | 0 | 4 | 21 | 54 | 111 | 204 | 340 | 539 | 755 | 983 | 1223 | 1413 | 1571 | 1675 | 1780 | 1856 | 1908 | 1922 | 1928 | 1929 |
| MONTEVIDEO 1 SW | 0 | 0 | 3 | 25 | 67 | 138 | 246 | 398 | 621 | 859 | 1110 | 1374 | 1584 | 1758 | 1873 | 1988 | 2072 | 2128 | 2148 | 2147 | 2138 |
| MOOSE LAKE 1 SSE | 0 | 1 | 16 | 49 | 111 | 209 | 351 | 541 | 803 | 1076 | 1363 | 1670 | 1923 | 2143 | 2294 | 2449 | 2564 | 2644 | 2677 | 2684 | 2679 |
| MORA | 0 | 0 | 8 | 35 | 86 | 170 | 294 | 465 | 707 | 964 | 1236 | 1525 | 1759 | 1959 | 2092 | 2228 | 2328 | 2395 | 2422 | 2425 | 2419 |
| MORRIS W C SCHOOL | 0 | 0 | 7 | 35 | 89 | 178 | 308 | 486 | 733 | 991 | 1261 | 1548 | 1781 | 1980 | 2115 | 2251 | 2352 | 2421 | 2450 | 2455 | 2449 |
| NEW LONDON | 0 | 0 | 5 | 28 | 76 | 154 | 272 | 437 | 671 | 920 | 1182 | 1461 | 1686 | 1877 | 2006 | 2135 | 2231 | 2297 | 2323 | 2327 | 2322 |
| NEW ULM | 0 | 0 | 3 | 20 | 55 | 115 | 208 | 342 | 540 | 756 | 985 | 1228 | 1421 | 1583 | 1690 | 1798 | 1878 | 1931 | 1949 | 1948 | 1939 |
| OLIVIA | 0 | 0 | 6 | 29 | 73 | 144 | 251 | 402 | 621 | 857 | 1106 | 1369 | 1580 | 1759 | 1880 | 2005 | 2101 | 2169 | 2196 | 2198 | 2190 |
| PARK RAPIDS | 0 | 0 | 13 | 54 | 127 | 238 | 393 | 598 | 881 | 1176 | 1485 | 1811 | 2074 | 2299 | 2451 | 2607 | 2725 | 2807 | 2842 | 2849 | 2843 |
| PINE RIVER DAM | 0 | 0 | 10 | 43 | 103 | 198 | 337 | 526 | 791 | 1070 | 1363 | 1673 | 1924 | 2139 | 2284 | 2433 | 2546 | 2627 | 2662 | 2670 | 2666 |
| PIPESTONE | 0 | 0 | 4 | 28 | 73 | 147 | 257 | 410 | 629 | 861 | 1105 | 1361 | 1565 | 1734 | 1845 | 1956 | 2036 | 2088 | 2106 | 2104 | 2095 |
| POKEGAMA DAM | 0 | 0 | 14 | 49 | 115 | 220 | 371 | 572 | 848 | 1135 | 1436 | 1755 | 2016 | 2242 | 2396 | 2555 | 2676 | 2761 | 2799 | 2809 | 2806 |
| PRESTON | 0 | 0 | 5 | 22 | 56 | 115 | 207 | 339 | 532 | 740 | 963 | 1201 | 1394 | 1558 | 1666 | 1774 | 1852 | 1903 | 1922 | 1923 | 1917 |
| RED LAKE FALLS | 0 | 0 | 16 | 64 | 147 | 269 | 436 | 654 | 954 | 1271 | 1604 | 1960 | 2252 | 2504 | 2678 | 2860 | 3001 | 3103 | 3149 | 3161 | 3157 |
| RED LAKE INDIAN | 0 | 3 | 21 | 62 | 136 | 253 | 420 | 640 | 937 | 1241 | 1557 | 1893 | 2171 | 2415 | 2583 | 2759 | 2892 | 2987 | 3031 | 3045 | 3044 |
| ROCHESTER WSO | 0 | 0 | 7 | 25 | 62 | 125 | 224 | 367 | 574 | 796 | 1029 | 1274 | 1469 | 1634 | 1744 | 1856 | 1940 | 1997 | 2019 | 2021 | 2013 |
| ROSEAU 1 E | 0 | 0 | 29 | 88 | 187 | 330 | 522 | 768 | 1100 | 1444 | 1803 | 2184 | 2497 | 2775 | 2970 | 3182 | 3351 | 3477 | 3536 | 3554 | 3550 |
| ROSEMOUNT AGRI EXP | 0 | 0 | 8 | 30 | 72 | 142 | 250 | 403 | 624 | 863 | 1117 | 1387 | 1607 | 1792 | 1937 | 2043 | 2137 | 2201 | 2226 | 2229 | 2222 |
| ST CLOUD WSO | 0 | 0 | 9 | 37 | 90 | 174 | 299 | 471 | 715 | 973 | 1243 | 1526 | 1753 | 1946 | 2077 | 2213 | 2317 | 2390 | 2419 | 2423 | 2414 |
| ST PETER 2 SW | 0 | 0 | 4 | 20 | 52 | 110 | 203 | 339 | 539 | 756 | 986 | 1227 | 1418 | 1574 | 1674 | 1772 | 1840 | 1884 | 1898 | 1898 | 1890 |
| SANDY LAKE DAM | 0 | 0 | 14 | 47 | 108 | 206 | 347 | 538 | 801 | 1077 | 1366 | 1672 | 1922 | 2139 | 2287 | 2441 | 2557 | 2638 | 2673 | 2681 | 2677 |
| SPRINGFIELD 1 NW | 0 | 0 | 3 | 20 | 56 | 119 | 217 | 359 | 564 | 784 | 1016 | 1259 | 1452 | 1612 | 1718 | 1823 | 1899 | 1949 | 1966 | 1965 | 1956 |
| THIEF RIVER FALLS | 0 | 0 | 16 | 67 | 153 | 282 | 458 | 682 | 988 | 1307 | 1644 | 2004 | 2300 | 2559 | 2738 | 2925 | 3068 | 3173 | 3221 | 3236 | 3233 |
| TRACY | 0 | 0 | 5 | 21 | 56 | 119 | 219 | 363 | 568 | 786 | 1012 | 1249 | 1438 | 1598 | 1704 | 1811 | 1890 | 1942 | 1961 | 1960 | 1952 |
| TWO HARBORS | 0 | 0 | 5 | 22 | 60 | 128 | 233 | 379 | 585 | 802 | 1034 | 1286 | 1499 | 1686 | 1814 | 1943 | 2038 | 2102 | 2130 | 2138 | 2136 |
| VIRGINIA | 0 | 3 | 22 | 65 | 139 | 253 | 413 | 622 | 904 | 1195 | 1496 | 1816 | 2078 | 2304 | 2459 | 2619 | 2739 | 2824 | 2861 | 2871 | 2868 |
| WADENA 3 S | 0 | 0 | 12 | 47 | 110 | 208 | 347 | 535 | 798 | 1076 | 1389 | 1681 | 1933 | 2148 | 2292 | 2439 | 2547 | 2622 | 2653 | 2658 | 2652 |
| WALKER | 0 | 0 | 16 | 54 | 122 | 226 | 374 | 571 | 845 | 1130 | 1429 | 1743 | 1998 | 2215 | 2363 | 2515 | 2631 | 2714 | 2751 | 2761 | 2758 |
| WARROAD | 0 | 0 | 22 | 75 | 186 | 301 | 487 | 725 | 1045 | 1376 | 1723 | 2096 | 2406 | 2679 | 2869 | 3069 | 3225 | 3340 | 3396 | 3418 | 3420 |
| WASECA EXP STA | 0 | 0 | 6 | 24 | 62 | 127 | 231 | 380 | 594 | 822 | 1062 | 1314 | 1515 | 1684 | 1796 | 1907 | 1988 | 2040 | 2058 | 2057 | 2049 |
| WHEATON | 0 | 0 | 6 | 31 | 80 | 161 | 283 | 450 | 685 | 933 | 1193 | 1467 | 1688 | 1877 | 2005 | 2138 | 2238 | 2307 | 2334 | 2338 | 2330 |
| WILLMAR ST HOSP | 0 | 0 | 6 | 32 | 79 | 156 | 270 | 430 | 660 | 909 | 1172 | 1450 | 1673 | 1862 | 1990 | 2123 | 2224 | 2295 | 2324 | 2328 | 2320 |
| WINDOM | 0 | 0 | 5 | 29 | 71 | 138 | 237 | 376 | 578 | 796 | 1027 | 1269 | 1461 | 1623 | 1731 | 1843 | 1929 | 1989 | 2013 | 2015 | 2008 |
| WINNEBAGO | 0 | 0 | 5 | 21 | 55 | 118 | 217 | 360 | 564 | 779 | 1003 | 1237 | 1424 | 1582 | 1688 | 1797 | 1878 | 1932 | 1953 | 1954 | 1947 |
| WINNIBIGOSHISH DAM | 0 | 0 | 17 | 57 | 127 | 233 | 383 | 583 | 862 | 1157 | 1468 | 1799 | 2070 | 2304 | 2464 | 2631 | 2759 | 2852 | 2894 | 2906 | 2903 |
| WINONA | 1 | 1 | 5 | 15 | 40 | 89 | 173 | 296 | 476 | 669 | 873 | 1088 | 1261 | 1403 | 1494 | 1581 | 1639 | 1675 | 1688 | 1688 | 1685 |
| WORTHINGTON | 0 | 0 | 6 | 26 | 65 | 131 | 231 | 373 | 576 | 790 | 1013 | 1245 | 1430 | 1586 | 1692 | 1804 | 1889 | 1949 | 1971 | 1971 | 1962 |
| ZUMBROTA | 0 | 0 | 8 | 27 | 65 | 129 | 228 | 369 | 576 | 798 | 1038 | 1293 | 1500 | 1676 | 1794 | 1913 | 2000 | 2058 | 2080 | 2081 | 2074 |
| FARGO ND WSO | 0 | 0 | 13 | 51 | 119 | 223 | 372 | 569 | 840 | 1124 | 1421 | 1736 | 1992 | 2213 | 2364 | 2522 | 2643 | 2729 | 2765 | 2773 | 2767 |
| SIOUX FALLS SD WSO | 0 | 0 | 4 | 22 | 57 | 115 | 205 | 335 | 526 | 733 | 951 | 1177 | 1355 | 1501 | 1598 | 1698 | 1773 | 1824 | 1843 | 1843 | 1834 |
| LA CROSSE WI WSO | 0 | 0 | 4 | 14 | 38 | 84 | 160 | 275 | 448 | 637 | 838 | 1050 | 1218 | 1356 | 1446 | 1533 | 1596 | 1636 | 1650 | 1649 | 1643 |

Appendix Table 13. Normal total melting degree days (or growing degree days), $T_b = 32°F$, for selected dates and adjusted to an 8 a.m. observation time.

| STATION NAME | MARCH | | APRIL | | MAY | | JUNE | | JULY | | AUGUST | | SEPTEMBER | | OCTOBER | | NOVEMBER | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 31 | 15 | 30 | 15 | 31 | 15 | 30 | 15 | 31 | 15 | 31 | 15 | 30 | 15 | 31 | 15 | 31 |
| ADA | 21 | 77 | 193 | 397 | 696 | 1110 | 1571 | 2084 | 2640 | 3283 | 3838 | 4388 | 4818 | 5168 | 5440 | 5625 | 5699 | 5716 |
| ALBERT LEA | 24 | 96 | 244 | 489 | 829 | 1289 | 1799 | 2364 | 2963 | 3618 | 4216 | 4796 | 5263 | 5658 | 5977 | 6208 | 6315 | 6351 |
| ALEXANDRIA FAA AP | 22 | 79 | 193 | 395 | 699 | 1122 | 1590 | 2114 | 2683 | 3319 | 3901 | 4456 | 4891 | 5249 | 5528 | 5719 | 5797 | 5816 |
| ARGYLE 4 E | 16 | 60 | 157 | 338 | 618 | 1017 | 1464 | 1957 | 2485 | 3075 | 3621 | 4140 | 4539 | 4858 | 5102 | 5267 | 5329 | 5338 |
| ARTICHOKE LAKE | 28 | 94 | 221 | 440 | 757 | 1195 | 1679 | 2219 | 2803 | 3453 | 4048 | 4617 | 5069 | 5446 | 5744 | 5951 | 6039 | 6063 |
| AUSTIN 3 S | 30 | 107 | 252 | 485 | 808 | 1245 | 1731 | 2270 | 2841 | 3463 | 4029 | 4579 | 5025 | 5403 | 5706 | 5922 | 6020 | 6053 |
| BABBITT 2 SE | 10 | 36 | 106 | 252 | 492 | 845 | 1247 | 1699 | 2191 | 2740 | 3239 | 3702 | 4053 | 4335 | 4556 | 4703 | 4755 | 4757 |
| BAUDETTE | 12 | 44 | 119 | 268 | 510 | 864 | 1271 | 1732 | 2234 | 2792 | 3297 | 3768 | 4126 | 4412 | 4629 | 4774 | 4828 | 4835 |
| BEMIDJI AP | 15 | 54 | 140 | 305 | 563 | 937 | 1363 | 1845 | 2371 | 2957 | 3486 | 3985 | 4367 | 4674 | 4909 | 5065 | 5125 | 5134 |
| BENSON | 30 | 101 | 237 | 464 | 789 | 1236 | 1729 | 2276 | 2865 | 3518 | 4116 | 4687 | 5137 | 5511 | 5806 | 6013 | 6102 | 6126 |
| BIG FALLS | 16 | 54 | 136 | 290 | 533 | 887 | 1294 | 1753 | 2250 | 2803 | 3307 | 3775 | 4128 | 4411 | 4631 | 4780 | 4835 | 4840 |
| BROWNS VALLEY | 20 | 82 | 212 | 434 | 749 | 1180 | 1658 | 2195 | 2776 | 3427 | 4027 | 4602 | 5055 | 5432 | 5733 | 5945 | 6034 | 6056 |
| CAMBRIDGE ST HOSP | 21 | 83 | 211 | 434 | 753 | 1185 | 1659 | 2186 | 2754 | 3382 | 3952 | 4494 | 4922 | 5281 | 5566 | 5766 | 5852 | 5875 |
| CAMPBELL | 24 | 89 | 214 | 426 | 728 | 1151 | 1625 | 2151 | 2712 | 3337 | 3915 | 4472 | 4906 | 5257 | 5529 | 5717 | 5795 | 5815 |
| CANBY | 36 | 117 | 263 | 497 | 826 | 1280 | 1786 | 2352 | 2959 | 3633 | 4252 | 4847 | 5320 | 5717 | 6038 | 6268 | 6369 | 6398 |
| CASS LAKE | 15 | 59 | 153 | 321 | 576 | 946 | 1374 | 1858 | 2378 | 2952 | 3478 | 3975 | 4357 | 4659 | 4891 | 5050 | 5114 | 5128 |
| CHASKA | 22 | 91 | 237 | 480 | 821 | 1280 | 1784 | 2343 | 2938 | 3593 | 4191 | 4763 | 5220 | 5605 | 5916 | 6138 | 6235 | 6263 |
| CLOQUET FOR RES CEN | 10 | 39 | 112 | 258 | 488 | 821 | 1204 | 1648 | 2142 | 2698 | 3200 | 3669 | 4031 | 4328 | 4553 | 4702 | 4759 | 4768 |
| COLLEGEVILLE ST JOHN | 22 | 82 | 208 | 428 | 745 | 1179 | 1656 | 2186 | 2757 | 3393 | 3976 | 4531 | 4970 | 5337 | 5630 | 5838 | 5927 | 5951 |
| CROOKSTON NW EXP STA | 18 | 65 | 165 | 347 | 626 | 1025 | 1474 | 1975 | 2516 | 3124 | 3686 | 4221 | 4634 | 4966 | 5221 | 5392 | 5458 | 5468 |
| DETROIT LAKES 1 NNE | 10 | 46 | 133 | 300 | 559 | 931 | 1353 | 1825 | 2336 | 2908 | 3433 | 3929 | 4308 | 4608 | 4837 | 4991 | 5050 | 5060 |
| DULUTH WSO | 9 | 37 | 112 | 262 | 496 | 830 | 1211 | 1651 | 2142 | 2695 | 3198 | 3671 | 4042 | 4350 | 4591 | 4754 | 4818 | 4831 |
| FAIRMONT | 37 | 126 | 288 | 548 | 908 | 1391 | 1920 | 2500 | 3112 | 3780 | 4391 | 4985 | 5469 | 5883 | 6220 | 6464 | 6578 | 6618 |
| FARIBAULT | 24 | 97 | 243 | 485 | 821 | 1272 | 1771 | 2326 | 2918 | 3565 | 4153 | 4721 | 5180 | 5572 | 5890 | 6118 | 6216 | 6248 |
| FARMINGTON 3 NW | 26 | 99 | 246 | 491 | 830 | 1285 | 1782 | 2331 | 2915 | 3557 | 4144 | 4708 | 5159 | 5540 | 5850 | 6073 | 6173 | 6204 |
| FERGUS FALLS | 18 | 70 | 181 | 385 | 689 | 1113 | 1582 | 2103 | 2667 | 3300 | 3881 | 4434 | 4865 | 5216 | 5489 | 5675 | 5750 | 5765 |
| FOSSTON | 16 | 62 | 164 | 347 | 623 | 1014 | 1453 | 1944 | 2474 | 3069 | 3617 | 4134 | 4530 | 4850 | 5103 | 5276 | 5343 | 5352 |
| GLENWOOD | 21 | 79 | 199 | 410 | 720 | 1147 | 1619 | 2145 | 2714 | 3349 | 3929 | 4482 | 4917 | 5277 | 5562 | 5762 | 5847 | 5869 |
| GRAND MARAIS | 6 | 25 | 80 | 194 | 374 | 630 | 925 | 1276 | 1687 | 2171 | 2629 | 3071 | 3421 | 3710 | 3932 | 4081 | 4144 | 4161 |
| GRAND MEADOW | 26 | 100 | 246 | 484 | 812 | 1254 | 1744 | 2285 | 2855 | 3478 | 4047 | 4600 | 5048 | 5428 | 5736 | 5961 | 6067 | 6104 |
| GRAND RAPIDS NC SCHL | 14 | 53 | 140 | 304 | 557 | 919 | 1330 | 1794 | 2298 | 2858 | 3365 | 3840 | 4203 | 4498 | 4727 | 4883 | 4943 | 4952 |
| GULL LAKE DAM | 17 | 61 | 158 | 338 | 614 | 1009 | 1455 | 1956 | 2500 | 3106 | 3656 | 4175 | 4580 | 4914 | 5177 | 5359 | 5431 | 5446 |
| HALLOCK | 7 | 41 | 134 | 314 | 591 | 985 | 1431 | 1931 | 2469 | 3065 | 3610 | 4124 | 4517 | 4830 | 5065 | 5220 | 5278 | 5288 |
| HINCKLEY | 8 | 49 | 152 | 342 | 623 | 1011 | 1443 | 1928 | 2453 | 3039 | 3573 | 4077 | 4467 | 4786 | 5037 | 5213 | 5285 | 5300 |
| INTERNATIONAL FALLS | 11 | 42 | 119 | 273 | 518 | 875 | 1285 | 1750 | 2257 | 2819 | 3326 | 3795 | 4152 | 4438 | 4658 | 4804 | 4857 | 4863 |
| ITASCA ST PARK SCHL | 16 | 54 | 136 | 293 | 540 | 902 | 1318 | 1787 | 2298 | 2868 | 3388 | 3875 | 4247 | 4547 | 4779 | 4936 | 4995 | 5002 |
| JORDAN 1 S | 28 | 102 | 245 | 481 | 811 | 1254 | 1740 | 2276 | 2849 | 3479 | 4052 | 4600 | 5038 | 5409 | 5710 | 5924 | 6019 | 6047 |
| LEECH LAKE DAM | 18 | 59 | 146 | 311 | 566 | 937 | 1361 | 1842 | 2365 | 2946 | 3473 | 3966 | 4349 | 4664 | 4911 | 5077 | 5139 | 5152 |
| LITCHFIELD | 29 | 100 | 235 | 459 | 782 | 1225 | 1717 | 2263 | 2847 | 3493 | 4083 | 4646 | 5093 | 5469 | 5771 | 5985 | 6076 | 6098 |
| LITTLE FALLS 1 N | 20 | 75 | 190 | 390 | 685 | 1096 | 1554 | 2068 | 2624 | 3240 | 3799 | 4329 | 4745 | 5090 | 5361 | 5548 | 5623 | 5639 |
| LONG PRAIRIE | 21 | 75 | 185 | 376 | 659 | 1057 | 1505 | 2009 | 2555 | 3161 | 3711 | 4231 | 4635 | 4967 | 5227 | 5406 | 5478 | 5493 |
| MADISON SEWAGE PLANT | 37 | 115 | 255 | 485 | 810 | 1258 | 1752 | 2304 | 2896 | 3553 | 4154 | 4725 | 5177 | 5557 | 5864 | 6079 | 6168 | 6199 |
| MAPLE PLAIN | 23 | 90 | 229 | 462 | 790 | 1232 | 1717 | 2255 | 2831 | 3466 | 4045 | 4600 | 5041 | 5414 | 5715 | 5933 | 6032 | 6063 |
| MARSHALL | 27 | 101 | 249 | 493 | 833 | 1295 | 1806 | 2373 | 2975 | 3638 | 4247 | 4834 | 5301 | 5695 | 6012 | 6241 | 6344 | 6379 |
| MEADOWLANDS | 23 | 68 | 149 | 299 | 537 | 885 | 1281 | 1731 | 2224 | 2776 | 3275 | 3740 | 4099 | 4389 | 4612 | 4761 | 4819 | 4829 |
| MILACA | 15 | 64 | 179 | 383 | 680 | 1086 | 1537 | 2044 | 2595 | 3207 | 3764 | 4292 | 4706 | 5047 | 5314 | 5496 | 5571 | 5589 |
| MILAN | 30 | 102 | 236 | 459 | 777 | 1216 | 1704 | 2247 | 2829 | 3473 | 4064 | 4630 | 5076 | 5444 | 5734 | 5935 | 6020 | 6042 |
| MINNEAPOLIS-ST PAUL | 30 | 111 | 271 | 531 | 885 | 1353 | 1865 | 2434 | 3046 | 3721 | 4335 | 4925 | 5400 | 5803 | 6128 | 6361 | 6467 | 6503 |
| MONTEVIDEO 1 SW | 23 | 91 | 231 | 468 | 801 | 1254 | 1752 | 2302 | 2887 | 3535 | 4130 | 4700 | 5151 | 5532 | 5843 | 6065 | 6160 | 6184 |
| MOOSE LAKE 1 SSE | 16 | 55 | 137 | 291 | 532 | 879 | 1273 | 1727 | 2232 | 2799 | 3314 | 3798 | 4177 | 4489 | 4731 | 4893 | 4958 | 4972 |
| MORA | 18 | 71 | 185 | 388 | 684 | 1089 | 1539 | 2044 | 2595 | 3209 | 3765 | 4291 | 4704 | 5046 | 5315 | 5498 | 5573 | 5589 |
| MORRIS W C SCHOOL | 18 | 77 | 206 | 425 | 740 | 1174 | 1657 | 2192 | 2761 | 3392 | 3974 | 4534 | 4971 | 5328 | 5605 | 5799 | 5882 | 5903 |
| NEW LONDON | 17 | 72 | 195 | 413 | 730 | 1166 | 1650 | 2190 | 2771 | 3414 | 3999 | 4556 | 4997 | 5366 | 5661 | 5868 | 5955 | 5977 |
| NEW ULM | 31 | 116 | 275 | 527 | 873 | 1337 | 1850 | 2418 | 3020 | 3678 | 4279 | 4861 | 5331 | 5731 | 6056 | 6293 | 6401 | 6437 |
| OLIVIA | 34 | 114 | 259 | 495 | 830 | 1289 | 1796 | 2355 | 2949 | 3600 | 4194 | 4766 | 5225 | 5614 | 5928 | 6154 | 6253 | 6281 |
| PARK RAPIDS | 11 | 48 | 137 | 309 | 578 | 964 | 1400 | 1887 | 2416 | 3008 | 3551 | 4064 | 4457 | 4773 | 5017 | 5183 | 5246 | 5255 |
| PINE RIVER DAM | 18 | 60 | 151 | 324 | 592 | 976 | 1407 | 1893 | 2422 | 3012 | 3544 | 4044 | 4435 | 4757 | 5010 | 5184 | 5255 | 5271 |
| PIPESTONE | 17 | 78 | 207 | 426 | 738 | 1168 | 1649 | 2188 | 2765 | 3403 | 3991 | 4555 | 4999 | 5363 | 5650 | 5849 | 5933 | 5953 |
| POKEGAMA DAM | 18 | 58 | 149 | 316 | 572 | 939 | 1355 | 1826 | 2339 | 2910 | 3430 | 3919 | 4295 | 4601 | 4840 | 5004 | 5068 | 5079 |
| PRESTON | 29 | 103 | 244 | 471 | 784 | 1208 | 1681 | 2209 | 2771 | 3387 | 3949 | 4491 | 4926 | 5291 | 5582 | 5789 | 5881 | 5912 |
| RED LAKE FALLS | 17 | 65 | 167 | 351 | 629 | 1021 | 1481 | 1954 | 2489 | 3086 | 3633 | 4152 | 4552 | 4876 | 5127 | 5296 | 5360 | 5371 |
| RED LAKE INDIAN | 14 | 50 | 133 | 293 | 550 | 928 | 1356 | 1838 | 2360 | 2942 | 3474 | 3974 | 4356 | 4664 | 4905 | 5073 | 5141 | 5154 |
| ROCHESTER WSO | 25 | 95 | 237 | 474 | 803 | 1246 | 1738 | 2283 | 2862 | 3495 | 4072 | 4631 | 5083 | 5467 | 5777 | 6000 | 6101 | 6134 |
| ROSEAU 1 E | 12 | 45 | 123 | 276 | 518 | 872 | 1278 | 1738 | 2237 | 2792 | 3294 | 3762 | 4117 | 4399 | 4613 | 4753 | 4805 | 4811 |
| ROSEMOUNT AGRI EXP | 25 | 92 | 224 | 445 | 758 | 1187 | 1666 | 2200 | 2771 | 3399 | 3971 | 4518 | 4955 | 5323 | 5618 | 5827 | 5918 | 5943 |
| ST CLOUD WSO | 23 | 83 | 207 | 423 | 736 | 1162 | 1630 | 2150 | 2712 | 3334 | 3900 | 4437 | 4862 | 5218 | 5500 | 5694 | 5773 | 5792 |
| ST PETER 2 SW | 21 | 94 | 249 | 505 | 858 | 1323 | 1837 | 2405 | 3009 | 3668 | 4269 | 4850 | 5318 | 5714 | 6038 | 6270 | 6380 | 6418 |
| SANDY LAKE DAM | 16 | 56 | 146 | 314 | 574 | 948 | 1369 | 1844 | 2360 | 2934 | 3458 | 3948 | 4326 | 4639 | 4887 | 5058 | 5126 | 5139 |
| SPRINGFIELD 1 NW | 23 | 97 | 246 | 492 | 836 | 1301 | 1817 | 2385 | 2981 | 3628 | 4216 | 4786 | 5248 | 5641 | 5960 | 6189 | 6294 | 6327 |
| THIEF RIVER FALLS | 8 | 41 | 130 | 304 | 571 | 954 | 1385 | 1868 | 2392 | 2978 | 3518 | 4029 | 4419 | 4729 | 4963 | 5118 | 5175 | 5182 |
| TRACY | 23 | 92 | 233 | 469 | 804 | 1261 | 1769 | 2332 | 2932 | 3594 | 4201 | 4784 | 5248 | 5639 | 5955 | 6181 | 6279 | 6305 |
| TWO HARBORS | 13 | 42 | 106 | 231 | 422 | 693 | 1005 | 1381 | 1825 | 2349 | 2838 | 3308 | 3682 | 3992 | 4232 | 4395 | 4465 | 4485 |
| VIRGINIA | 14 | 47 | 126 | 283 | 531 | 891 | 1298 | 1759 | 2263 | 2823 | 3330 | 3803 | 4166 | 4461 | 4688 | 4839 | 4895 | 4901 |
| WADENA 3 S | 10 | 50 | 151 | 342 | 630 | 1033 | 1484 | 1987 | 2531 | 3139 | 3697 | 4226 | 4633 | 4964 | 5221 | 5398 | 5468 | 5483 |
| WALKER | 15 | 54 | 145 | 317 | 582 | 961 | 1387 | 1865 | 2386 | 2970 | 3502 | 4001 | 4385 | 4700 | 4950 | 5125 | 5193 | 5205 |
| WARROAD | 9 | 35 | 102 | 239 | 467 | 813 | 1219 | 1684 | 2191 | 2755 | 3268 | 3747 | 4112 | 4402 | 4620 | 4764 | 4816 | 4823 |
| WASECA EXP STA | 14 | 72 | 205 | 437 | 766 | 1211 | 1703 | 2247 | 2823 | 3451 | 4024 | 4577 | 5022 | 5396 | 5694 | 5906 | 6000 | 6029 |
| WHEATON | 31 | 106 | 242 | 464 | 779 | 1217 | 1708 | 2256 | 2843 | 3497 | 4100 | 4681 | 5140 | 5521 | 5824 | 6037 | 6127 | 6152 |
| WILLMAR ST HOSP | 26 | 95 | 229 | 455 | 777 | 1219 | 1710 | 2255 | 2839 | 3484 | 4071 | 4636 | 5088 | 5470 | 5776 | 5993 | 6086 | 6112 |
| WINDOM | 36 | 118 | 267 | 504 | 835 | 1287 | 1794 | 2359 | 2958 | 3612 | 4209 | 4784 | 5245 | 5635 | 5948 | 6178 | 6292 | 6344 |
| WINNEBAGO | 36 | 121 | 277 | 525 | 865 | 1324 | 1833 | 2396 | 2989 | 3636 | 4229 | 4805 | 5270 | 5663 | 5981 | 6213 | 6322 | 6359 |
| WINNIBIGOSHISH DAM | 15 | 50 | 134 | 297 | 554 | 929 | 1358 | 1843 | 2370 | 2956 | 3488 | 3984 | 4365 | 4674 | 4913 | 5072 | 5130 | 5141 |
| WINONA | 33 | 122 | 294 | 563 | 923 | 1393 | 1908 | 2477 | 3083 | 3745 | 4349 | 4936 | 5412 | 5821 | 6157 | 6411 | 6540 | 6592 |
| WORTHINGTON | 36 | 120 | 270 | 509 | 840 | 1292 | 1792 | 2346 | 2934 | 3580 | 4169 | 4736 | 5189 | 5567 | 5871 | 6091 | 6194 | 6227 |
| ZUMBROTA | 26 | 97 | 237 | 466 | 783 | 1214 | 1695 | 2233 | 2809 | 3441 | 4018 | 4573 | 5017 | 5393 | 5697 | 5915 | 6014 | 6045 |
| FARGO ND WSO | 23 | 82 | 200 | 408 | 716 | 1141 | 1611 | 2136 | 2705 | 3344 | 3933 | 4493 | 4931 | 5287 | 5563 | 5752 | 5829 | 5848 |
| SIOUX FALLS SD WSO | 45 | 141 | 308 | 565 | 913 | 1378 | 1892 | 2469 | 3092 | 3783 | 4416 | 5025 | 5510 | 5914 | 6236 | 6466 | 6571 | 6606 |
| LA CROSSE WI WSO | 32 | 121 | 294 | 568 | 938 | 1419 | 1939 | 2513 | 3124 | 3796 | 4411 | 5010 | 5498 | 5918 | 6261 | 6515 | 6642 | 6693 |

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