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University of Connecticut Agriculture Climate Station in Coventry , Connecticut, The

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The University of Connecticut Agriculture Climate Station in Coventry, Connecticut



By David R. Miller and Byron E. Janes
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We wish to thank all those who have faithfully recorded the daily observations over the years, in particular Louis Marschat and John Scarchuk. Also,

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The University of Connecticut Agriculture Climate Station in Coventry, Connecticut

David R. Miller and Byron E. Janes 1/

Station History and Location

The weather station located on The University of Connecticut research farm in Coventry, Connecticut, Lat. 41° 47' 30" Long. 72° 22' 29", was established in 1939. The farm's cultivated area of approximately 40 acres fills a flat flood plain on the Skungamaug River where the valley widens into a bowl-shaped area. Figure 1 is a topographic map of the area and shows the valley floor, at an elevation of 485 feet, to be some 100 to 200 feet below the surrounding hilltops.

Prior to 1957, the weather station instruments were located in the cultivated field on a plot of grass approximately 20 feet square. There were tall trees 300 to 400 feet to the north and east and 800 to 1200 feet to the south and west. In 1957 the instruments were moved to their present position, approximately 100 feet to the west, and the grassed area enlarged to a plot 100 feet square.

The original instruments, used from 1940 to 1957, were a hygrothermograph, an anemometer located 10 feet above ground, a tipping bucket and

a standard 6 inch rain gauge, and a Marvin sunshine duration sensor. The hours of sunshine, rainfall and miles of wind were recorded on a triple register strip chart recorder. A standard weather bureau evaporation pan was added in 1950 and operated during the months of May to October.

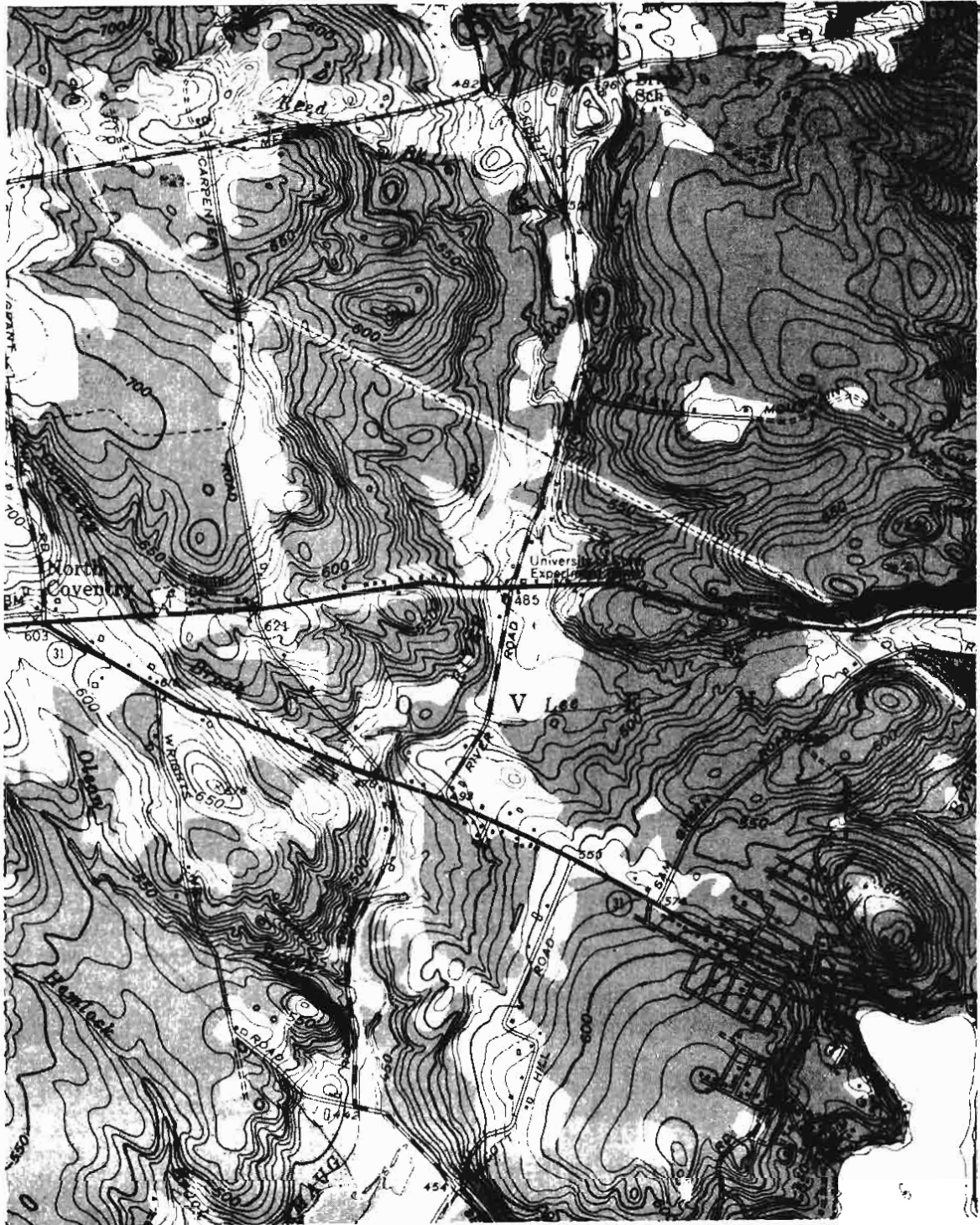
In 1957 a small shed to house recorders was located in the northwest corner of the grassed plot and the following instruments were installed: a mercury fitted expansion bulb and maximum-minimum thermometers were housed in a standard shelter 5 feet above ground; a series of shielded and aspirated thermocouples were placed at heights of 1', 1', 4' and 5' above ground with a wet bulb at 5'; a Beckman-Whitely net radiometer; a Belford cup anemometer with a wind direction indicator was installed at 30'; and a second cup anemometer was placed 18" above the evaporation pan. The tipping bucket and the standard rain gauges and the evaporation pan were moved to the new location and continue in use.

The net radiometer and air profile temperature measurements were discontinued in 1961. In 1965 an Epply pyranometer was installed.

An event recorder was used to record wind speed and direction, and rainfall. Thermocouple

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Fig. 1. Map of The University of Connecticut Research Farm Area in Coventry, Connecticut (Taken from South Coventry Quadrangle, U.S. Geological Survey). Scale 1:24000.



temperatures and net radiation were recorded on a 6 point strip chart recorder. Liquid expansion bulb thermometers were installed in 1965 at 4", 8" and 12" depths below the sod to measure soil temperature. The pyranometer mv signals were recorded with a strip chart recorder and totalizer giving 20-minute and 24-hour integrated values.

The temperature and rainfall records are the most complete and with the exception of the period 1944 to 1949 the original charts are still available. Wind speed records are intermittent from 1940 to 1957. After 1957 there are more or less continuous records of both direction and miles passed at 30 feet height and total miles passed in a 24-hour period at 18". Pan evaporation data are available for ice-free periods May to October from 1950 to the present. The atmometers were maintained during frost-free periods from 1950 to 1967. Soil temperature data are available from 1965 to 1975.

Due to breakdown of recorders or sensors and to occasional changes in personnel there are short periods of missing data in all the records. An effort has been made to be consistent in time of making observation and in method of recording data.

The valley is a typical Connecticut frost pocket. Therefore the climatic averages differ from those of the hill tops and more exposed sites which are normally used to locate weather stations. But much of Connecticut's agricultural, industrial and commercial development is located in valley bottoms which are more or less severe frost pockets. The records available at the station are sufficient to characterize both the macro and micro-climates of the valley.

The available data for the 25-year period from 1950 through 1975 are summarized in Tables I through IX. These will be updated periodically as more information and records become available. It is hoped the tables will be utilized to help plan not only agriculture operations, but developments in Connecticut valleys.

Air Temperatures

The daily air temperature data obtained from the maximum and minimum thermometer records in the standard shelter for the 25-year period 1950-1975 are summarized in Table I and Figure 2. Mean daily temperatures are given along with the corresponding maxima and minima.

Weekly averages and standard deviations of the

temperatures are given in Table II and Figure 3 for 7-day periods beginning March 1.

Freezing Temperatures in the Spring and Fall

Table III lists the average dates the first occurrences of 0°F, 10°F, 25°F and 32°F temperatures in the spring and their last occurrences in the Fall. It also lists the earliest and latest dates in the 25-year period. Near or below freezing temperatures are the most serious climatic hazard to agriculture and ornamental plants in Connecticut. Therefore, information on the last occurrence of freezing weather in the Spring, the first such occurrence in the fall and thereby the length of the freeze-free growing season are useful both economically and aesthetically to the gardener, orchardist, and farmer in the state. The length of the freeze-free period determines which plants can best be grown in valley bottoms in the area. Each plant species has a given requirement for growth, length of time to reach maturity, cold tolerance, and other related physiological phenomena.

Some plants are more easily damaged by freezes than others; therefore, the severity of freezes are characterized, depending on the extent of the temperature fall. Generally three classification of freezes are recognized:

- (1) **The light freeze**, when temperatures dip into the range from 28° to 32°F. It adversely affects very susceptible plants such as melons, tomatoes and tobacco.
- (2) **The moderate freeze**, when temperatures are in the range of 24° to 28°F. In this range hardier plants are damaged such as potatoes, onions and fruit trees.
- (3) **The severe freeze**, when temperatures fall below 24°F. Severe freezes kill most annuals and cause perennial plants to become dormant in fall.

Temperatures colder than those classified above bring on hazards other than their effect on plants. Very cold periods below 10°F cause problems such as freezing pipes, unworkable soil and heaving roads. At temperatures below 0°F winter kill of ornamental and fruit crops may occur.

Growing Degree Days (GDD)

Plant growth generally does not begin in the spring until air temperatures rise above a minimum value. Each plant species requires a dif-

ferent minimum value. For many cool season plants, such as small grains and cool season grasses, growth and development begin when temperatures rise above 40°F. For many other plants such as corn, tomatoes and beans, growth does not begin until temperatures are higher than 50°F. The amount of plant growth is then approximately proportional to the amount of heat or temperature accumulated above the base.

The most common system to quantify this accumulation of heat is to calculate heat units, called growing degree days (GDD), for each day and sum them from the beginning of the season.

The growing degree day value for any day is easily obtained by subtracting the approximate base of threshold temperature from the mean temperature. For example:

$$\text{GDD} = T - 40$$

or

$$\text{GDD} = T - 50$$

Table IV lists average and accumulated weekly GDDs for 7-day periods beginning March 1 for the 25 years for bases 40° and 50°F. The same information is graphed in Figures 4 and 5.

Heating Degree Days (HDD)

An average outdoor temperature of 65°F is the lowest permissible without supplying heat to a building which is to be maintained at approximately 70°F. The amount of heat (or fuel) required in the building is proportional to accumulated deficit of heat below 65°F. Therefore heat units, called Heating Degree Days (HDD), can be calculated and summed to quantify building heating demand. For example:

$$\text{HDD} = 65 - T.$$

The HDD data may be used as a basis for planning the insulation, heating plants and estimating fuel requirements of buildings.

Table IV gives the average weekly HDDs and the weekly accumulations of average HDDs. Figures 4 and 5 graph the average and accumulated average HDDs throughout the year.

Solar Radiation

Table V gives weekly averages of solar radiation on a horizontal surface (R_S) for the 1971-1977 period. Only five years record is available and the year-to-year variation is quite large. Therefore the data in Table V is only approximate and should not

be used for exact calculations until a considerably longer period of record is available. Table V also lists the percent of potential solar radiation (R_P) that was transmitted through the atmosphere during the 1971-77 period. R_P was calculated using the method and equations of Furnival et. al. (1975) and then the ratio of R_S/R_P was calculated.

Soil Temperatures

The soil temperature is uniquely important in the maintenance of plant life. The soil is a major sink for heat, storing it in the warm seasons, and releasing it during the cold seasons. Changes in soil temperature affects physical processes of water movement, chemical composition, and biological activities such as microbial decomposition of organic matter and root development and function.

Table VI lists weekly averages of soil temperatures at 4" and 8" depths below a blue grass sod. Figure 6 graphs the average soil temperature waves through the year at the two depths.

The soil at the site is a sandy loam which warms more rapidly in the spring and cools more rapidly in the fall than heavier silt or clay soil. The grass sod is a major insulator and therefore shows much smaller extremes of temperatures and less rapid changes in soil temperature than would be found under bare soil.

Precipitation and Evaporation

The average precipitation catch in the standard range gauge for the 25-year period and the maximum weekly catch during the period are listed in Table VII and graphed in Figures 7 and 8.

The average evaporation measured in the Standard Evaporation Pan and the average and maximum snow cover are listed in Table VII and graphed in Figures 9 and 10.

Windspeeds

The wind speed data in Table VIII are weekly averages of 24-hour periods with the anemometers 30 feet and 18 inches above ground. Along with the average wind speed for the weekly periods the highest and lowest extremes during the period of record are listed.

Table VIII also lists the percentage of time average the winds are from each direction. The wind direction data is based on single daily observations at 0800 hours.

Fig. 2. Daily Averages of Air Temperatures

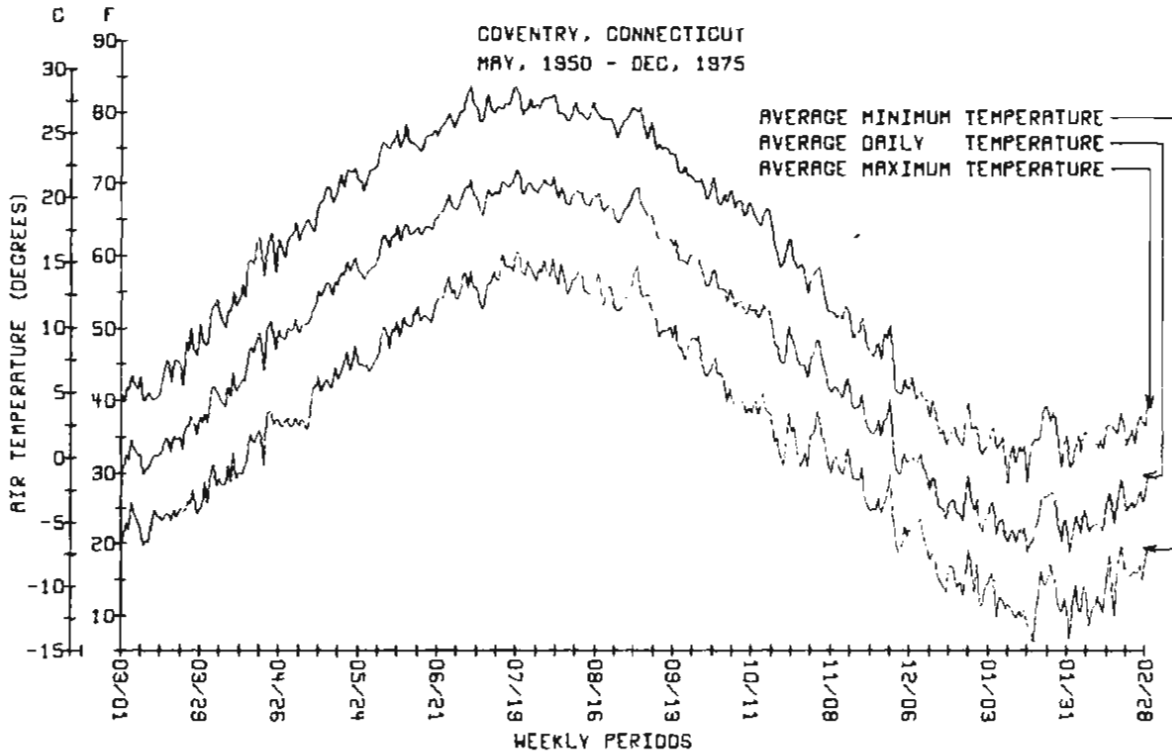


Fig. 3. Weekly Averages of Air Temperatures

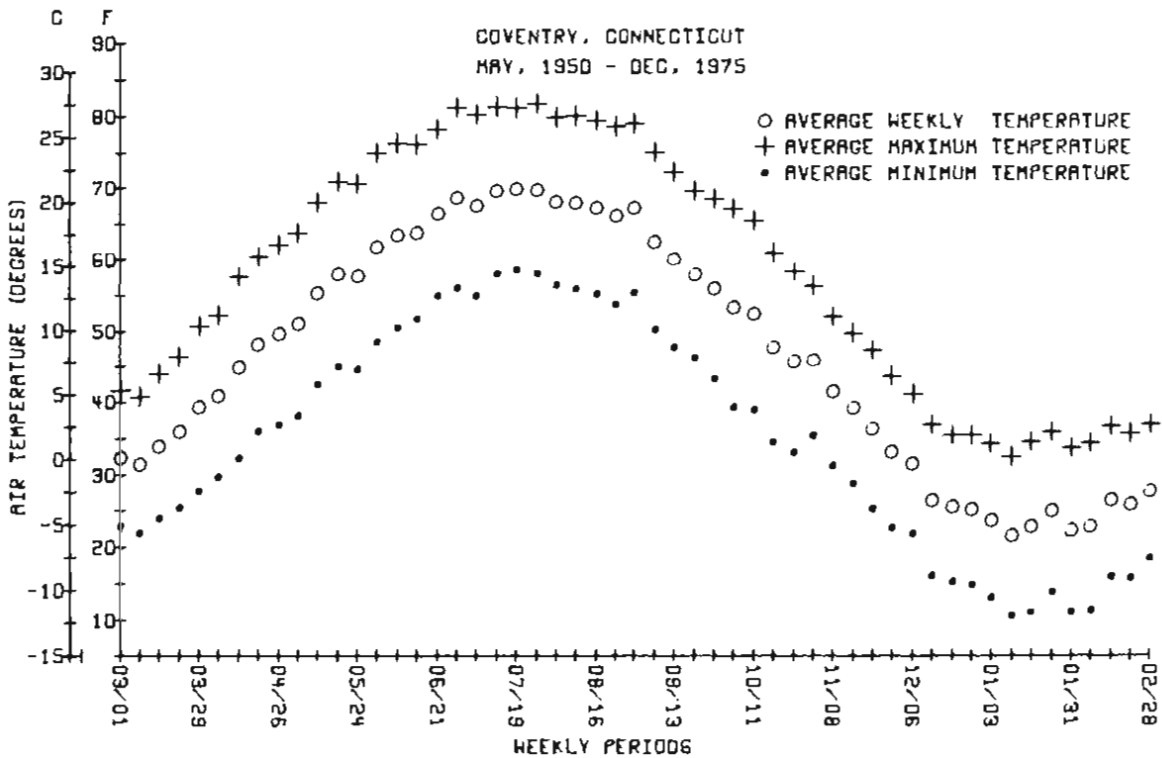


Fig. 4. Average Weekly Heating and Growing Degree Days

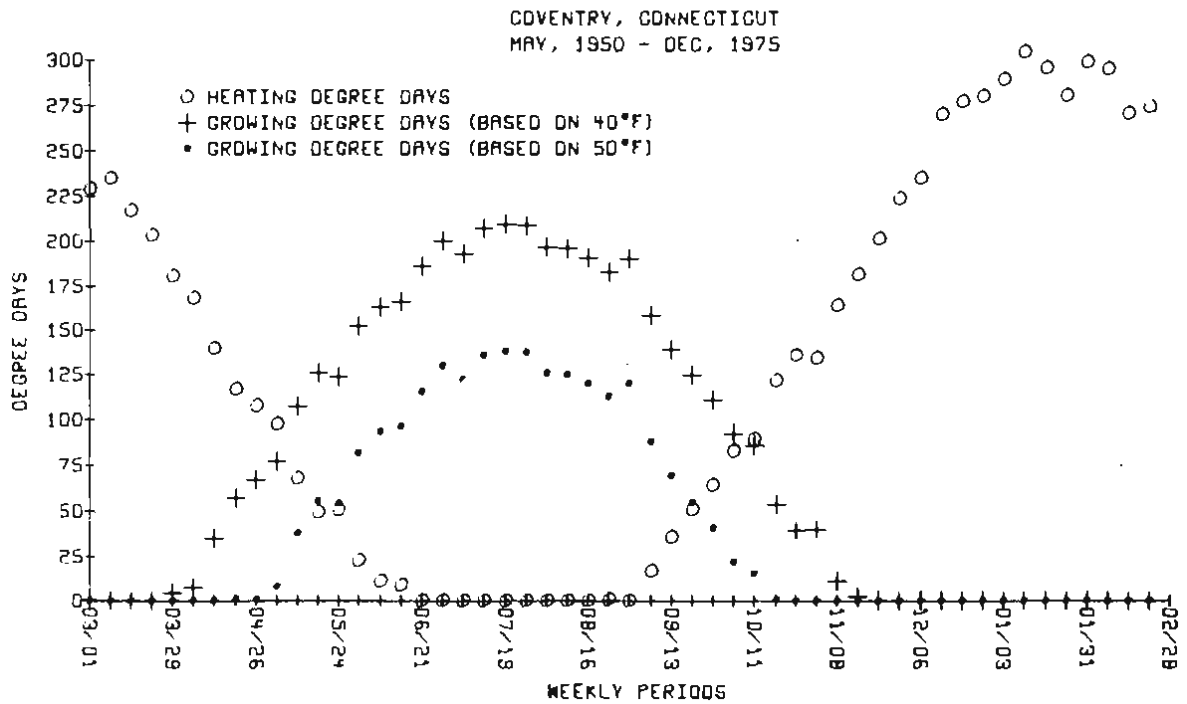


Fig. 5. Average Weekly Accumulated Heating and Growing Degree Days

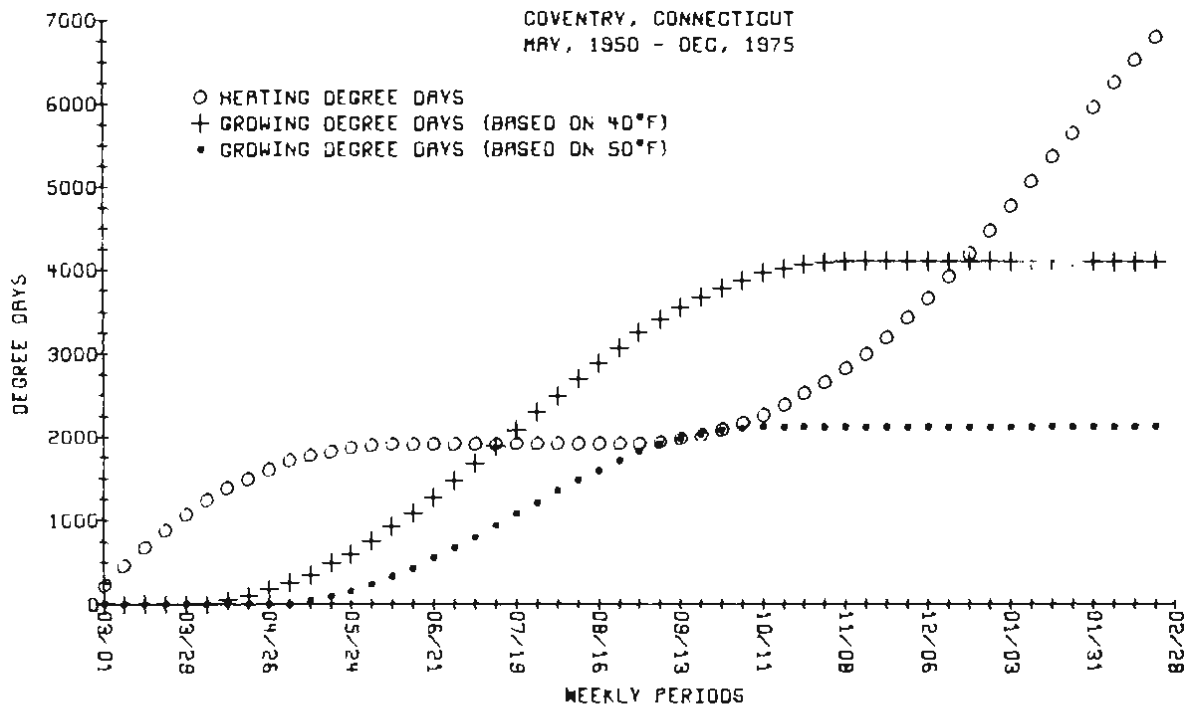


Fig. 6. Average Weekly Soil Temperature at 4-inch depth (.) and 8-inch depth (x). 1966-1976

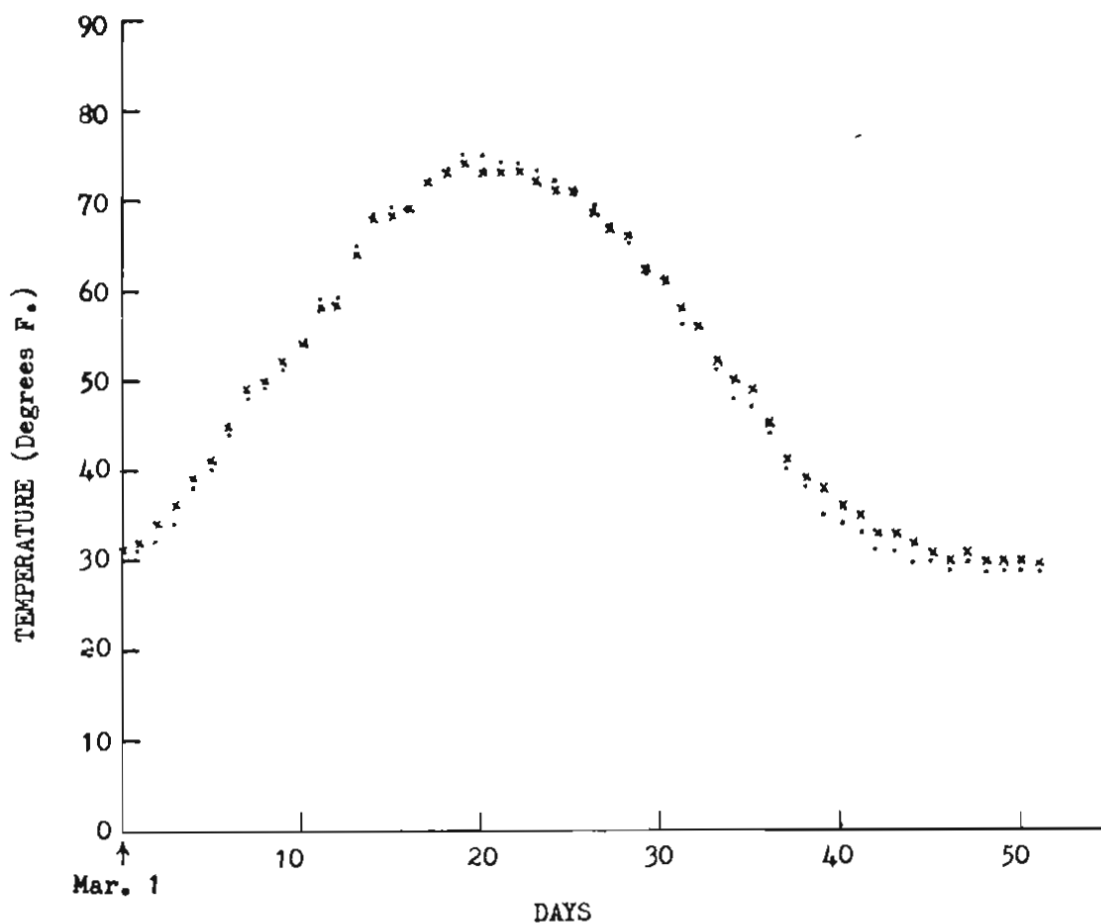


Fig. 7. Average Weekly Precipitation

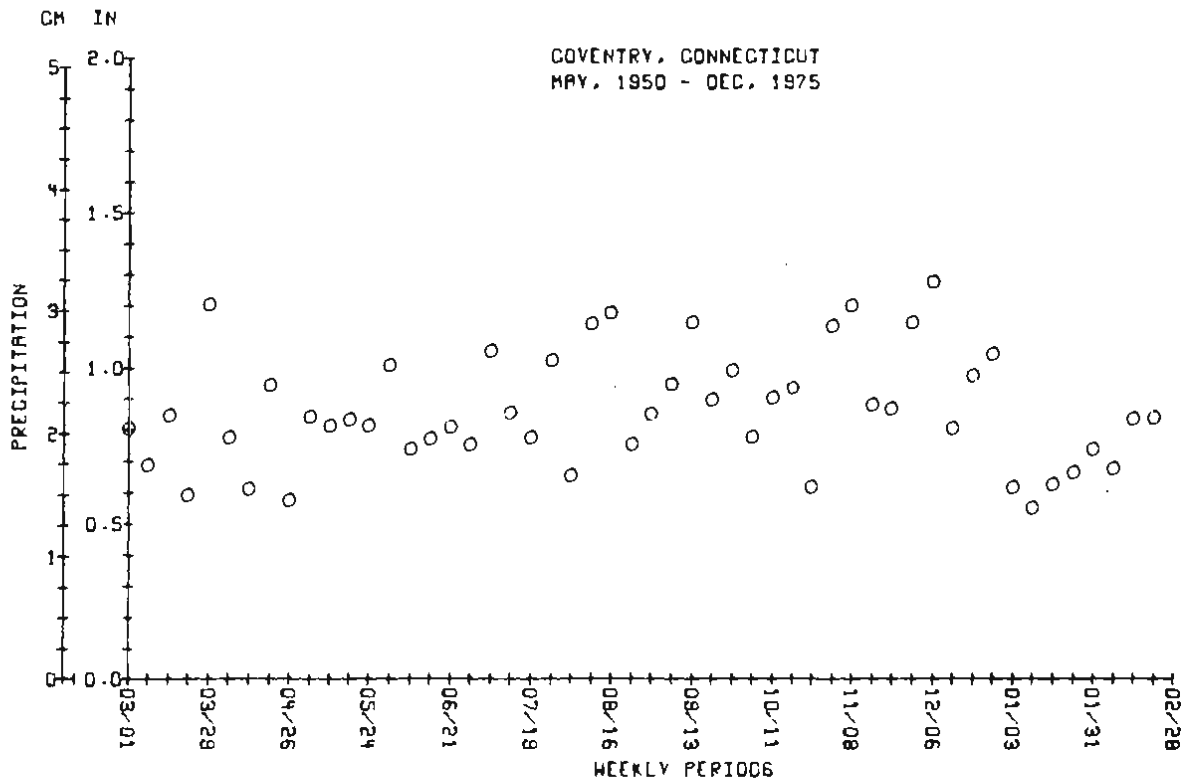


Fig. 8. Weekly Maximum Precipitation

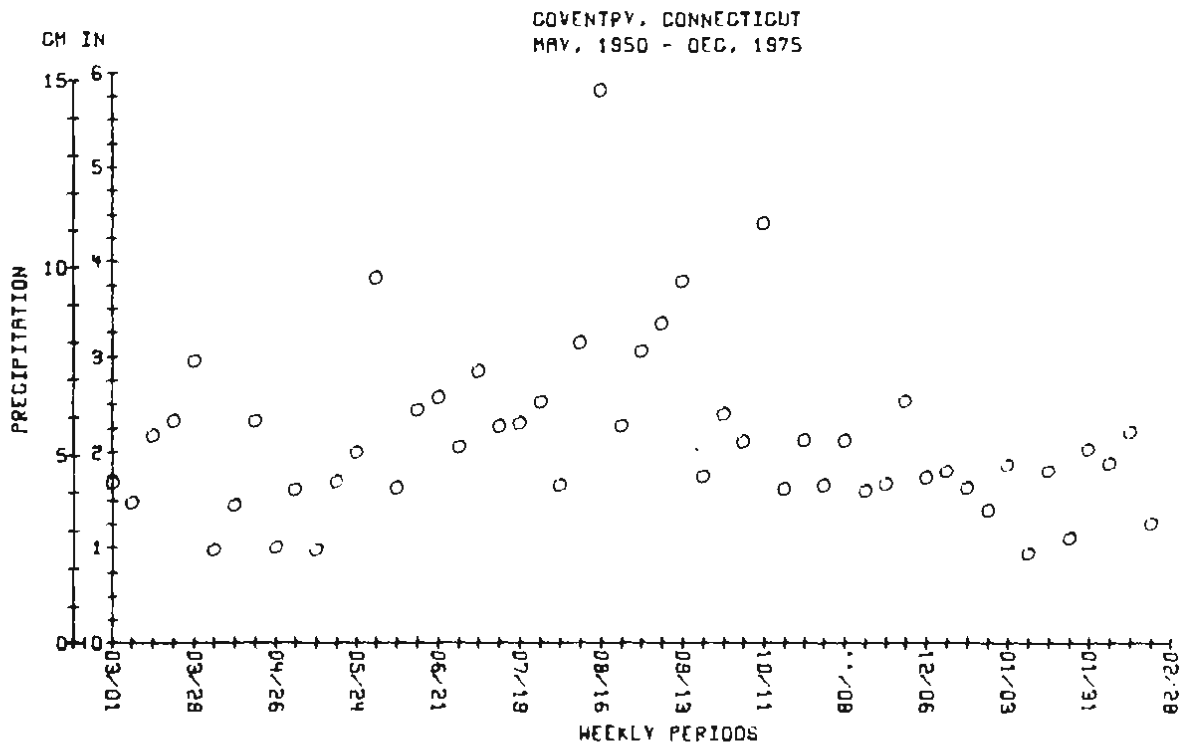


Fig. 9. Average Weekly Evaporation During the Growing Season

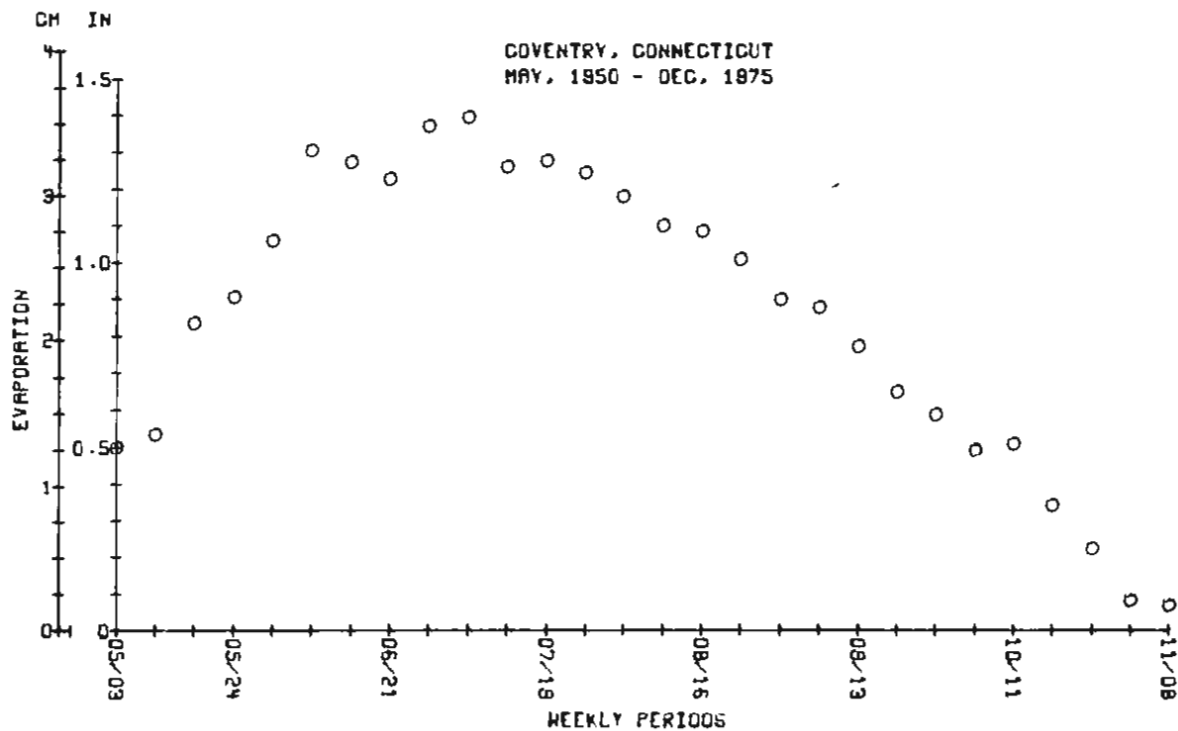


Fig. 10. Snow on Ground

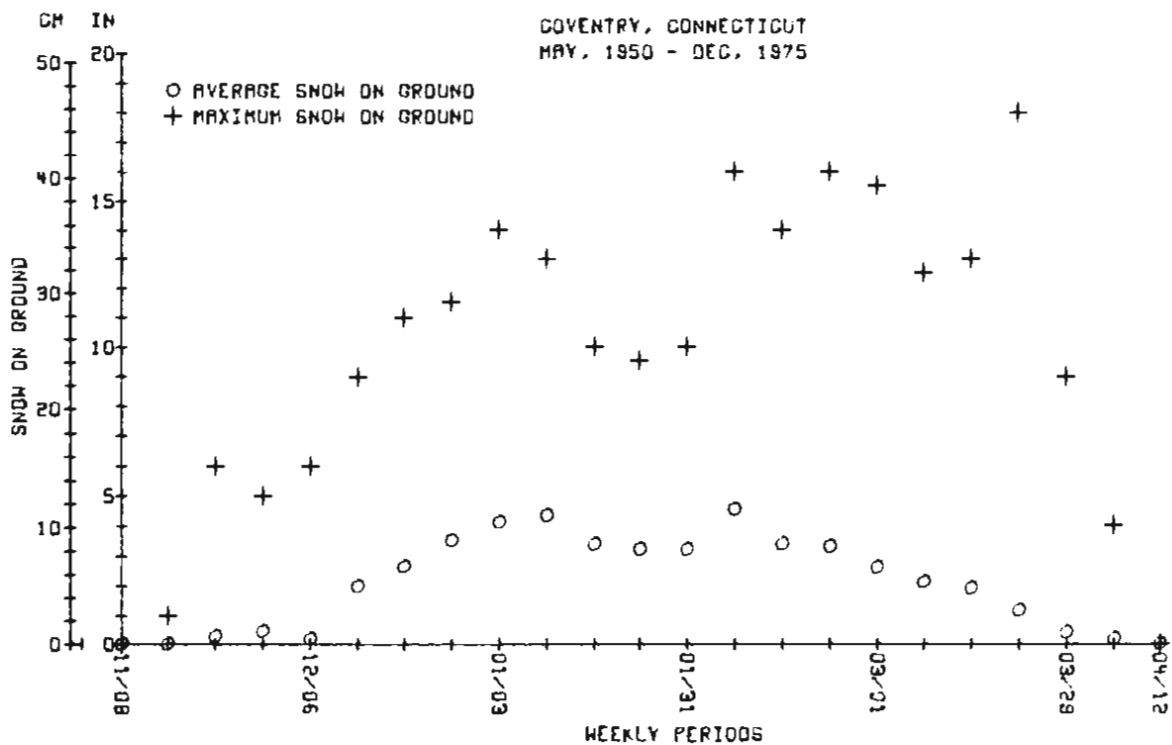


Table I Daily Air Temperature Summary, 1950-1975

DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP	DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP
1/ 1	32.3	11.0	21.7	2/17	35.9	9.3	22.8
1/ 2	33.4	13.7	23.5	2/18	35.3	16.3	25.8
1/ 3	33.8	14.6	24.2	2/19	38.5	19.8	29.1
1/ 4	36.0	16.1	26.0	2/20	37.1	17.9	27.5
1/ 5	36.2	15.0	25.6	2/21	33.7	15.3	24.5
1/ 6	33.1	9.5	21.3	2/22	34.8	15.4	25.1
1/ 7	33.9	12.6	23.3	2/23	36.1	15.7	25.9
1/ 8	35.1	12.1	23.6	2/24	33.9	16.2	25.1
1/ 9	31.5	10.7	21.1	2/25	37.1	15.8	26.4
1/10	28.7	11.5	20.2	2/26	38.0	17.1	27.6
1/11	32.8	10.9	21.8	2/27	36.9	14.9	25.9
1/12	33.9	10.2	22.1	2/28	36.3	16.1	27.2
1/13	31.1	9.3	20.2	2/29	39.8	19.3	29.5
1/14	33.7	10.6	22.2				
1/15	32.9	9.5	21.2				
1/16	33.6	10.9	22.3	3/ 1	40.9	20.2	30.6
1/17	28.6	8.7	18.6	3/ 2	39.6	21.7	30.6
1/18	32.2	8.1	20.2	3/ 3	41.8	23.2	32.5
1/19	34.9	6.5	20.7	3/ 4	41.5	22.1	31.8
1/20	34.7	10.9	22.8	3/ 5	43.4	25.9	34.7
1/21	34.3	13.0	23.7	3/ 6	42.3	24.4	33.4
1/22	36.6	16.5	26.5	3/ 7	41.5	23.1	32.3
1/23	39.3	14.1	26.7	3/ 8	43.3	22.7	32.6
1/24	38.9	14.8	26.3	3/ 9	39.9	19.6	29.7
1/25	36.9	17.3	27.1	3/10	40.1	20.3	30.2
1/26	38.3	15.5	26.9	3/11	41.1	20.2	30.6
1/27	37.2	14.3	26.1	3/12	40.2	23.5	31.9
1/28	34.3	11.2	22.7	3/13	41.1	24.8	32.5
1/29	30.7	10.3	20.5	3/14	40.6	24.1	32.3
1/30	34.8	12.5	23.6	3/15	41.2	23.9	32.5
1/31	35.3	10.6	22.9	3/16	42.9	23.2	33.1
				3/17	45.6	24.3	35.0
2/ 1	30.5	6.6	18.5	3/18	44.9	23.9	34.4
2/ 2	30.9	10.9	20.9	3/19	42.5	23.2	32.7
2/ 3	33.9	14.4	24.1	3/20	45.5	24.8	35.2
2/ 4	35.3	10.5	22.9	3/21	45.5	23.9	34.7
2/ 5	32.6	10.3	21.5	3/22	44.9	25.0	34.9
2/ 6	35.6	14.3	25.0	3/23	42.9	24.5	33.3
2/ 7	35.3	13.1	24.2	3/24	48.1	24.6	36.4
2/ 8	35.0	8.3	21.6	3/25	46.6	26.2	36.4
2/ 9	34.3	11.2	22.8	3/26	50.1	25.6	37.3
2/10	34.0	11.5	22.7	3/27	46.9	27.7	37.3
2/11	33.3	12.6	23.1	3/28	46.1	24.2	35.1
2/12	34.8	11.5	23.1	3/29	50.7	25.0	37.8
2/13	33.0	10.2	21.9	3/30	48.3	25.4	36.9
2/14	36.8	14.8	25.8	3/31	47.6	28.8	38.2
2/15	36.3	16.6	27.5				
2/16	36.5	14.0	25.2				

Table I, continued

DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP	DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP
4/ 1	47.8	25.6	36.7	5/19	69.3	45.4	57.4
4/ 2	52.9	30.5	41.7	5/20	71.8	46.8	59.3
4/ 3	53.1	31.1	42.1	5/21	71.6	44.0	57.8
4/ 4	54.0	28.1	41.1	5/22	71.5	44.9	58.2
4/ 5	52.2	29.2	40.4	5/23	72.0	47.6	59.8
4/ 6	51.2	28.2	39.7	5/24	70.3	44.3	57.6
4/ 7	50.0	28.2	39.1	5/25	70.2	44.9	57.5
4/ 8	52.5	31.1	41.8	5/26	68.7	44.6	56.6
4/ 9	52.2	28.8	40.5	5/27	69.8	44.9	57.4
4/10	55.0	33.0	44.0	5/28	71.6	44.0	57.8
4/11	52.8	29.3	41.5	5/29	72.0	44.7	58.3
4/12	54.0	29.9	42.0	5/30	72.0	45.5	58.8
4/13	56.1	29.7	42.9	5/31	72.9	46.0	59.4
4/14	54.2	30.8	42.5				
4/15	59.3	31.9	45.6	6/ 1	75.1	48.0	61.5
4/16	59.2	35.6	47.4	6/ 2	75.6	50.3	63.0
4/17	58.8	34.0	46.4	6/ 3	75.0	49.3	62.1
4/18	61.7	34.7	48.2	6/ 4	74.8	47.0	60.9
4/19	62.6	35.9	49.3	6/ 5	75.9	50.0	63.0
4/20	59.8	34.9	47.4	6/ 6	75.8	49.4	62.6
4/21	57.3	30.8	44.1	6/ 7	77.4	51.0	64.2
4/22	61.3	38.2	49.8	6/ 8	75.0	48.6	61.8
4/23	63.2	38.8	51.0	6/ 9	76.3	51.5	63.9
4/24	61.2	36.5	48.9	6/10	78.4	50.4	64.4
4/25	57.6	37.4	46.9	6/11	75.7	50.0	62.9
4/26	62.3	37.3	49.7	6/12	75.6	50.1	62.9
4/27	61.3	36.2	48.7	6/13	75.5	51.5	63.5
4/28	59.5	37.0	48.2	6/14	74.8	53.0	63.9
4/29	62.0	37.7	49.9	6/15	74.5	50.8	62.6
4/30	62.8	36.4	49.6	6/16	75.2	51.6	63.4
				6/17	76.4	51.5	63.9
5/ 1	62.8	36.4	49.6	6/18	76.6	51.1	63.9
5/ 2	64.6	37.7	51.2	6/19	76.8	50.4	63.5
5/ 3	62.0	36.4	49.2	6/20	77.2	53.0	65.1
5/ 4	63.3	37.4	50.3	6/21	76.6	53.8	65.2
5/ 5	64.4	36.9	50.6	6/22	77.4	54.1	65.8
5/ 6	65.0	35.9	51.4	6/23	78.1	53.8	66.0
5/ 7	64.4	37.1	50.8	6/24	78.6	56.0	67.3
5/ 8	63.3	41.9	52.6	6/25	79.7	57.2	68.5
5/ 9	64.6	41.9	53.2	6/26	78.9	54.6	66.8
5/10	67.0	43.4	55.2	6/27	77.6	55.2	66.4
5/11	67.5	41.2	54.3	6/28	78.5	53.6	66.1
5/12	68.1	42.2	55.1	6/29	80.1	54.8	67.4
5/13	69.5	42.6	56.2	6/30	79.7	57.5	68.6
5/14	69.4	41.3	55.6				
5/15	67.2	41.3	54.5				
5/16	68.1	44.7	56.4				
5/17	69.0	42.9	55.9				
5/18	71.4	43.6	57.5				

Table I, continued

DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP	DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP
7/ 1	81.7	57.7	69.7	8/17	79.7	57.7	68.7
7/ 2	82.8	55.3	69.1	8/18	78.9	55.2	67.0
7/ 3	83.5	57.8	70.7	8/19	79.1	52.7	65.9
7/ 4	81.1	55.6	68.3	8/20	78.8	54.6	66.7
7/ 5	90.6	55.3	68.0	8/21	79.1	55.8	67.5
7/ 6	78.6	53.5	66.0	8/22	78.7	54.4	66.5
7/ 7	78.5	52.3	65.4	8/23	77.8	52.3	65.1
7/ 8	80.6	53.5	67.0	8/24	76.1	52.4	64.2
7/ 9	82.5	56.0	69.2	8/25	77.4	52.4	64.9
7/10	80.1	56.2	68.2	8/26	78.7	54.0	66.3
7/11	79.9	57.3	68.9	8/27	79.0	54.3	66.6
7/12	80.6	56.5	68.5	8/28	79.7	55.0	67.4
7/13	80.6	56.4	68.5	8/29	80.6	55.8	68.2
7/14	80.3	60.3	70.3	8/30	80.6	57.6	69.1
7/15	81.1	58.5	69.8	8/31	80.0	58.8	69.5
7/16	80.9	58.3	69.6				
7/17	81.6	58.1	69.9				
7/18	83.2	57.4	70.3	9/ 1	80.5	55.5	68.0
7/19	83.3	60.5	71.9	9/ 2	79.2	54.2	66.7
7/20	82.2	60.0	71.1	9/ 3	77.5	54.2	65.9
7/21	79.4	57.3	68.3	9/ 4	76.1	54.8	65.3
7/22	80.3	57.0	68.6	9/ 5	78.6	52.6	65.0
7/23	80.4	59.3	69.9	9/ 6	76.9	52.1	64.5
7/24	81.8	58.2	70.0	9/ 7	74.6	51.3	63.0
7/25	80.5	57.6	69.1	9/ 8	75.4	48.5	62.0
7/26	81.0	56.2	68.6	9/ 9	74.8	49.6	62.2
7/27	80.4	58.1	69.3	9/10	74.9	49.6	62.3
7/28	81.6	57.4	69.5	9/11	74.6	49.7	62.2
7/29	81.7	59.5	70.6	9/12	74.0	50.2	62.1
7/30	82.0	58.1	70.1	9/13	74.1	48.5	61.3
7/31	82.0	57.0	69.5	9/14	74.0	50.5	62.2
				9/15	71.4	47.2	59.3
				9/16	71.5	47.0	59.3
8/ 1	82.2	59.7	71.0	9/17	72.5	45.4	58.9
8/ 2	81.6	56.7	69.1	9/18	70.9	46.2	58.5
8/ 3	79.6	56.0	67.8	9/19	71.1	48.1	59.2
8/ 4	79.8	59.0	69.4	9/20	70.6	48.7	59.6
8/ 5	79.4	56.6	68.0	9/21	70.0	48.2	59.1
8/ 6	78.6	54.2	66.4	9/22	70.5	48.8	59.4
8/ 7	79.0	55.2	67.1	9/23	70.6	45.7	58.2
8/ 8	79.9	56.8	68.3	9/24	69.6	44.0	56.8
8/ 9	81.4	56.5	68.9	9/25	67.7	43.1	55.4
8/10	79.7	57.8	68.7	9/26	68.5	43.9	56.2
8/11	79.9	57.8	68.9	9/27	70.9	45.0	57.9
8/12	79.3	55.0	67.2	9/28	69.7	45.9	57.8
8/13	78.9	54.8	66.9	9/29	67.3	43.4	55.4
8/14	79.2	54.4	66.8	9/30	66.9	43.3	55.3
8/15	81.4	55.1	68.2				
8/16	80.2	55.6	67.9				

Table I, continued

DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP	DATE	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP
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10 / 1	68.4	42.3	55.4	11/15	51.8	31.5	41.5
10 / 2	67.4	39.5	53.4	11/16	48.4	29.1	38.8
10 / 3	68.9	41.9	55.4	11/17	49.1	29.1	39.1
10 / 4	69.0	40.0	54.5	11/18	49.3	28.9	39.1
10 / 5	66.4	39.3	52.9	11/19	51.4	30.6	41.0
10 / 6	67.6	39.3	53.4	11/20	49.8	26.1	38.0
10 / 7	67.5	39.9	53.7	11/21	47.2	25.4	36.3
10 / 8	65.4	39.6	52.5	11/22	46.4	24.6	35.5
10 / 9	65.4	37.3	51.3	11/23	45.8	25.0	35.4
10 / 10	67.4	38.8	53.1	11/24	47.3	24.3	35.8
10 / 11	66.8	38.2	52.5	11/25	47.8	26.7	37.3
10 / 12	65.3	39.9	52.6	11/26	45.5	24.1	34.8
10 / 13	64.6	37.9	51.3	11/27	49.2	25.4	37.3
10 / 14	63.9	38.9	51.4	11/28	48.4	27.2	37.8
10 / 15	65.3	41.0	53.1	11/29	50.4	29.8	40.1
10 / 16	66.5	38.6	52.6	11/30	46.7	24.4	35.6
10 / 17	65.9	38.2	52.0				
10 / 18	64.0	36.9	50.5	12 / 1	41.3	23.6	31.4
10 / 19	61.2	34.2	47.7	12 / 2	40.8	18.7	29.8
10 / 20	60.5	34.8	47.7	12 / 3	41.0	19.2	30.1
10 / 21	58.4	32.6	45.5	12 / 4	43.0	22.7	32.9
10 / 22	58.9	30.8	44.9	12 / 5	41.7	21.2	31.4
10 / 23	60.4	33.8	47.1	12 / 6	43.4	22.3	31.8
10 / 24	62.3	38.3	50.3	12 / 7	43.5	21.2	32.4
10 / 25	61.6	35.4	48.5	12 / 8	40.1	22.2	31.1
10 / 26	59.1	36.6	47.9	12 / 9	40.6	22.6	31.6
10 / 27	58.0	32.6	45.3	12 / 10	41.3	23.3	32.6
10 / 28	58.7	30.6	44.6	12 / 11	40.3	21.1	30.7
10 / 29	58.5	31.6	45.0	12 / 12	40.1	20.0	30.1
10 / 30	56.3	32.8	44.6	12 / 13	37.7	17.5	27.6
10 / 31	54.6	31.0	42.8	12 / 14	40.1	18.8	29.4
				12 / 15	38.9	18.4	28.6
				12 / 16	36.3	15.4	25.9
				12 / 17	35.1	14.6	24.8
				12 / 18	35.8	14.3	25.1
11 / 1	56.5	35.4	46.0	12 / 19	33.7	13.1	23.4
11 / 2	57.6	35.6	46.6	12 / 20	35.2	16.9	26.1
11 / 3	58.3	38.6	48.4	12 / 21	35.6	16.9	26.3
11 / 4	58.4	37.3	47.8	12 / 22	36.3	16.3	26.3
11 / 5	56.0	34.7	45.4	12 / 23	35.0	13.8	24.4
11 / 6	53.9	34.5	44.3	12 / 24	33.9	14.6	24.3
11 / 7	52.1	31.3	41.7	12 / 25	33.5	12.6	23.1
11 / 8	52.1	29.6	40.9	12 / 26	38.1	15.5	27.5
11 / 9	51.8	31.9	41.9	12 / 27	39.9	19.6	29.7
11 / 10	51.2	32.1	41.7	12 / 28	35.8	17.2	26.5
11 / 11	51.7	30.7	41.2	12 / 29	36.4	15.0	24.6
11 / 12	51.0	29.5	40.3	12 / 30	35.8	17.1	26.4
11 / 13	52.9	31.0	41.9	12 / 31	33.1	11.6	22.3
11 / 14	52.4	33.6	43.0				

Table II Weekly Average Air Temperatures, 1950-1975

Week be- ginning	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP	Week be- ginning	AV MAX TEMP	AV MIN TEMP	OVERALL AVERAGE TEMP
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Mar 1	41.6	22.9	32.3	Sept 6	75.0	50.2	62.6
Mar 8	40.8	22.1	31.4	Sept 13	72.2	47.6	59.9
Mar 15	44.0	23.9	34.0	Sept 20	69.6	46.1	57.9
Mar 22	46.4	25.4	35.9	Sept 27	68.5	43.2	55.8
Mar 29	50.6	27.8	39.2	Oct 4	67.0	39.2	53.1
Apr 5	52.3	29.7	40.9	Oct 11	65.5	39.0	52.2
Apr 12	57.6	32.3	45.0	Oct 18	60.8	34.5	47.6
Apr 19	60.4	36.1	48.2	Oct 25	58.1	32.9	45.5
Apr 26	62.2	36.9	49.5	Nov 1	56.1	35.4	45.8
May 3	63.9	38.2	51.0	Nov 8	51.9	31.2	41.5
May 10	68.1	42.5	55.3	Nov 15	49.6	28.6	39.1
May 19	71.0	45.0	58.0	Nov 22	47.2	25.3	36.3
May 24	70.7	44.8	57.7	Nov 29	43.6	22.5	33.0
May 31	75.0	48.5	61.8	Dec 6	41.0	21.8	31.4
June 7	76.3	50.4	63.4	Dec 13	36.8	16.0	26.4
June 14	75.9	51.6	63.8	Dec 20	35.3	15.3	25.4
June 21	78.1	55.0	66.6	Dec 27	35.3	14.8	25.0
June 28	81.1	56.0	68.6	Jan 3	34.2	12.9	23.6
July 5	80.1	54.9	67.5	Jan 10	32.4	10.5	21.4
July 15	81.2	57.9	69.6	Jan 17	34.4	11.1	22.7
July 19	81.1	58.6	69.8	Jan 24	35.9	13.8	24.8
July 26	81.6	58.0	69.8	Jan 31	33.5	11.1	22.3
Aug 2	79.7	56.4	68.0	Feb 7	34.3	11.2	22.8
Aug 9	79.9	55.9	67.9	Feb 14	36.6	15.9	26.3
Aug 16	79.2	55.1	67.2	Feb 21	35.8	15.8	25.8
Aug 23	78.5	53.7	65.1	Feb 28	36.9	18.3	27.6
Aug 30	78.9	55.3	67.1				

Table III Growing Season Lengths and Dates of Critical Freezing Temperatures in the Spring and Fall Seasons, 1950-1975

	Temperature			
	0°F	10°F	25°	32°F
Spring Season:				
Latest dates of occurrence on record.....	March 26	April 1	May 11	June 24
Average dates of last occurrence.....	March 14	March 22	April 29	May 27
Fall Season:				
Earliest dates of occurrence on record.....	December 5	November 11	September 25	September 7
Average dates of first occurrence.....	December 22	December 4	October 17	September 27
Average growing season frost free period:	122 days			
Shortest growing season frost free period:	75 days			

Table IV Weekly Average Heating and Growing Degree Days 5/10/1950 to 12/31/1975

Week beginning	AV		BASE 40		BASE 50	
	DAILY HDD	ACCUM HDD	DAILY GDD	ACCUM GDD	DAILY GDD	ACCUM GDD
	-----	-----	-----	-----	-----	-----
Mar 1	229.2	229.2	0.0	0.0	0.0	0.0
Mar 8	235.1	464.3	0.0	0.0	0.0	0.0
Mar 15	217.3	681.6	0.0	0.0	0.0	0.0
Mar 22	203.7	885.2	0.0	0.0	0.0	0.0
Mar 29	180.5	1065.7	4.9	4.9	0.0	0.0
Apr 5	169.5	1234.1	7.7	12.5	0.0	0.0
Apr 12	140.0	1374.2	35.0	47.5	0.0	0.0
Apr 19	117.7	1491.8	57.3	104.8	1.0	1.0
Apr 26	108.1	1599.9	66.9	171.7	1.2	2.1

Table IV, continued

Week beginning	AV		BASE 40		BASE 50	
	DAILY	ACCUM	DAILY	ACCUM	DAILY	ACCUM
	HDD	HDD	GDD	GDD	GDD	GDD
May 3	97.8	1697.7	77.2	249.0	8.0	10.1
May 10	67.7	1765.4	107.3	356.3	37.3	47.5
May 19	49.1	1814.4	125.9	482.2	55.9	103.4
May 24	50.9	1865.4	124.1	606.3	54.1	157.5
May 31	22.5	1887.9	152.5	758.8	82.5	240.0
June 7	11.5	1899.3	163.5	922.3	93.5	333.5
June 14	8.7	1908.0	166.4	1088.7	96.4	429.9
June 21	0.0	1908.0	185.9	1274.6	115.9	545.8
June 28	0.0	1908.0	200.0	1474.6	130.0	675.8
July 5	0.0	1908.0	192.7	1667.3	122.7	798.5
July 15	0.0	1908.0	207.0	1874.3	137.0	935.4
July 19	0.0	1908.0	209.0	2083.3	139.0	1074.4
July 26	0.0	1908.0	208.5	2291.8	138.5	1213.0
Aug 2	0.0	1908.0	196.2	2488.0	126.2	1339.2
Aug 9	0.0	1908.0	195.6	2683.6	125.6	1464.8
Aug 16	0.0	1908.0	190.3	2873.9	120.3	1585.0
Aug 23	0.9	1908.9	182.7	3056.6	112.7	1697.8
Aug 30	0.0	1908.9	190.1	3246.7	120.1	1817.8
Sept 6	16.9	1925.8	158.1	3404.8	88.1	1905.9
Sept 13	35.5	1961.3	139.5	3544.3	69.5	1975.4
Sept 20	50.2	2011.6	124.8	3669.0	54.8	2030.2
Sept 27	64.3	2075.9	110.7	3779.7	40.7	2070.9
Oct 4	83.5	2159.4	91.5	3871.2	21.5	2092.4
Oct 11	89.4	2248.8	85.6	3956.8	15.6	2108.0
Oct 18	121.4	2370.2	53.6	4010.4	0.8	2108.7
Oct 25	136.2	2506.5	38.8	4049.1	0.0	2108.7
Nov 1	134.9	2641.3	40.1	4089.3	0.0	2108.7
Nov 8	164.2	2805.6	10.8	4100.0	0.0	2108.7
Nov 15	181.3	2986.8	2.5	4102.5	0.0	2108.7
Nov 22	201.1	3188.0	0.0	4102.5	0.0	2108.7
Nov 29	223.8	3411.7	0.1	4102.6	0.0	2108.7
Dec 6	234.9	3646.6	0.0	4102.6	0.0	2108.7
Dec 13	270.2	3916.8	0.0	4102.6	0.0	2108.7
Dec 20	277.2	4194.0	0.0	4102.6	0.0	2108.7
Dec 27	280.3	4474.2	0.0	4102.6	0.0	2108.7
Jan 3	289.9	4764.1	0.0	4102.6	0.0	2108.7
Jan 10	305.0	5069.1	0.0	4102.6	0.0	2108.7
Jan 17	295.8	5364.9	0.0	4102.6	0.0	2108.7
Jan 24	281.1	5645.9	0.0	4102.6	0.0	2108.7
Jan 31	299.0	5945.0	0.0	4102.6	0.0	2108.7
Feb 7	295.5	6240.5	0.0	4102.6	0.0	2108.7
Feb 14	271.2	6511.7	0.0	4102.6	0.0	2108.7
Feb 21	274.6	6786.2	0.0	4102.6	0.0	2108.7
Feb 28	73.3	6859.5	0.0	4102.6	0.0	2108.7

Table V Average Weekly Solar Radiation on a Horizontal Surface and Atmospheric Transmission Percentages

Week beginning	Solar Radiation (cal $\frac{-2}{cm} \frac{-1}{week}$)	Atmospheric Transmission of Solar Radiation (%)	Week beginning	Solar Radiation (cal $\frac{-2}{cm} \frac{-1}{week}$)	Atmospheric Transmission of Solar Radiation (%)
Mar 1	1713	43	Aug 30	2530	46
Mar 8	1781	36	Sept 6	2514	48
Mar 15	1844	40	Sept 13	2160	44
Mar 22	2515	51	Sept 20	1988	43
Mar 29	2250	43	Sept 27	1864	43
Apr 5	2442	45	Oct 4	2038	51
Apr 12	2993	52	Oct 11	1761	47
Apr 19	2752	46	Oct 18	1752	50
Apr 26	2574	42	Oct 25	1555	52
May 3	2433	38	Nov 1	1376	46
May 10	2694	41	Nov 8	1203	44
May 19	2429	36	Nov 15	1253	50
May 24	3400	50	Nov 22	1179	50
May 31	3074	45	Nov 29	1093	49
June 7	2892	41	Dec 6	1079	50
June 14	2677	38	Dec 13	1011	48
June 21	2872	41	Dec 20	850	41
June 28	3450	50	Dec 27	986	47
July 5	3665	53	Jan 3	1191	55
July 15	2912	38	Jan 10	1060	46
July 19	4314	47	Jan 17	1246	51
July 26	2807	43	Jan 24	1284	49
Aug 2	2895	46	Jan 31	1391	49
Aug 9	3031	49	Feb 7	1513	49
Aug 16	3003	51	Feb 14	1583	47
Aug 23	2769	59	Feb 21	1617	44

Table VI Weekly Averages of Soil Temperatures
at 4-inch and 8-inch Depths Below Grass Sod

1966-1976			1966-1976		
Week be- ginning	SOIL TEMPERATURES		Week be- ginning	SOIL TEMPERATURES	
	<u>4"</u>	<u>8"</u>		<u>4"</u>	<u>8"</u>
Mar 1	30	31	Aug 30	69	69
Mar 8	31	32	Sept 6	67	67
Mar 15	32	34	Sept 13	65	66
Mar 22	34	36	Sept 20	62	63
Mar 29	38	39	Sept 27	61	61
Apr 5	40	41	Oct 4	56	58
Apr 12	44	45	Oct 11	56	56
Apr 19	48	49	Oct 18	51	52
Apr 26	49	50	Oct 25	48	50
May 3	51	52	Nov 1	47	49
May 10	54	54	Nov 8	44	45
May 19	59	58	Nov 15	40	41
May 24	59	59	Nov 22	38	39
May 31	65	64	Nov 29	35	38
June 7	68	68	Dec 6	34	36
June 14	69	68	Dec 13	33	35
June 21	69	69	Dec 20	31	33
June 28	72	72	Dec 27	31	33
July 5	73	73	Jan 3	30	32
July 15	75	74	Jan 10	30	31
July 19	75	73	Jan 17	29	30
July 26	74	73	Jan 24	30	31
Aug 2	74	73	Jan 31	29	30
Aug 9	73	72	Feb 7	29	30
Aug 16	72	72	Feb 14	29	30
Aug 23	71	71	Feb 21	29	30

Table VII Weekly Averages of Precipitation, Evaporation and Snow Depth (All values in Inches)

Week beginning	PRECIPITATION		EVAPORATION AV	SNOW ON GROUND	
	MAX	AV		MAX	AV
Mar 1	1.67	0.801	0.000	15.5	2.60
Mar 8	1.47	0.585	0.000	12.5	2.09
Mar 15	2.18	0.343	0.000	13.0	1.89
Mar 22	2.33	0.590	0.000	18.0	1.14
Mar 29	2.95	1.202	0.000	9.0	0.42
Apr 5	0.93	0.772	0.000	4.0	0.18
Apr 12	1.44	0.612	0.000	0.0	0.00
Apr 19	2.33	0.941	0.052	0.0	0.00
Apr 26	1.00	0.574	0.284	0.0	0.00
May 3	1.60	0.840	0.499	0.0	0.00
May 10	0.97	0.309	0.534	0.0	0.00
May 19	1.69	0.830	0.833	0.0	0.00
May 24	2.00	0.812	0.906	0.0	0.00
May 31	3.82	1.005	1.059	0.0	0.00
June 7	1.61	0.735	1.303	0.0	0.00
June 14	2.44	0.770	1.272	0.0	0.00
June 21	2.57	0.808	1.227	0.0	0.00
June 28	2.05	0.751	1.371	0.0	0.00
July 5	2.84	1.052	1.393	0.0	0.00
July 15	2.27	0.851	1.259	0.0	0.00
July 19	2.30	0.775	1.274	0.0	0.00
July 26	2.51	1.022	1.244	0.0	0.00
Aug 2	1.64	0.654	1.178	0.0	0.00
Aug 9	3.15	1.138	1.096	0.0	0.00
Aug 16	5.80	1.173	1.082	0.0	0.00
Aug 23	2.27	0.753	1.005	0.0	0.00
Aug 30	3.05	0.850	0.896	0.0	0.00
Sept 6	3.35	0.943	0.877	0.0	0.00
Sept 13	3.78	1.144	0.771	0.0	0.00
Sept 20	1.74	0.394	0.650	0.0	0.00
Sept 27	2.40	0.991	0.586	0.0	0.00
Oct 4	2.11	0.771	0.492	0.0	0.00
Oct 11	4.40	0.839	0.508	0.0	0.00
Oct 18	1.60	0.933	0.342	0.5	0.01
Oct 25	2.12	0.613	0.222	0.0	0.00
Nov 1	1.65	1.133	0.082	0.0	0.00
Nov 8	2.12	1.198	0.069	0.0	0.00
Nov 15	1.53	0.379	0.019	1.0	0.03
Nov 22	1.66	0.864	0.000	6.0	0.29
Nov 29	2.53	1.144	0.000	5.0	0.47
Dec 6	1.72	1.272	0.000	6.0	0.18
Dec 13	1.79	0.804	0.000	9.0	2.00
Dec 20	1.61	0.973	0.000	11.0	2.62
Dec 27	1.39	1.044	0.000	11.5	3.50
Jan 3	1.86	0.614	0.000	14.0	4.12
Jan 10	0.93	0.546	0.000	13.0	4.33
Jan 17	1.80	0.623	0.000	10.0	3.36
Jan 24	1.10	0.662	0.000	9.5	3.19
Jan 31	2.02	0.736	0.000	10.0	3.20
Feb 7	1.83	0.674	0.000	16.0	4.56
Feb 14	2.20	0.330	0.000	14.0	3.38
Feb 21	1.25	0.837	0.000	16.0	3.28
Feb 28	0.30	0.047	0.000	16.0	4.38
TOTALS		44.719	24.384		

Table VIII Average, Maximum and Minimum Weekly Wind Speeds at 30 feet and 1.5 feet and Average Wind Directions

Week be- ginning	Wind Speed (miles per week)											
	18 INCHES			30 FEET			DIRECTION PERCENTAGES					
	MAX	MIN	AVE	MAX	MIN	AVE	N	NE	E	SE	S	SW
Mar 1	825	325	588	1126	693	864	19	14	10	0	12	14
Mar 8	832	395	628	1152	641	962	29	24	5	0	10	12
Mar 15	795	389	557	999	816	893	19	12	7	10	7	21
Mar 22	691	459	581	1082	975	1043	22	20	5	2	12	5
Mar 29	841	183	531	909	722	846	24	14	7	10	10	10
Apr 5	810	517	643	1252	998	1135	21	10	0	7	7	17
Apr 12	723	384	542	999	664	777	17	14	0	10	10	17
Apr 19	784	280	526	1175	723	907	26	14	0	7	12	14
Apr 26	655	92	432	946	325	672	33	12	12	5	10	5
May 3	843	65	486	757	222	569	21	12	5	12	14	10
May 10	599	290	463	1010	473	737	14	7	12	7	17	12
May 19	795	261	490	694	516	595	12	14	14	12	14	12
May 24	645	149	399	1085	303	685	29	10	2	25	7	18
May 31	467	87	351	780	304	539	23	19	2	14	19	7
June 7	519	233	350	915	286	555	19	7	10	10	19	17
June 14	595	204	361	1015	191	501	7	17	7	17	19	21
June 21	522	187	359	981	331	571	17	14	21	12	19	10
June 28	476	222	352	801	365	508	17	12	10	17	10	21
July 5	427	108	308	565	210	397	19	12	5	7	12	12
July 15	462	207	302	602	152	455	12	10	10	7	14	24
July 19	1040	196	346	671	270	474	19	24	2	10	24	12
July 26	727	27	283	566	328	445	14	17	5	21	17	19
Aug 2	413	92	267	616	170	451	14	17	2	24	17	12
Aug 9	476	133	288	677	281	490	17	21	5	17	7	17
Aug 16	510	105	279	468	232	367	26	19	12	19	10	5
Aug 23	390	118	256	404	146	319	14	14	0	22	7	22
Aug 30	446	79	248	625	251	437	33	24	0	5	17	7
Sept 6	426	60	275	597	123	409	26	19	5	5	7	19
Sept 13	538	141	265	576	191	392	45	7	10	5	2	14
Sept 20	408	132	283	785	234	510	35	18	5	2	19	7
Sept 27	513	115	314	572	144	358	24	20	0	18	19	2
Oct 4	494	141	294	723	302	468	31	18	2	6	14	6
Oct 11	541	163	323	820	438	598	47	6	2	6	10	14
Oct 18	634	104	351	726	297	543	35	14	6	4	10	6
Oct 25	716	90	376	740	371	550	43	16	0	2	8	6
Nov 1	579	242	373	946	307	657	22	14	4	4	18	8
Nov 8	591	258	402	798	533	698	24	18	4	10	10	10
Nov 15	545	104	372	742	388	585	31	10	8	6	8	14
Nov 22	597	116	408	997	347	669	39	10	2	4	18	2
Nov 29	621	229	432	782	185	608	28	10	0	0	11	17
Dec 6	721	190	426	915	518	672	26	21	3	7	14	5
Dec 13	652	306	455	823	377	584	32	10	2	3	14	7
Dec 20	597	315	469	899	444	722	26	21	0	5	7	12
Dec 27	629	121	333	1019	408	615	24	14	5	2	10	17
Jan 3	650	194	377	703	125	511	34	8	4	4	4	14
Jan 10	684	256	448	664	463	573	29	6	0	10	8	14
Jan 17	578	246	398	761	445	661	16	13	9	2	21	23
Jan 24	725	270	459	1013	539	784	20	10	2	10	9	18
Jan 31	596	372	485	1070	582	726	31	20	2	2	2	14
Feb 7	688	278	478	845	500	615	39	16	0	4	8	12
Feb 14	764	355	560	904	631	803	22	10	2	6	10	12
Feb 21	768	352	553	963	566	789	14	12	2	6	8	16
Feb 28	183	46	84	171	88	120	0	14	0	14	29	43

(Because of missing data the percentages do not add up to exactly 100)

LITERATURE CITED

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